NOAA's Response to and Lessons Learned from Sandy

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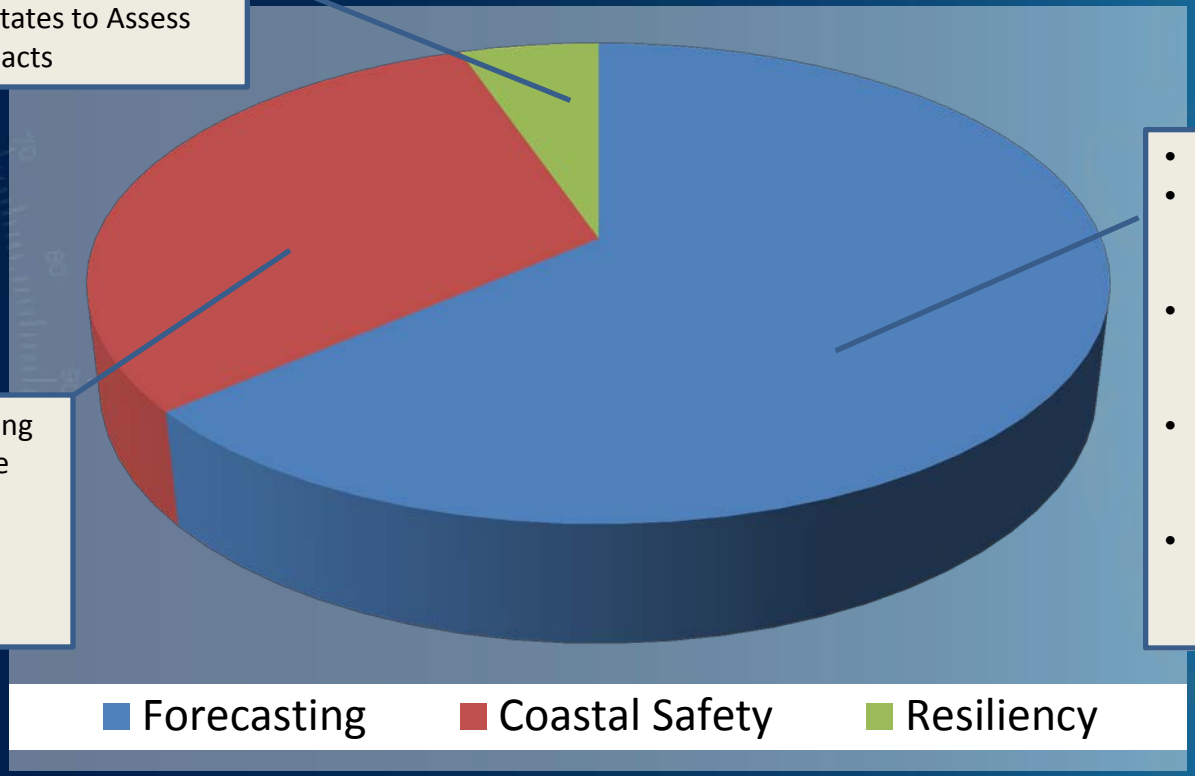
Hydrographic Services Review Panel
February 25, 2014

NOAA Sandy Supplemental

- Facilities Damages
- Fishery Disasters to NY/NJ
- Technical Assistance to States to Assess Impacts

$309.7 M received



- Satellite Gap Mitigation
- Laboratory and Cooperative Institute Research
- Improve Weather and Hurricane Intensity Forecasting
- Prepare NWS Infrastructure for Increased Capacity
- Improvements to Forecasting Equipment and Supercomputers

- Mapping and Charting
- Repairs to Hurricane Hunter Aircraft
- Repair Ocean and Coastal Monitoring Tools

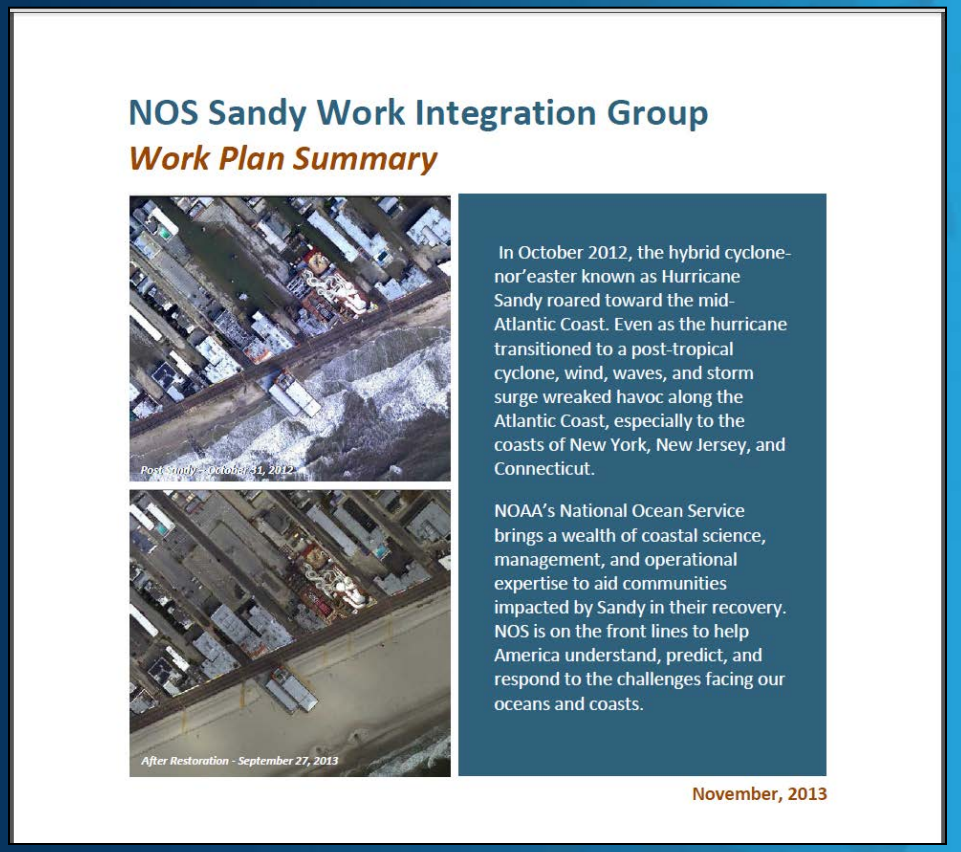
NOS Sandy Work Integration Group

- (1) improve the execution of NOS supplemental spending …
- (2) look for new ways of doing business…

NOS Sandy Work Integration Group

Strategic Activities

- More resilient coastal communities
- Protection from storm surge
- Integrated coastal mapping
- More resilient NOAA facilities



NOS Sandy Supplemental

- More resilient coastal communities
  - Marine Debris Assessment/Removal: $ 4.7 M
  - Coastal Impact Assistance: $ 2.6 M
- Protection from storm surge
  - Shallow water hydro surveys: $ 14.3 M
  - Coastal Inundation Modeling: $ 1.9 M
- Integrated coastal mapping
  - Topobathy Lidar Shoreline Surveys: $ 13.1 M
  - IOCM Processing Center: $ 2.1 M
  - Water level, charting support: $ 2.7 M
  - Enhanced GRAV-D: $ 1.9 M
  - VDatum Upgrades: $ 1.0 M
  - Environ Sensitivity Index Mapping: $ 4.7 M
- More resilient NOAA facilities
  - Facility Repairs: $ 2.2 M
  - Observing equipment repairs: $ 8.9 M

NOS Sandy Work Integration Group

More resilient coastal communities

- All Hazards Response Plan
- Marine Debris Assessment
- National Disaster Recovery Framework
- NOAA Coastal Storms Program

NOS Sandy Work Integration Group

Protection from Storm Surge

- New Surge Models
- Hydrographic Surveys
- Nearshore Elevation Data
- Coastal Inundation Benchmarks
- Sea Level Rise Planning Tools

NOS Sandy Work Integration Group

Integrated Coastal Mapping

- Hydrographic data acquisition
- Collection & processing of topobathy lidar data
- Shoreline change analysis
- Marine debris mapping & removal prioritization
- Updated Environmental Sensitivity Index (ESI) Maps

NOS Sandy Work Integration Group

More resilient NOAA facilities

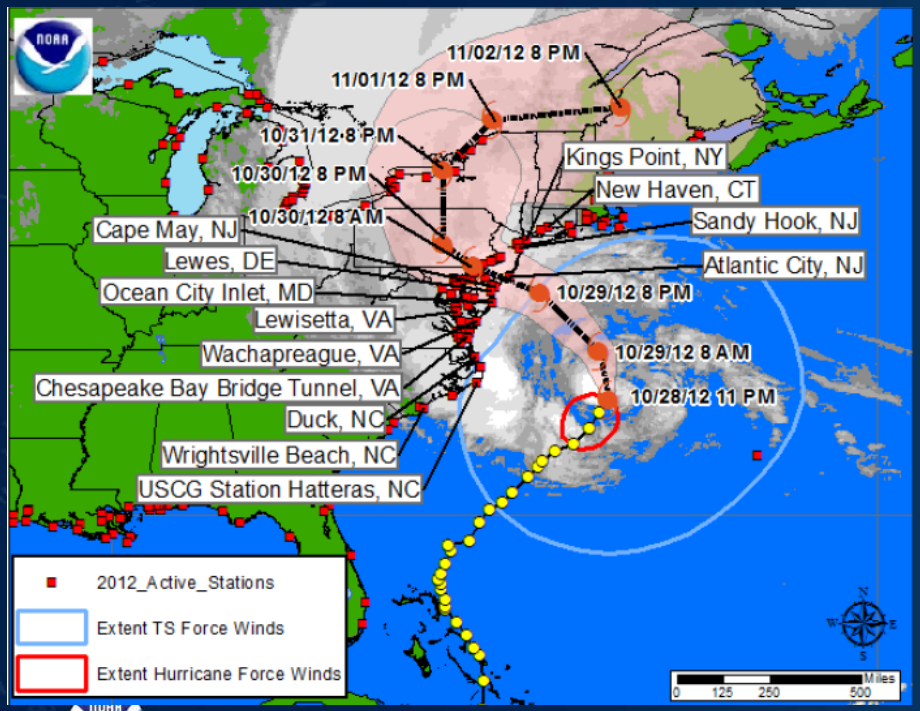
- Repairing facilities
- Replacing lost, damaged or compromised equipment
- Promoting recovery strategies
- Improving observation stations and systems

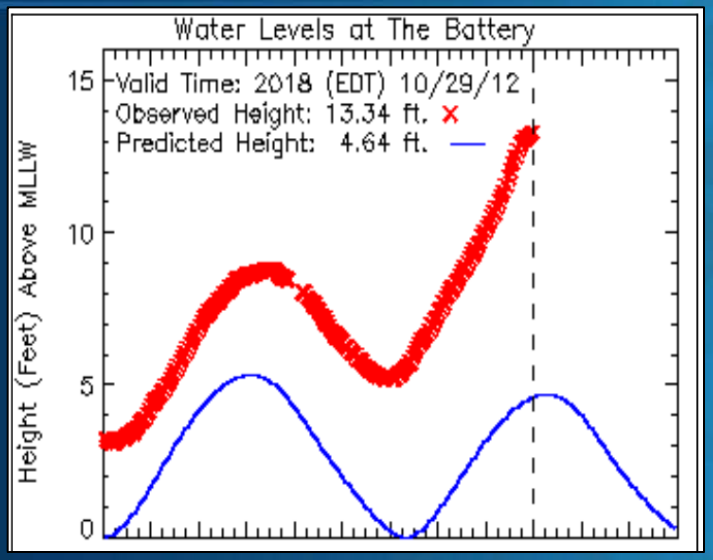
NOAA Sandy Efforts

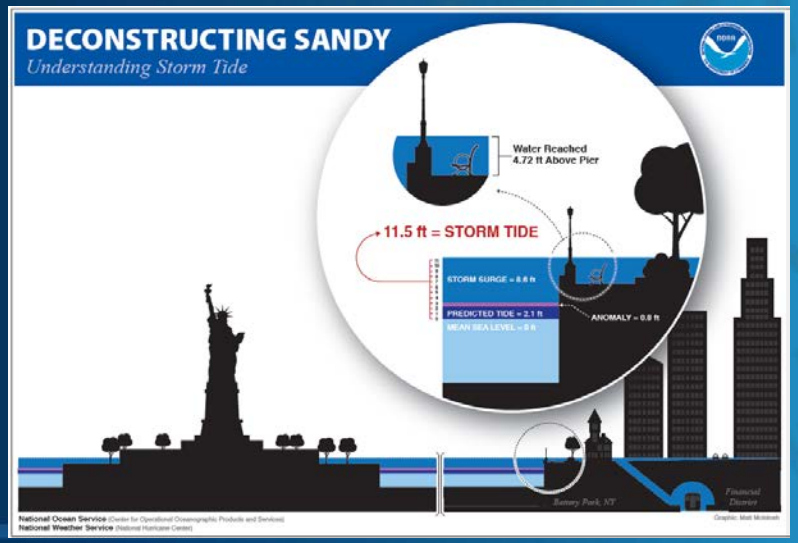
- Sandy Supplemental Integration Strategy (SSIS)
- Background
- Key goals for integration
  - Preparedness
  - Response
  - Recovery
  - Resiliency

Hurricane Quicklook

- Provides real-time water level and meteorological information
- Round the clock updates
- Data updates every six minutes





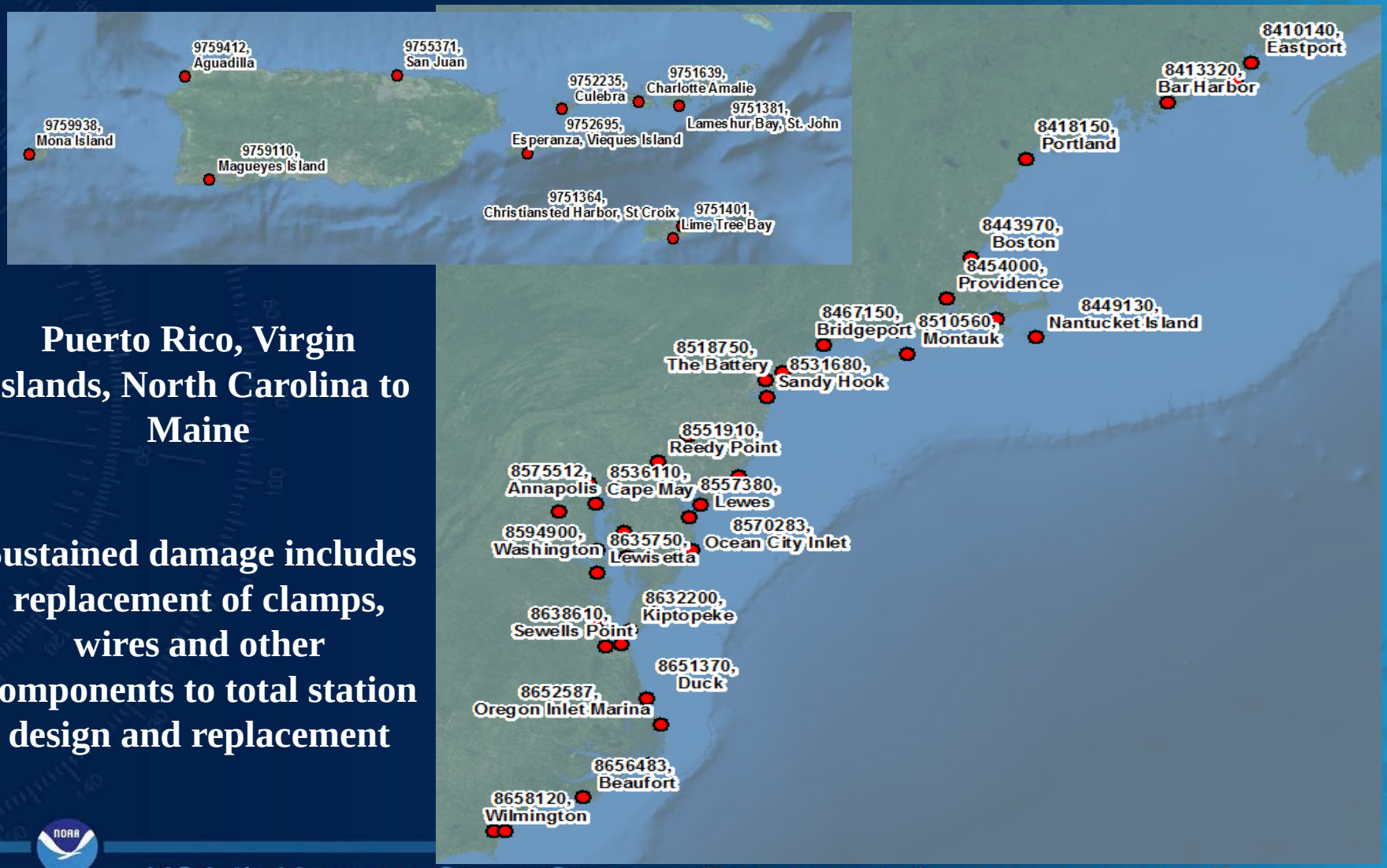


$3M NWLON/PORTS repairs

Aguadilla, PR Before Storm

Aguadilla, PR After Storm

Affected NWLON Stations



Puerto Rico, Virgin Islands, North Carolina to Maine

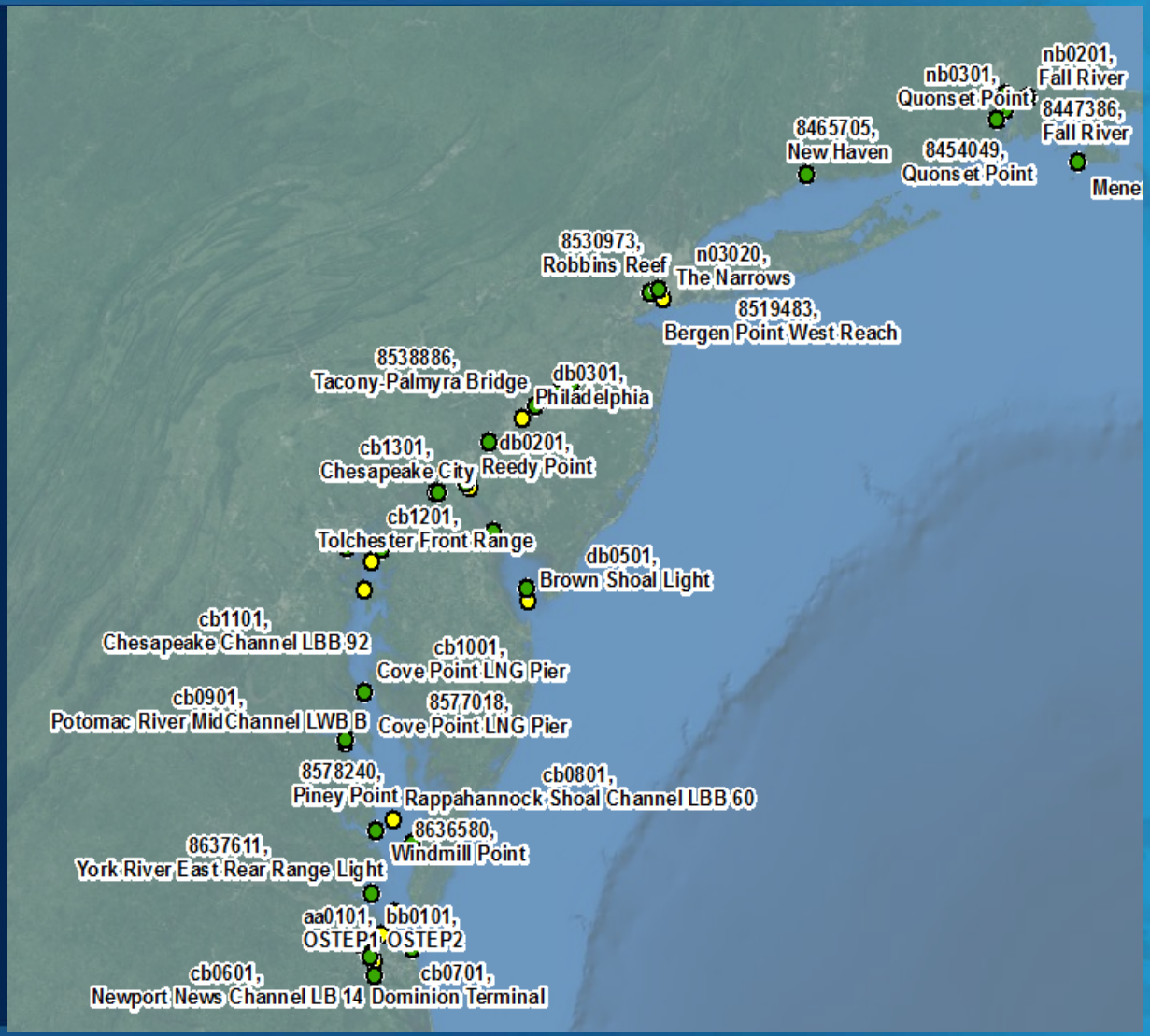
Sustained damage includes replacement of clamps, wires and other components to total station design and replacement

Affected PORTS® Stations

Virginia to Maine

Sustained damage includes replacement of clamps, wires and other components to total station design and replacement

Water level in green
Current Meters in yellow



NWLON/PORTS Repair Status

- 89 stations from NC to ME, PR and VI sustained damage
  - NWLON – 44
  - PORTS – 45

- "Minor" and "Moderate" repairs (completed)
  - CO-OPS did an initial triage sweep of the entire region
  - Many stations were still functional but sustained damage
  - Replaced damaged equipment, components and supplies (ie batteries)
  - Stability checks completed at all stations

- 13 Major Station Replacements
  - Phase 1 Detailed Recon and Report
  - Phase 2 Detailed Design
  - Phase 3 Fabrication
  - Phase 4 Installation

Station Replacements

13 Station Replacements (Phased Approach)

- **Phase 1 Detailed Recon and Report**
  - Completed
- **Phase 2 Detailed Design**
  - Design reviews at conceptual,
  - 30%, 60%, 90% and final
  - Completion 02/28/2014
- **Phase 3 Fabrication**
  - Completion target - 4/15/2014
- **Phase 4 Installation**
  - Contractor PORTS
  - In-house NWLON
  - Completion 9/30/2014

Severely Damaged Stations

Stations that will need complete overhauls

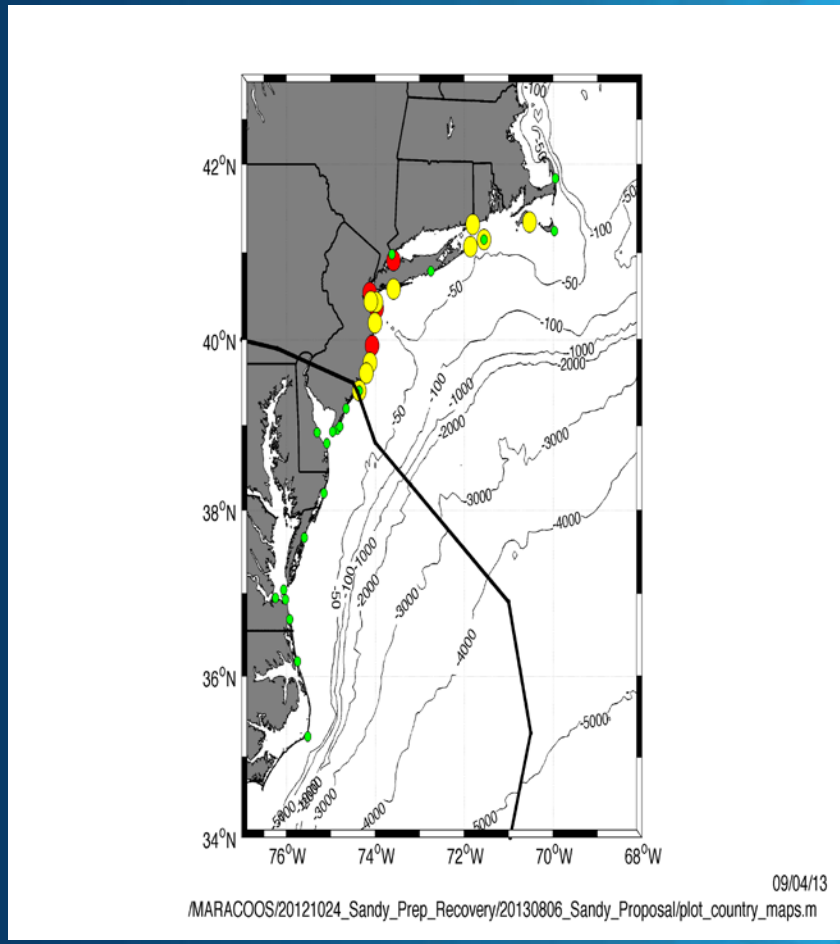
Station ID	Station Name	NWLON/PORTS	Tentative Install Date
8467150	Bridgeport	NWLON	4/30/2014
8510560	Montauk	NWLON	5/30/2014
8516945	Kings Point	NWLON	6/30/2014
8518750	The Battery	NWLON	7/30/2014
8531680	Sandy Hook	NWLON	9/30/2014
9759412	Aguadilla	NWLON	9/30/2014
8452944	Conimicut Light	PORTS	4/30/2014
8454049	Quonset Point	PORTS	5/30/2014
8519483	Bergen Point West Reach	PORTS	6/30/2014
8555889	Brandywine Shoal Light	PORTS	7/30/2014
db0501	Brown Shoal Light	PORTS	5/30/2014
n03020	The Narrows	PORTS	6/30/2014
nb0301	Quonset Point	PORTS	5/30/2014

IOOS Regional Associations

- FY13 funds awarded competitively to MARACOOS and NERACOOS to repair and harden damaged U.S. IOOS assets in the Mid-Atlantic and Northeast Atlantic regions
- First time IOOS Regions have received supplemental dollars
- Total funding: MARACOOS-$2,330,510; NERACOOS-$257,892

MARACOOS

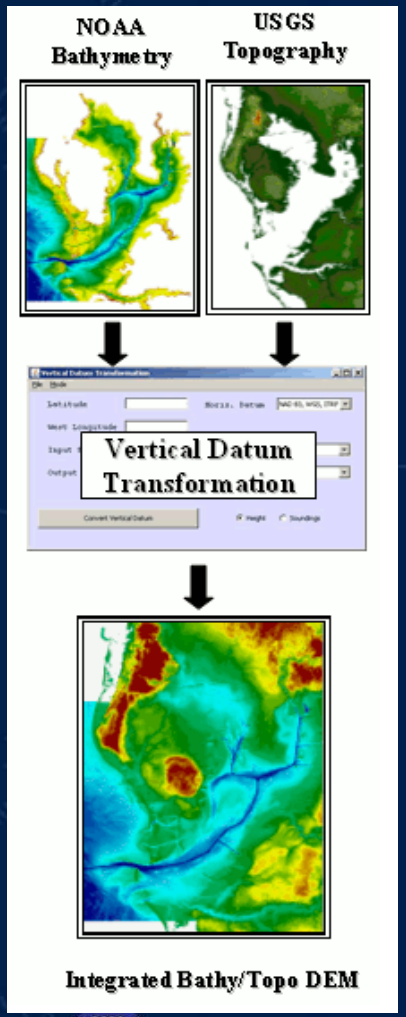
- Figure shows the Mid-Atlantic HFR network.
- Red=totally destroyed; yellow=damaged; green=no damage.
- Funds will repair and harden 17 High Frequency Radars, plus some computer and Acoustic Doppler Current Profiler (ADCP) assets lost during the storm



NERACOOS

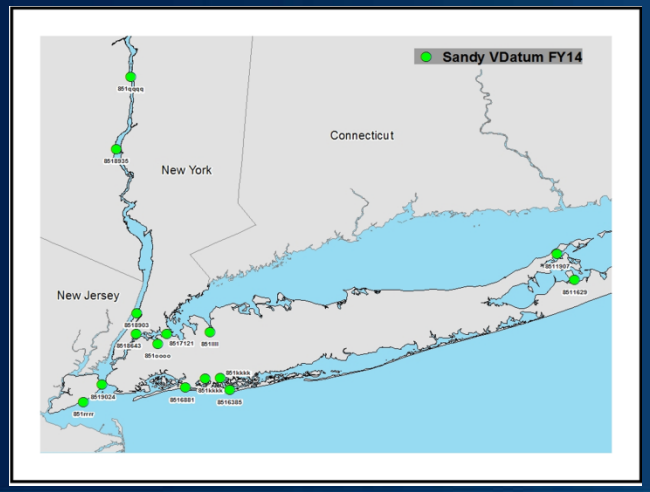
- Northeast Atlantic effort includes restoring damaged buoy hulls, replacing met sensors, and creating a cloud-based solution to ensure data, models and observations are available during future storms

$1M VDatum

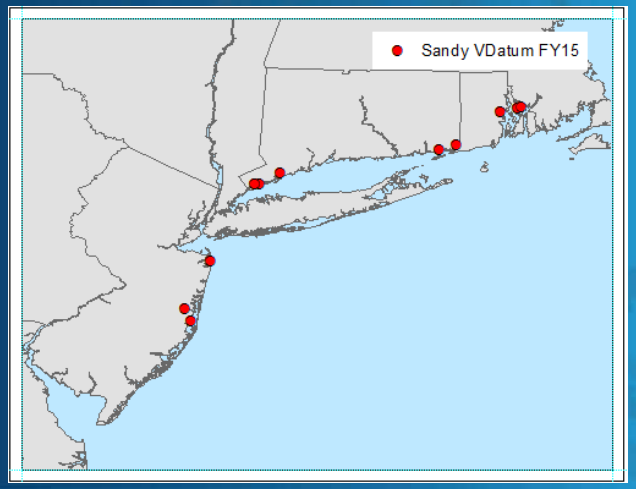


Installing ~35 Water Level Stations During FY14 and FY15 to Provide Updated Tidal and Geodetic Relationships for VDatum

FY14 Installations



FY15 Installations

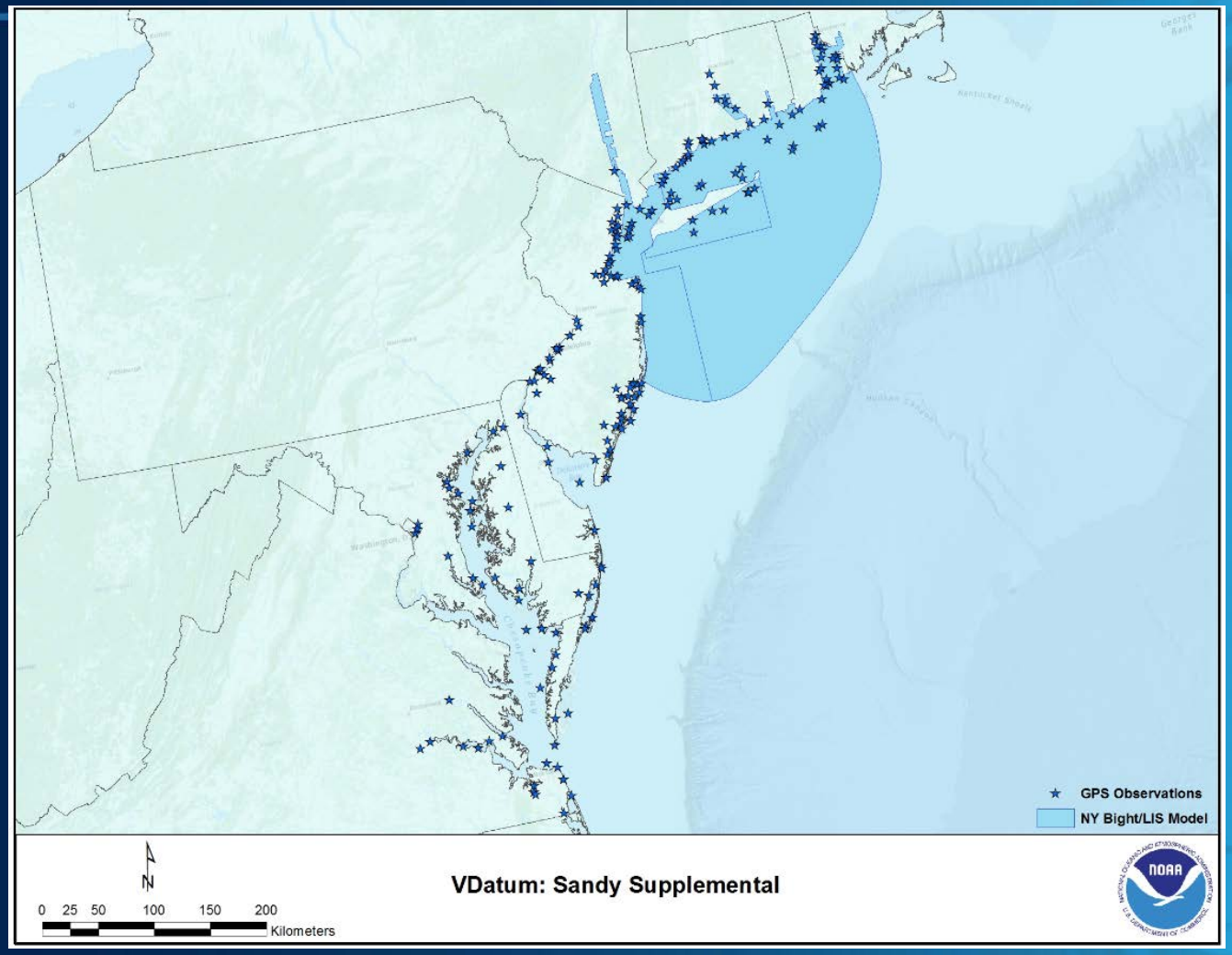


$1M VDatum

New York /Connecticut/ Rhode Island – Outer NY Bight, eastern Long Island Sound, Block Island Sound

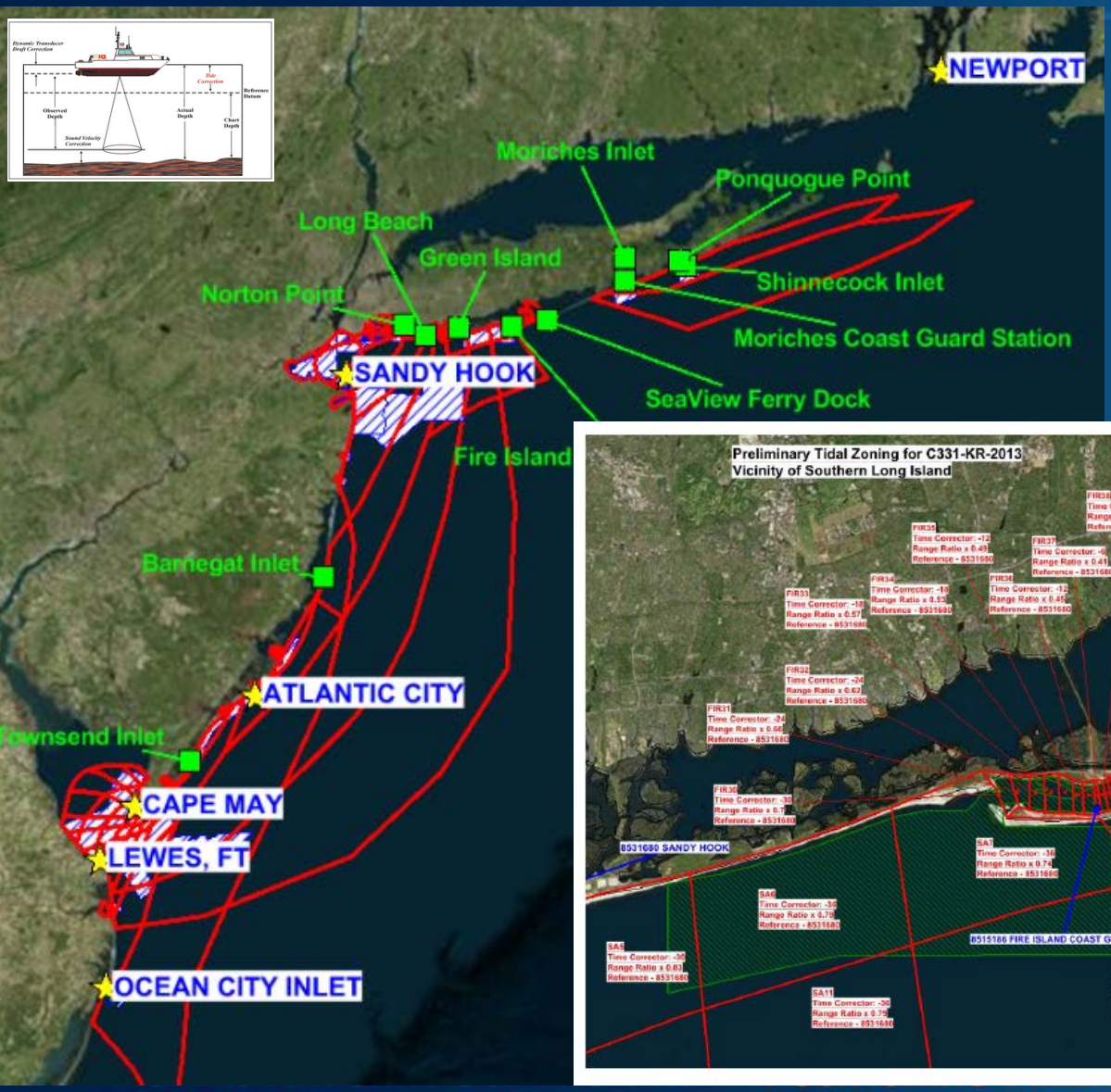
New York - The Great South Bay

New Jersey/New York/Connecticut – Northern NJ, NY Harbor, western Long Island Sound



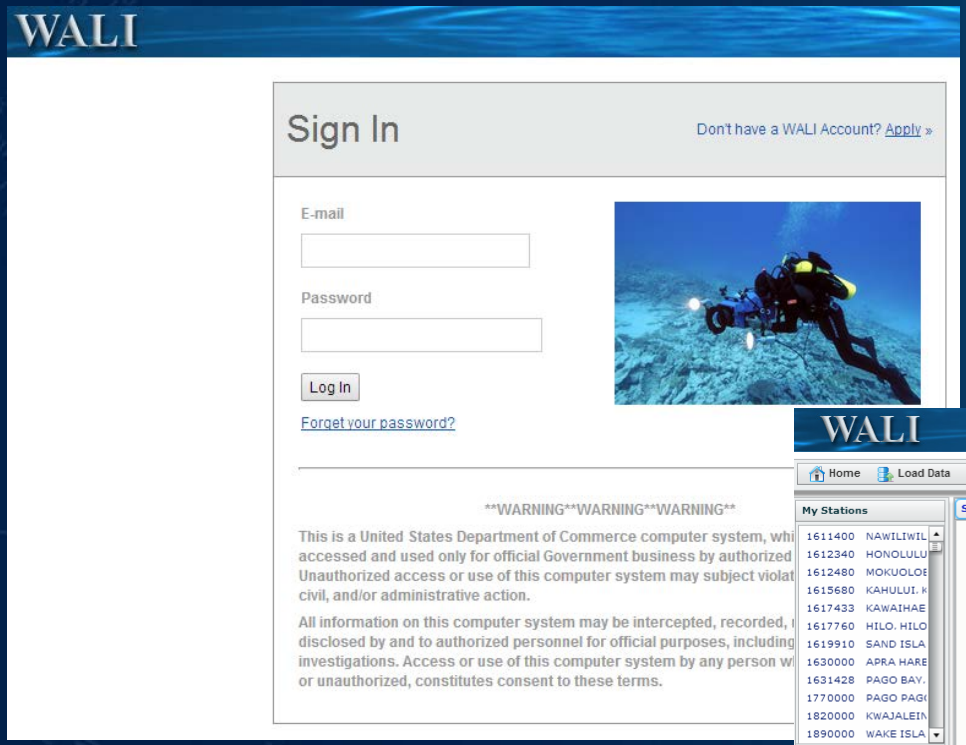
Model Regions to be updated and GPS

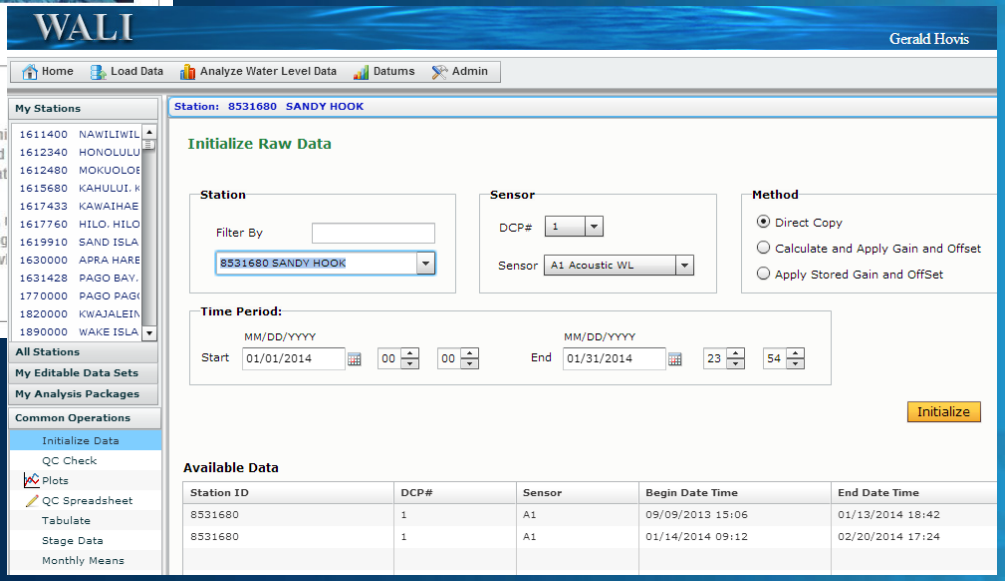
$2.2M CO-OPS Water Level Support



Supporting tide gauge installation and data requirements for the hydrographic survey activities

Enhancing a Web Based Water Level Processing Tool (WALI)

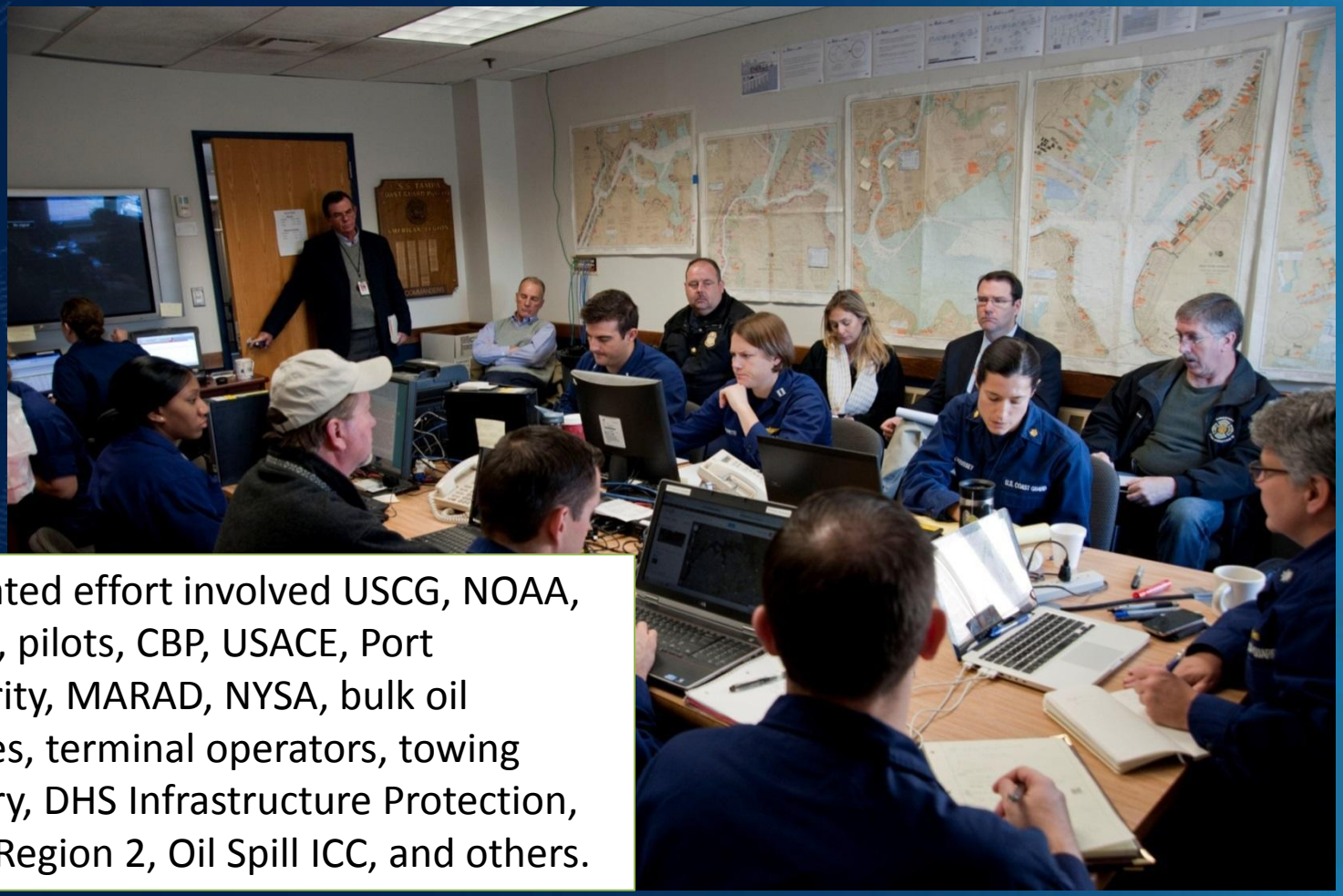




Software enhancements to improve efficiency of data processing of tide date

https://access.co-ops.nos.noaa.gov/wali/logout.do

Sandy Response - Marine Transportation System Recovery Unit (MTSRU)



Integrated effort involved USCG, NOAA, USACE, pilots, CBP, USACE, Port Authority, MARAD, NYSA, bulk oil facilities, terminal operators, towing Industry, DHS Infrastructure Protection, FEMA Region 2, Oil Spill ICC, and others.

Port of New York - New Jersey

- *NOAA starts surveying Oct 31*
- *Port resumes modified ops within 5 days*

NRT5

NRT2

Thomas Jefferson

Cape May, New Jersey - Lewes, Delaware

- *NOAA starts surveying Oct 31*
- *After comparison with earlier data, shoaling reported on Nov 4*

R/V Potawaugh

Ferdinand Hassler

R/V Bay Hydro II

Hampton Roads - Norfolk, VA

- *NOAA starts surveying Oct 29*
- *Port resumes normal operations at 4 pm the next day (Oct 30)*

NOAA assets supporting MTS response to Sandy

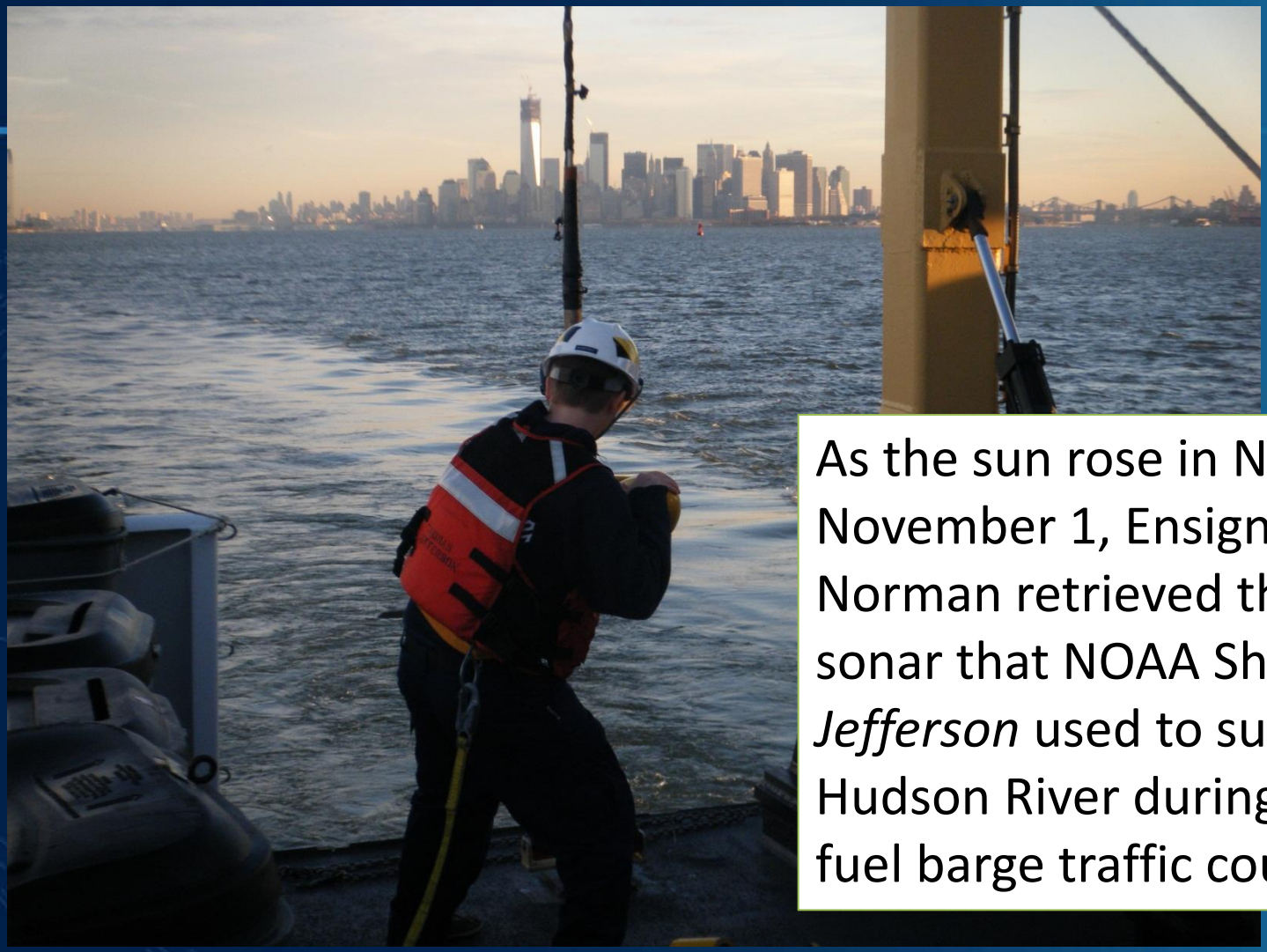
NOAA Ship *Ferdinand R. Hassler*

NOAA Ship
Thomas Jefferson

Potawaugh

Navigation Response Teams (2)

Bay Hydro II

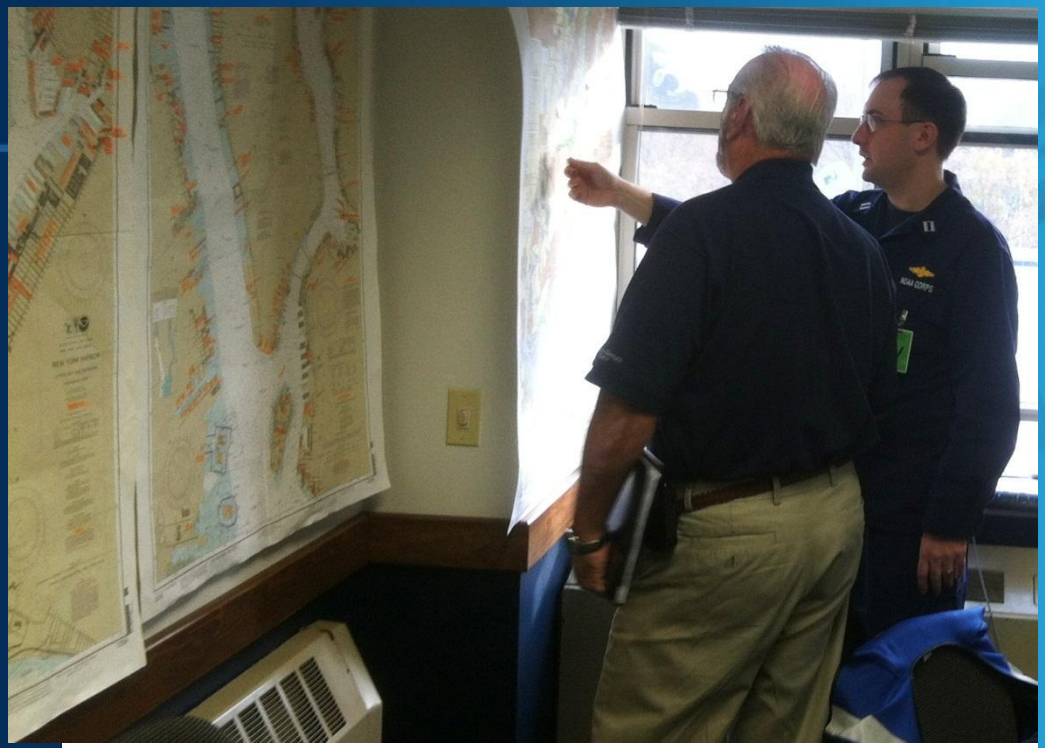


As the sun rose in New York on November 1, Ensign Lindsey Norman retrieved the side scan sonar that NOAA Ship *Thomas Jefferson* used to survey the Hudson River during the night, so fuel barge traffic could resume.

The New York / New Jersey port area is the country's largest for petro-chemical transportation, with the second largest oil refinery.

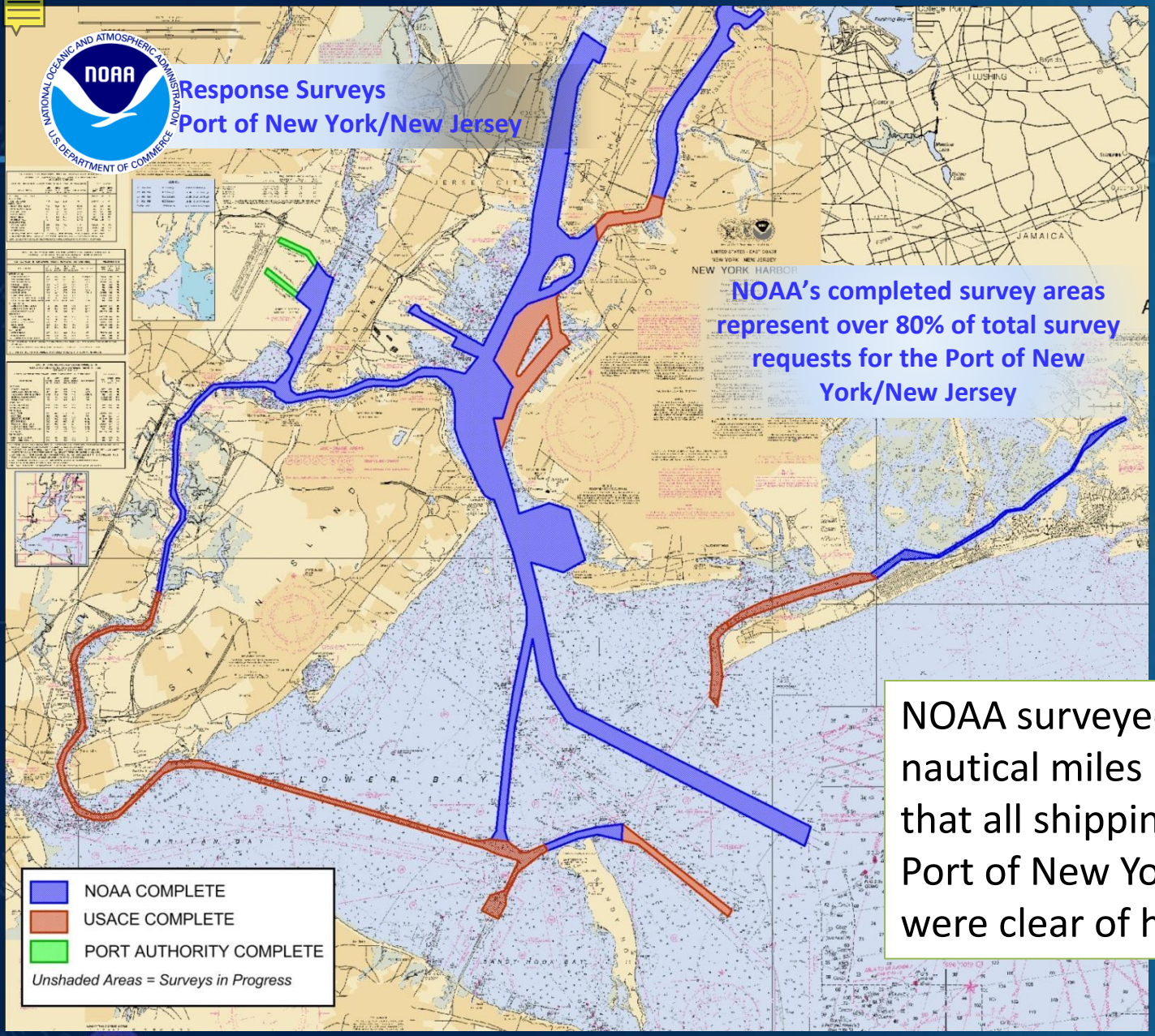
Navigation managers coordinated with:

- Coast Guard
- Army Corps of Engineers
- Pilots
- Port officials
- Terminal operators



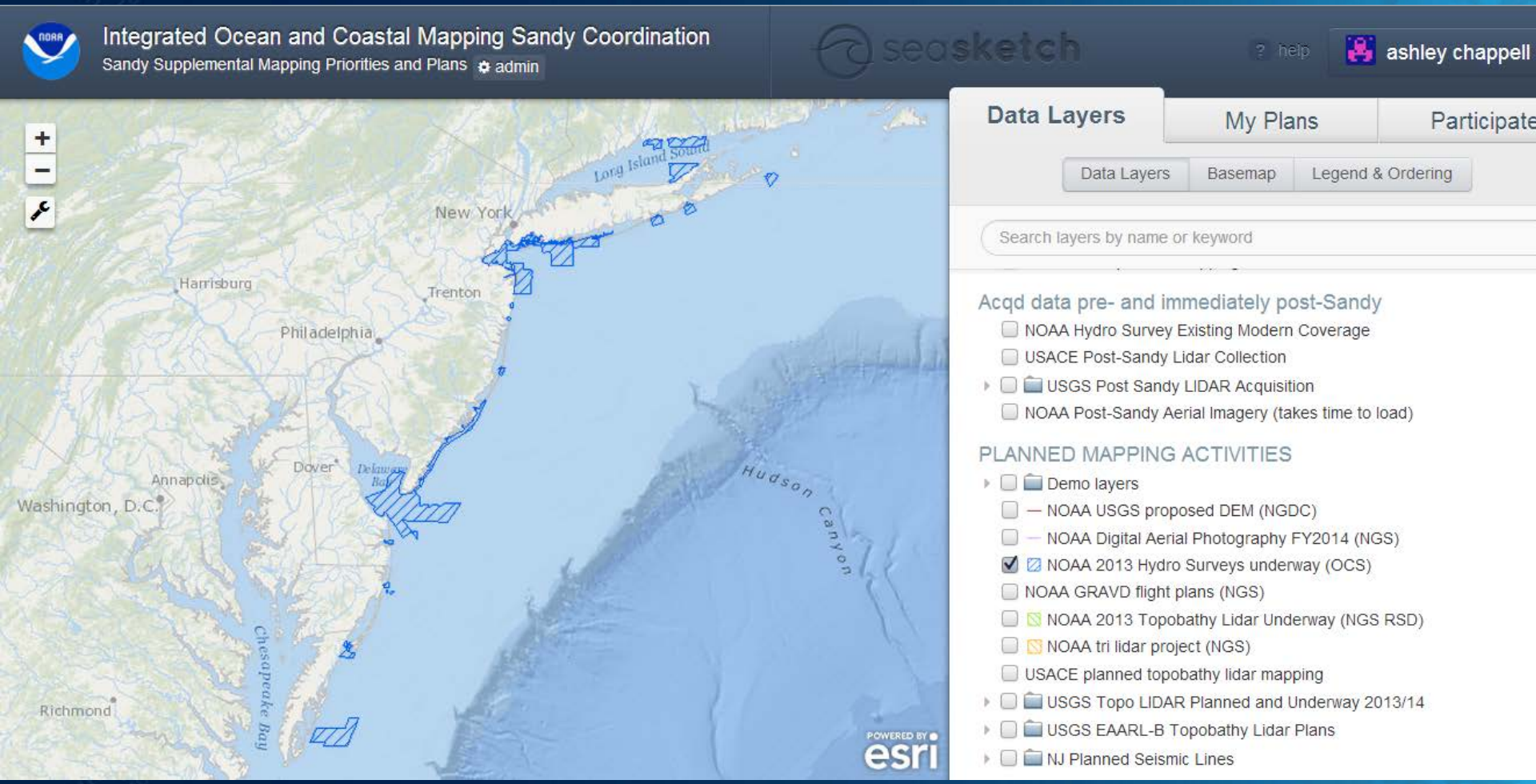
Lt. Brent Pounds uses sunlight to explain survey plans to a terminal operator.

For days, the team in NY-NJ had no power, no phones, no hot water / hot food, little / no connectivity, and a major fuel crisis.

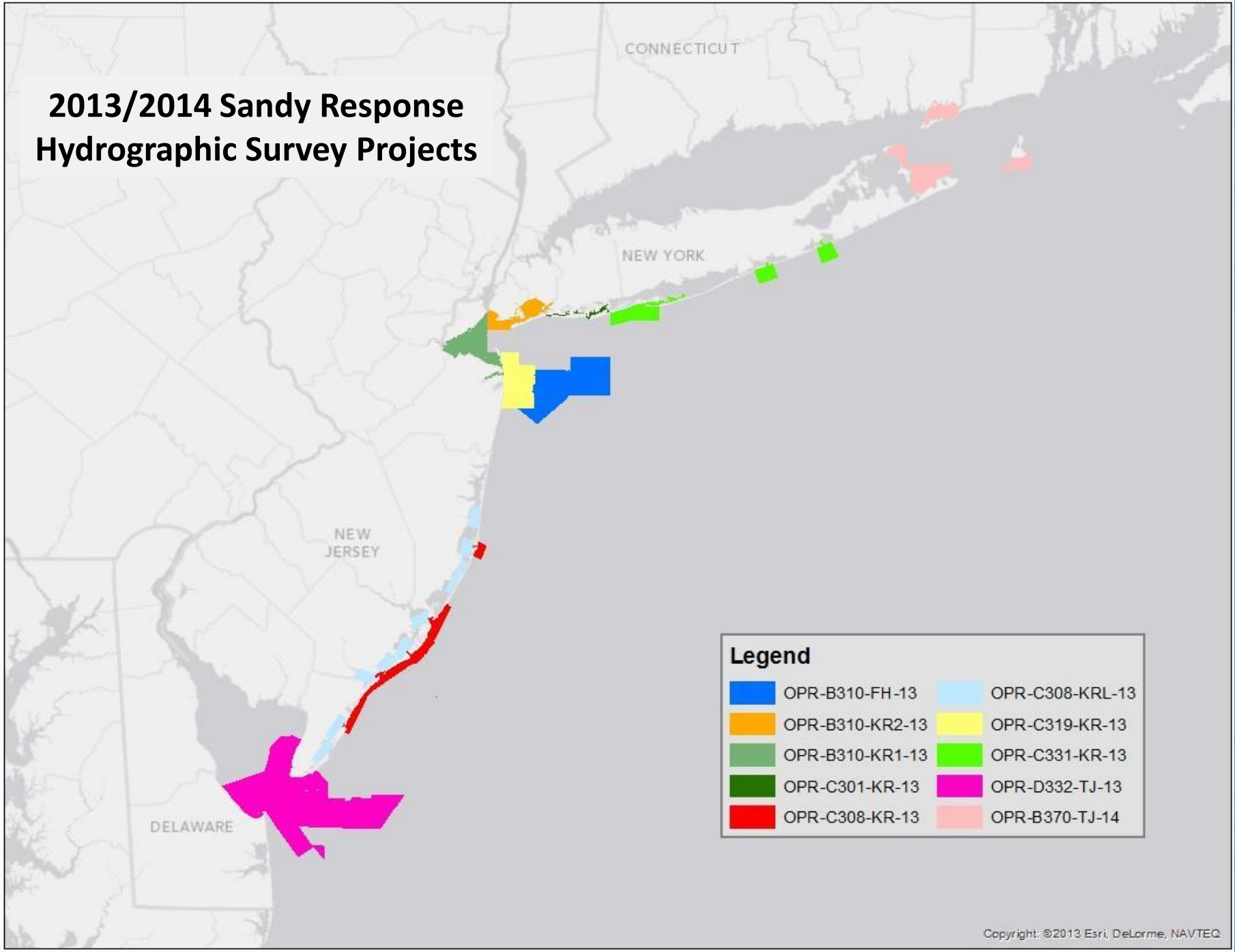


NOAA surveyed 20 square nautical miles in 5 days, ensuring that all shipping channels in the Port of New York & New Jersey were clear of hazards.

Supplemental:
$14M Hydrographic Surveys



2013/2014 Sandy Response Hydrographic Survey Projects



2013/2014 Sandy Response Hydrographic Survey Projects

OPR-B310-FH-13 (NOAA) 43 SNM
Approaches to New York, NY
- Acquisition Ended – November, 2013
- Expected Data Delivery - April, 2014

OPR-B310-KR1-13 (SAIC) 55 SNM
OPR-B310-KR2-13 (OSI) 33 SNM
Approaches to New York, NY
- Acquisition Ended – November, 2013
- Expected Data Delivery – April, 2014

OPR-C301-KR-13 (OSI) 5 SNM
East Rockaway Inlets, NY
- Acquisition Ended – December, 2013
- Expected Data Delivery – March, 2014

OPR-C308-KR-13 (DEA) 61 SNM
New Jersey Coast and Vicinity, NJ
- Expected End of Acquisition – March, 2014
- Expected Data Delivery – July, 2014

OPR-C308-KRL-13 (DEA) 10 SNM
New Jersey Coast and Vicinity, NJ (Bathy lidar)
- Planned Acquisition Dates – March, 2014
- Data Delivery – July, 2014

OPR-C319-KR-13 (C&C) 59 SNM
Southern Approaches to New York and Vicinity, NJ
- Expected End of Acquisition – 4/2014
- Expected Data Delivery – 7/2014

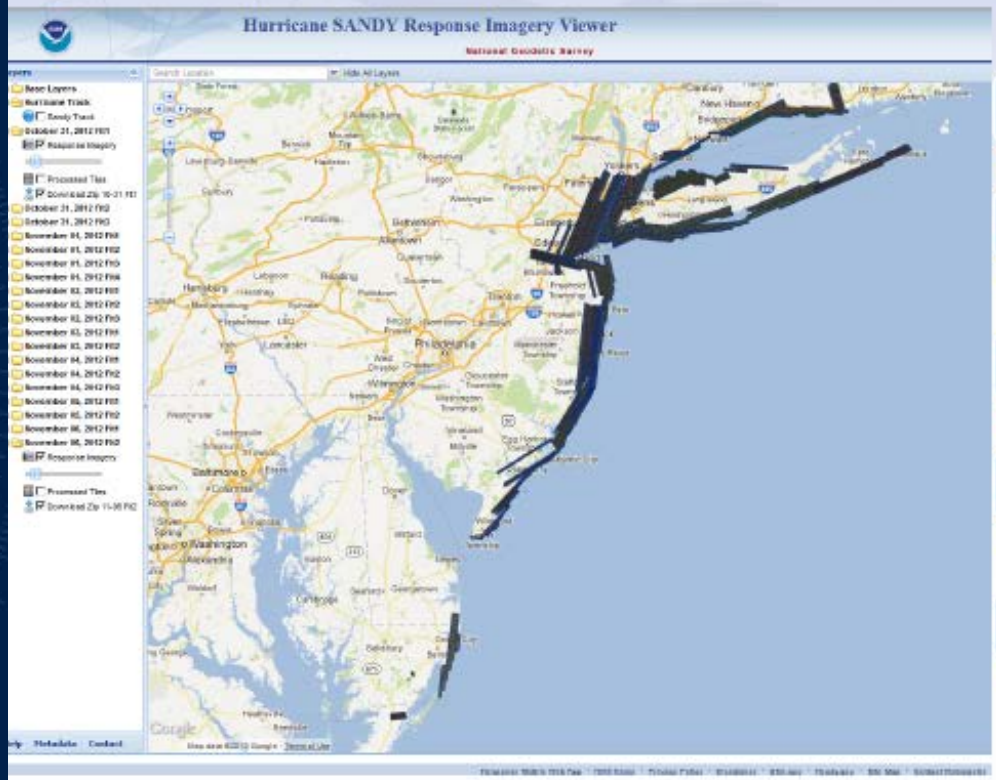
OPR-C331-KR-13 (Williamson) 57 SNM
Vicinity of Southern Long Island Sound, NY
- Expected End of Acquisition – March, 2014
- Expected Data Delivery – July, 2014

OPR-D332-TJ-13 (NOAA) 261 SNM
Delaware Bay and Approaches, DE
- Acquisition Ended – November, 2013
- Expected Data Delivery – March, 2014

OPR-B370-TJ-14 (NOAA) 49 SNM
Eastern Long Island Sound, NY
- Planned Acquisition Dates – July-August, 2014
- Expected Data Delivery – December, 2014

NGS Remote Sensing Division
Damage Assessment Response to Hx Sandy

Imagery deliverables



Data Type
- RGB Ortho Mosaic Imagery

Resolution
- 20-30 cm (dependent on response/weather/etc.)

Distribution
- 2.5 X 2.5 km tiles

Horizontal
- UTM, NAD83 meters (CORS96) (EPOCH:2002.0000)

Format
- JPEG with world files (jgw) for ingest into GIS

storms.ngs.noaa.gov

NOAA Hx Sandy Emergency Response Imagery

Response Strategy

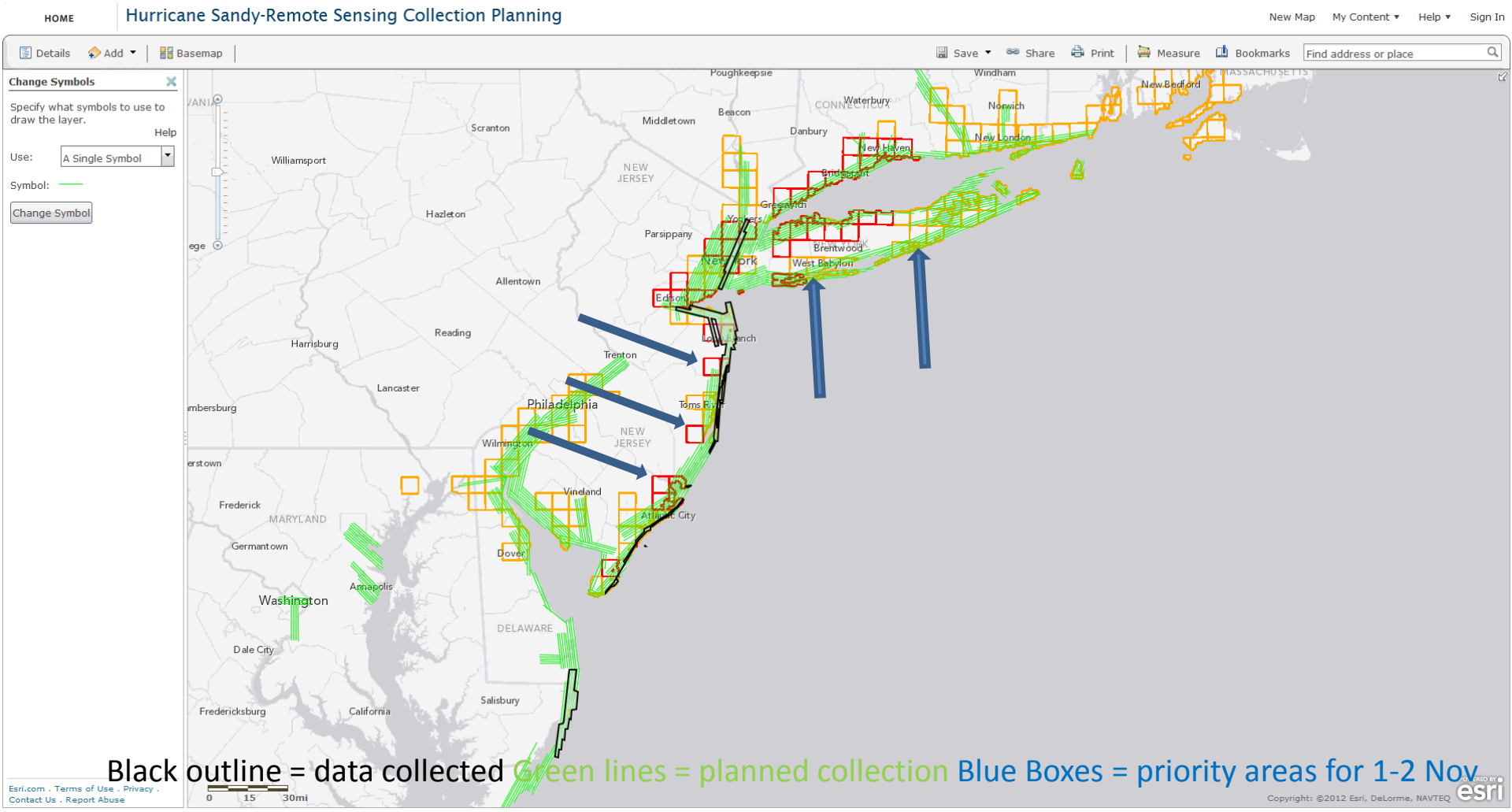
Preplanned flight lines for damage assessment imagery were developed and shared with interagency partners through FEMA coordination that include state and local representation as well as used modeled impacts of storm surge and damage from the FEMA Modeling Task Force (MOTF).

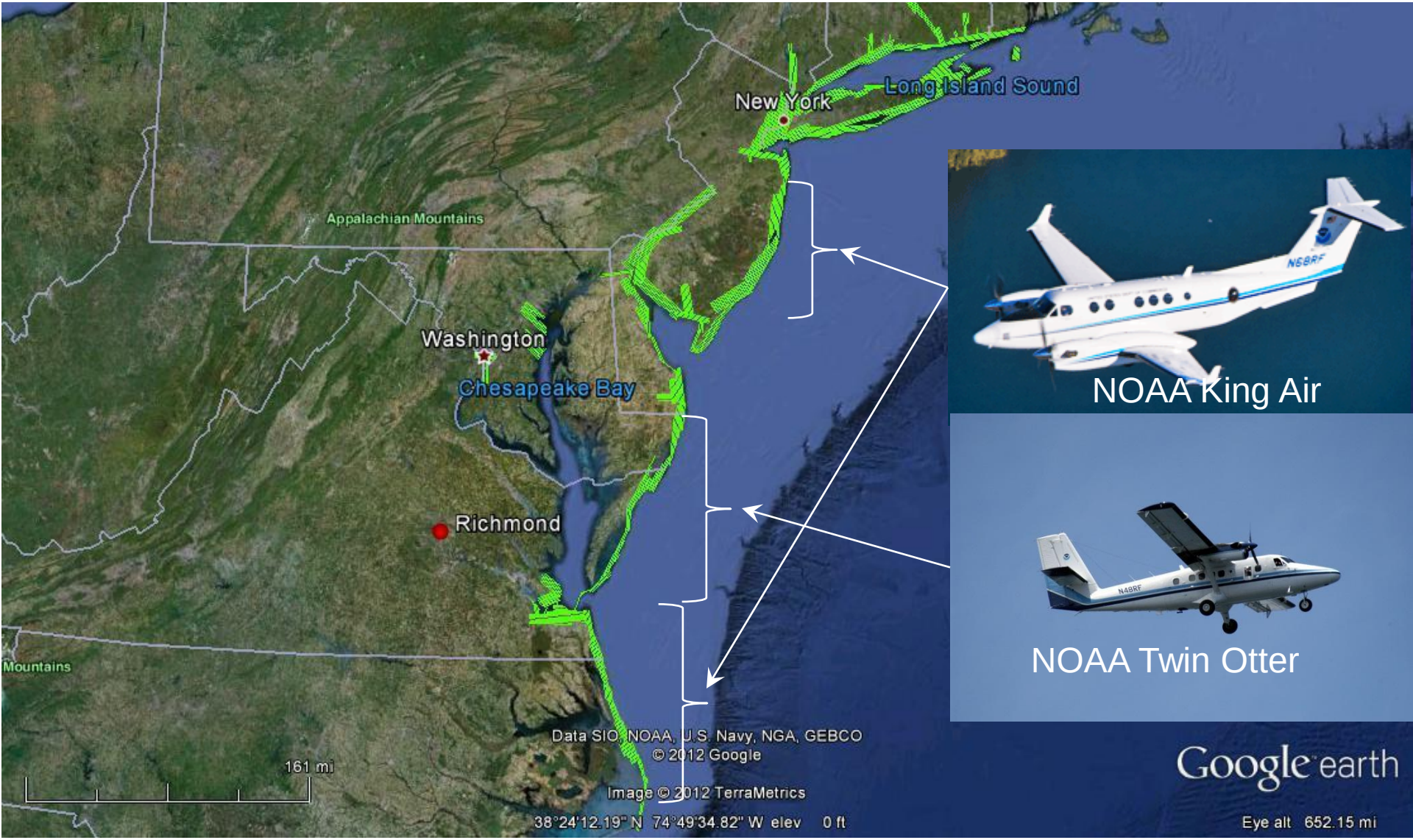
Requirements of Response

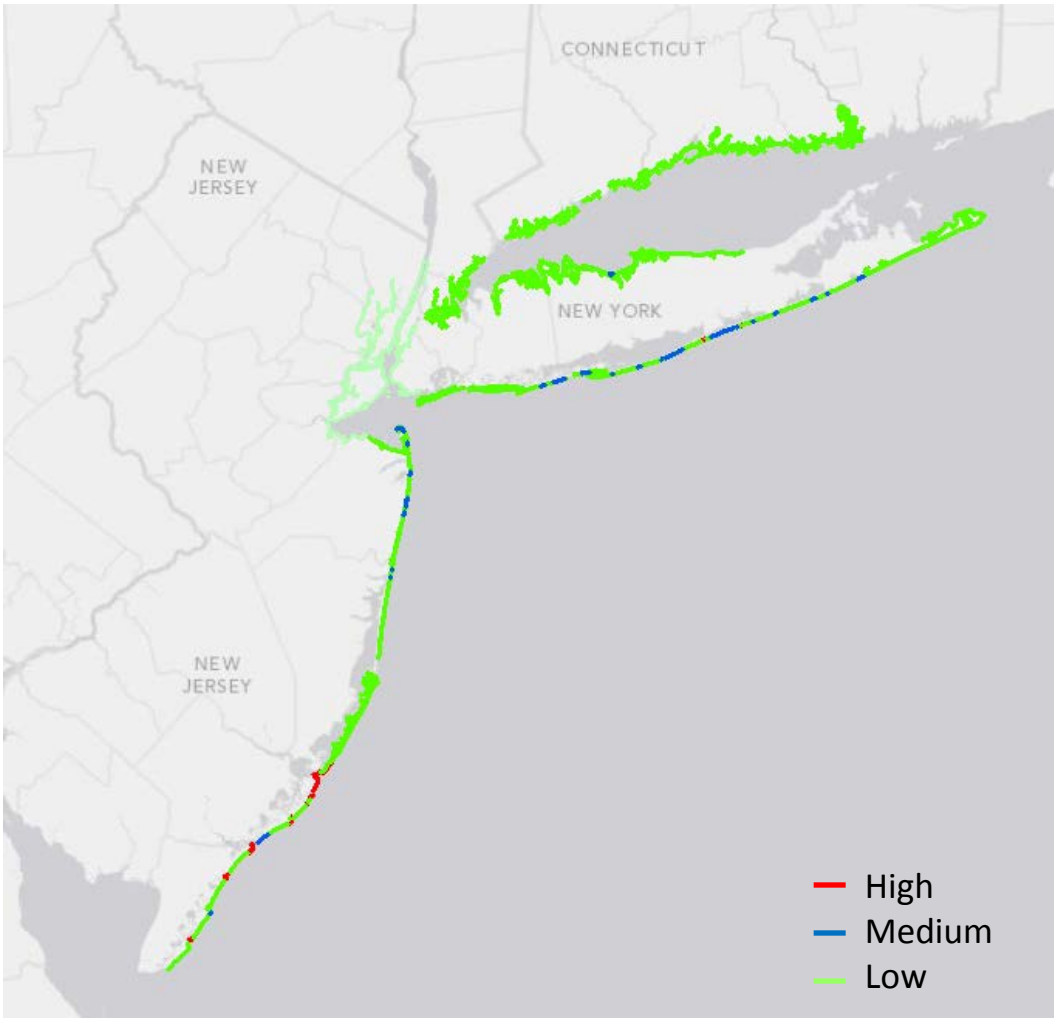
The flight lines cover areas of known and potential impacts to navigation, critical infrastructure including those with potential HAZMAT issues, coastal zone management concerns, and overlapping requirements of federal partners including FEMA, USCG, USACE, NGA, and USGS.

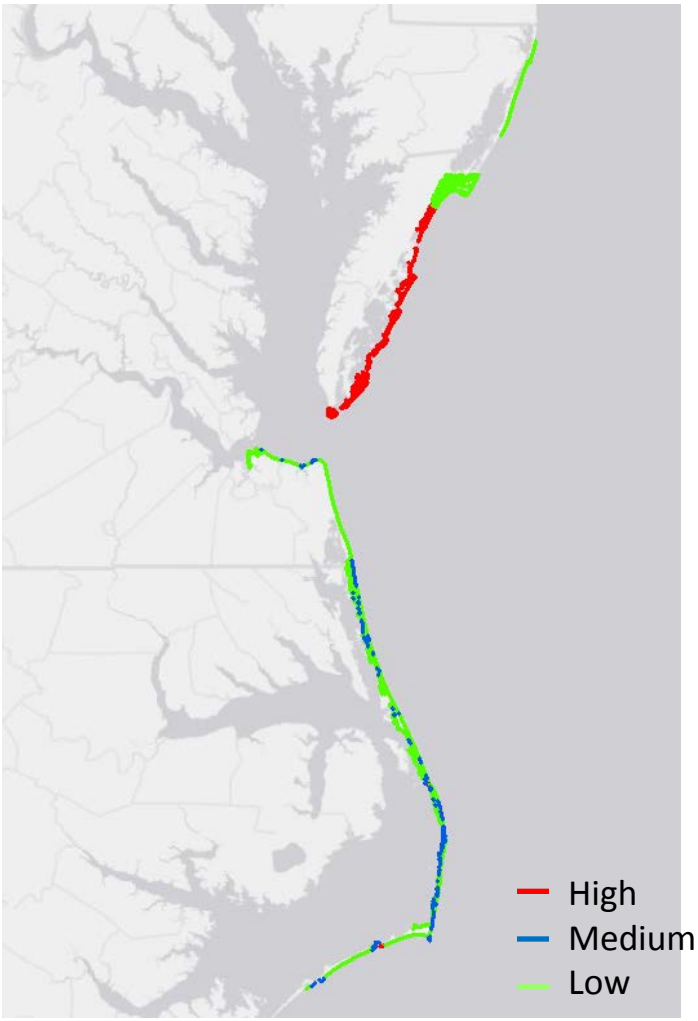
Priorities

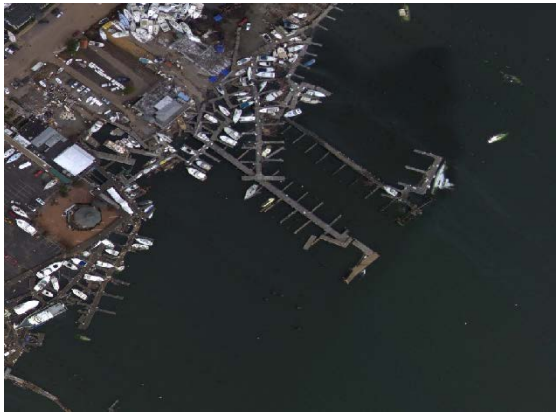
Priorities are centered on the major ports and waterways supporting the Marine Transportation System; known or projected severe impacts to coastlines and critical infrastructure (New Jersey/New York), areas of severe flooding impacting coastal communities

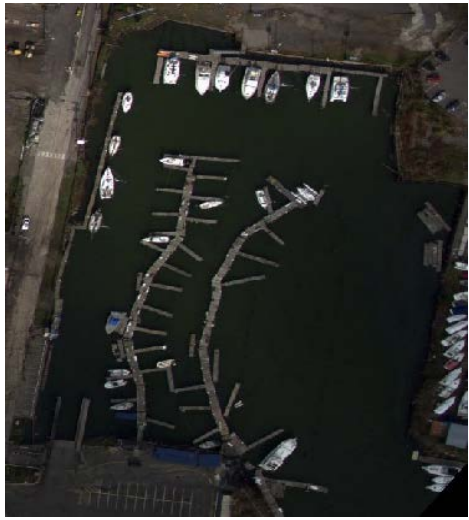

HOME
Hurricane Sandy-Remote Sensing Collection Planning
New Map
My Content
Help
Sign In
Details
Add
Basemap
Save
Share
Print
Measure
Bookmarks
Find address or place
Change Symbols
Specify what symbols to use to draw the layer.
Help
Use:
A Single Symbol
Symbol:
Change Symbol
Poughkeepsie
Windham
New Bedford
Waterbury
Norwich
Middletown
Beacon
Danbury
New London
Scranton
New Haven
Williamsport
NEW JERSEY
Bridgeport
Greenwich
Hazleton
Parsippany
Brentwood
West Babylon
Allentown
Edison
Reading
Harrisburg
Trenton
Lancaster
Philadelphia
Toms River
Wilmington
Vineland
Atlantic City
Frederick
MARYLAND
Germantown
Dover
Annapolis
Washington
DELAWARE
Dale City
Salisbury
Fredericksburg
California
Black outline = data collected
Green lines = planned collection
Blue Boxes = priority areas for 1-2 Nov
0
15
30mi
Esri.com . Terms of Use . Privacy . Contact Us . Report Abuse
Copyright: ©2012 Esri, DeLorme, NAVTEQ
esri

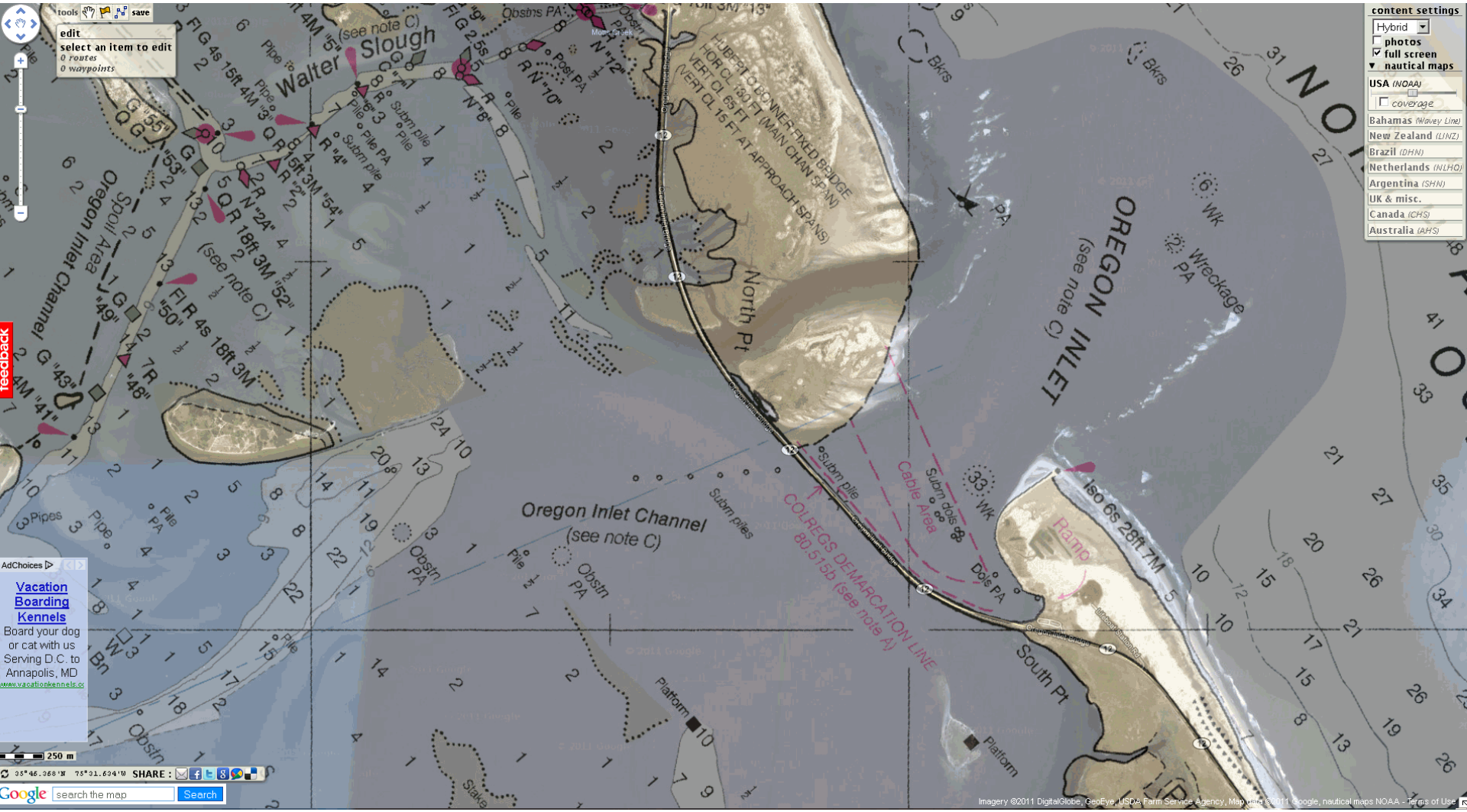

New York
Long Island Sound
Appalachian Mountains
Washington
Chesapeake Bay
Richmond
Mountains
NOAA King Air
NOAA Twin Otter
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2012 Google
Image © 2012 TerraMetrics
161 mi
38°24'12.19" N 74°49'34.82" W elev 0 ft
Google earth
Eye alt 652.15 mi


CONNECTICUT
NEW JERSEY
NEW YORK
NEW JERSEY
High
Medium
Low


High
Medium
Low






tools
save
edit
select an item to edit
0 routes
0 waypoints
content settings
Hybrid
photos
full screen
nautical maps
USA (NOAA)
coverage
Bahamas (Waxey Line)
New Zealand (LINZ)
Brazil (DHN)
Netherlands (NLHO)
Argentina (SHN)
UK & misc.
Canada (CHS)
Australia (AHS)
Walter Slough
(see note C)
Oregon Inlet Channel
(see note C)
North Pt
OREGON INLET
(see note C)
South Pt
HUBERT O'BONNER FIXED BRIDGE
HOR CL 150 FT (MAIN CHAN SPAN)
VERT CL 65 FT
(VERT CL 15 FT AT APPROACH SPANS)
COLREGS DEMARCATION LINE
80.515b (see note A)
Cable Area
Ramp
Wreckage
Platform
Platform
Oregon Inlet Area
Spoil Area
Pipes
Subm pile
Subm piles
Subm dols
Dols PA
Obstn
Obstn PA
Pile
Pile PA
Post PA
Wk
Bkrs
PA
Iso 6s 28ft 7M
Fl R 4s 18ft 3M
Fl G 4s 15ft 4M
Fl G 2.5s
Q R 18ft 3M
Q G
Q R
R "2"
R "4"
R "8"
R "10"
R "12"
G "43"
G "49"
G "53"
G "55"
R "46"
R "48"
R "50"
R "52"
R "54"
N "24"
"41"
AdChoices
Vacation Boarding Kennels
Board your dog or cat with us
Serving D.C. to Annapolis, MD
250 m
35°46.366'N 75°31.634'W
SHARE :
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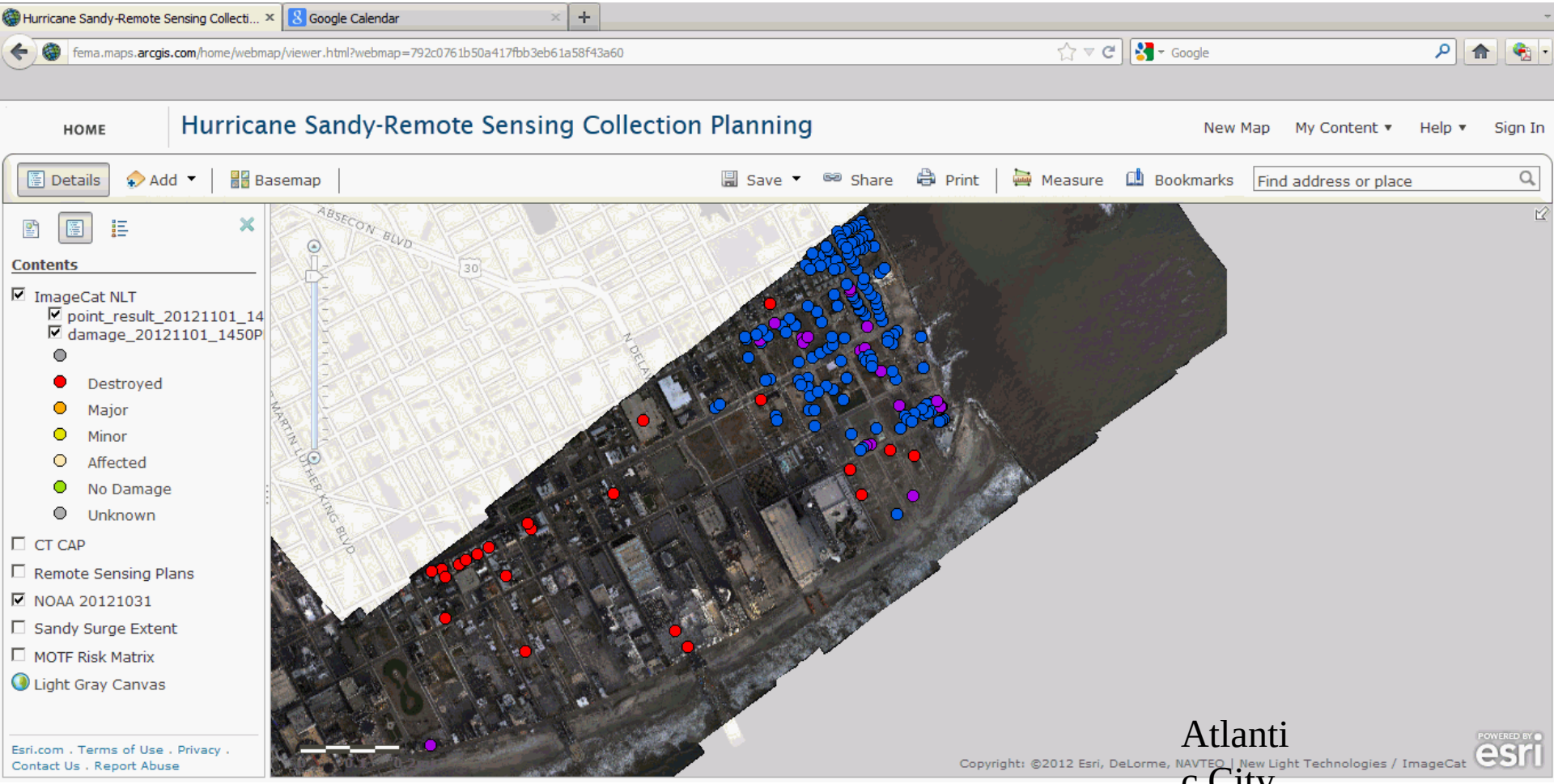
search the map
Search
Imagery ©2011 DigitalGlobe, GeoEye, USDA Farm Service Agency, Map data ©2011 Google, nautical maps NOAA - Terms of Use
feedback



Atlanti
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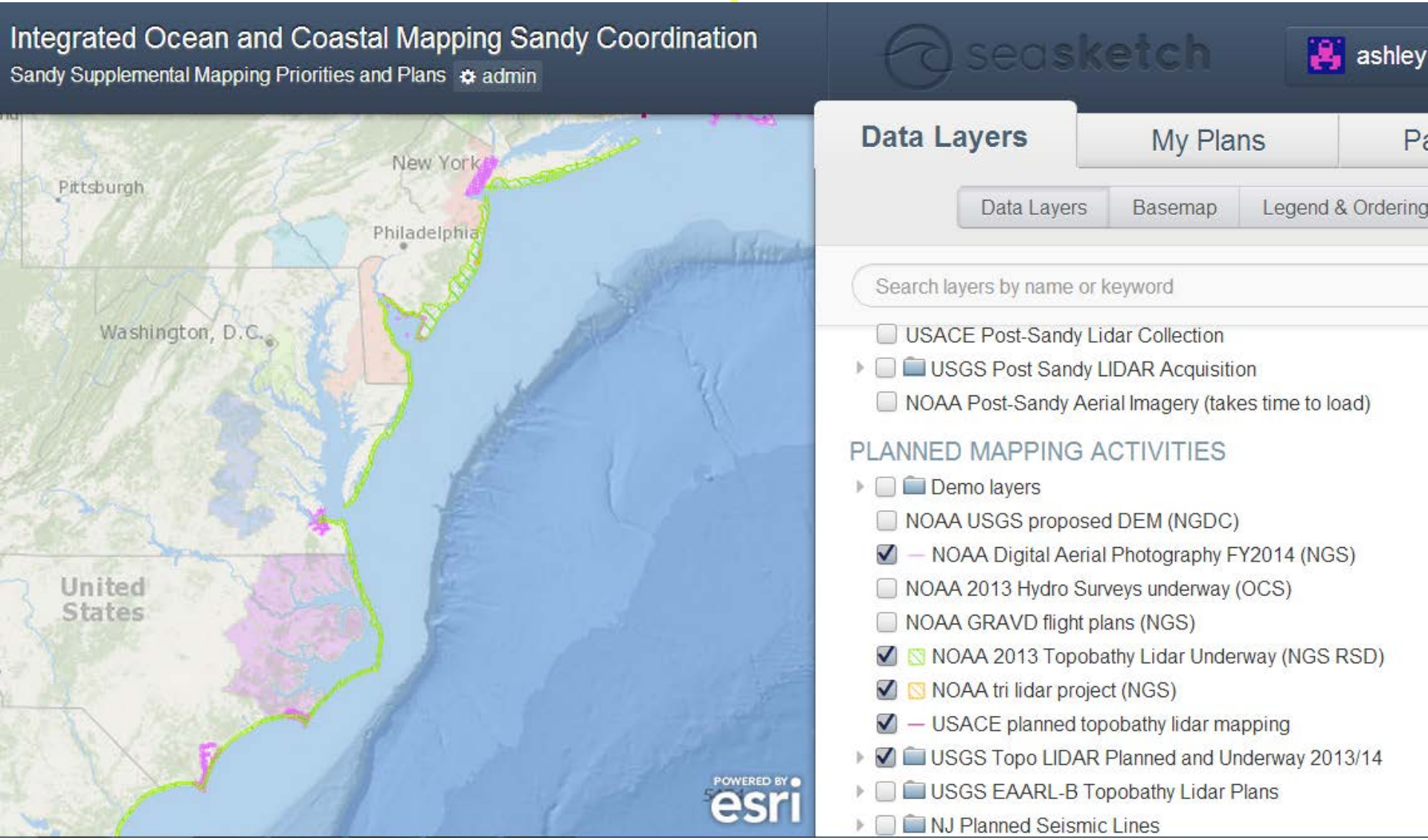
$12M RSD Topobathy Lidar



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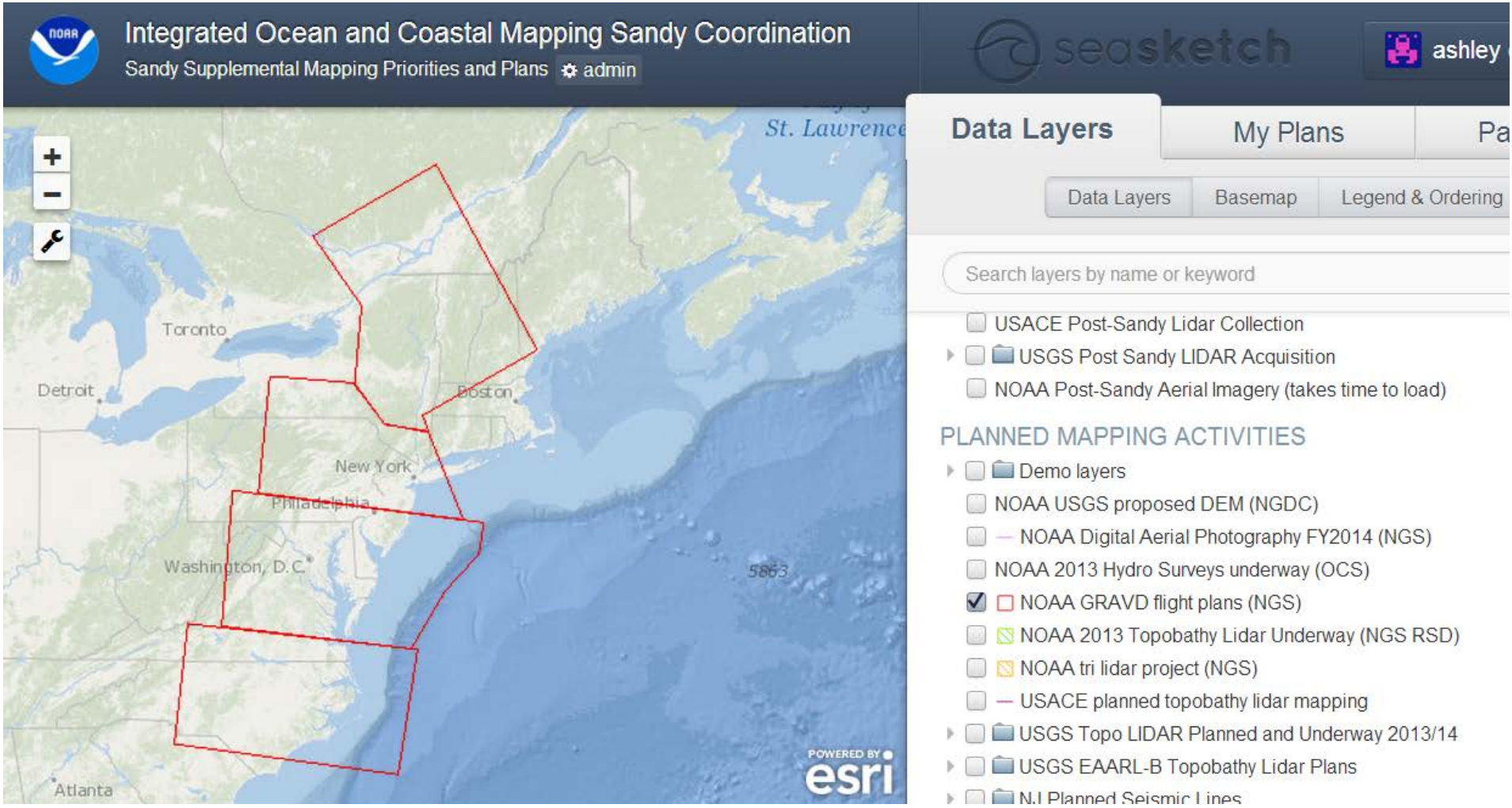

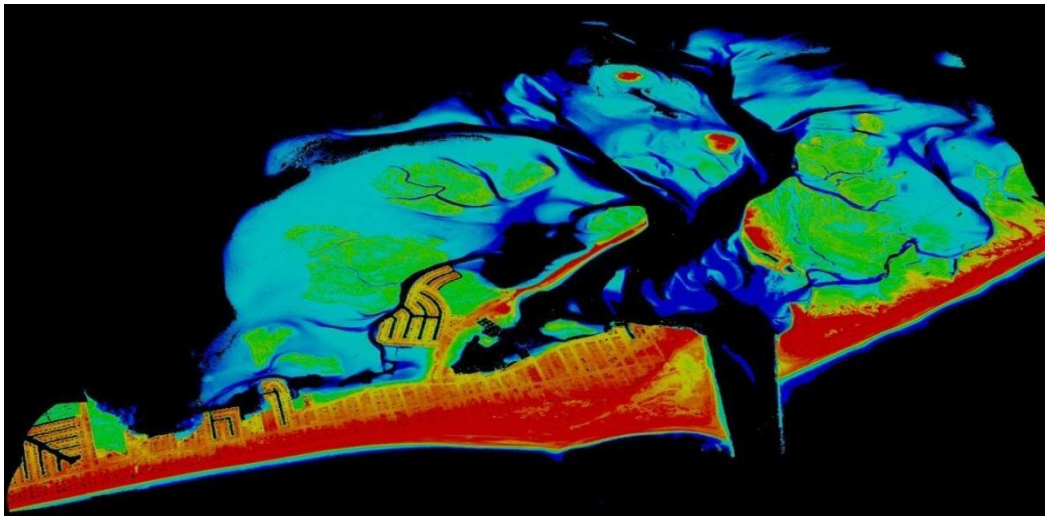

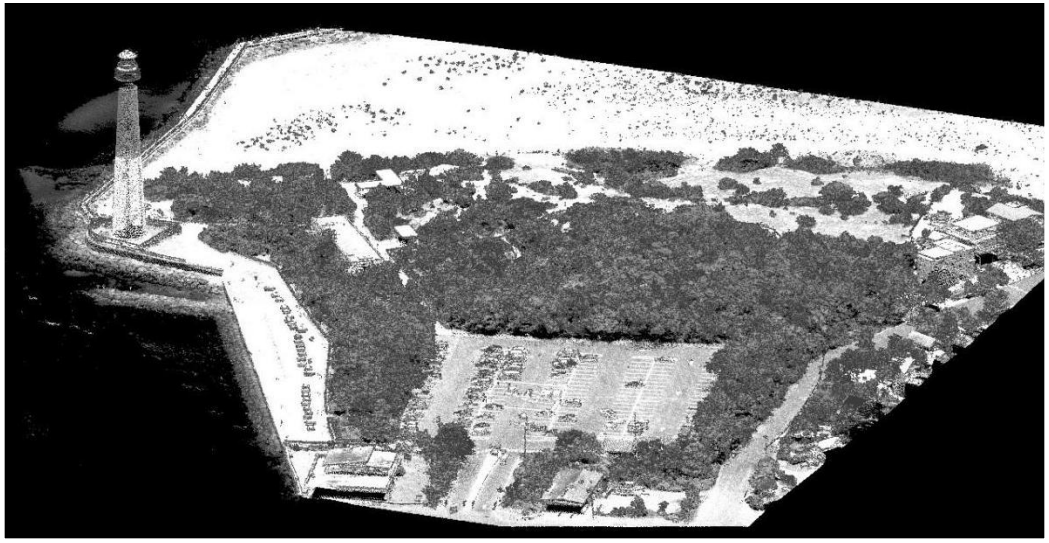

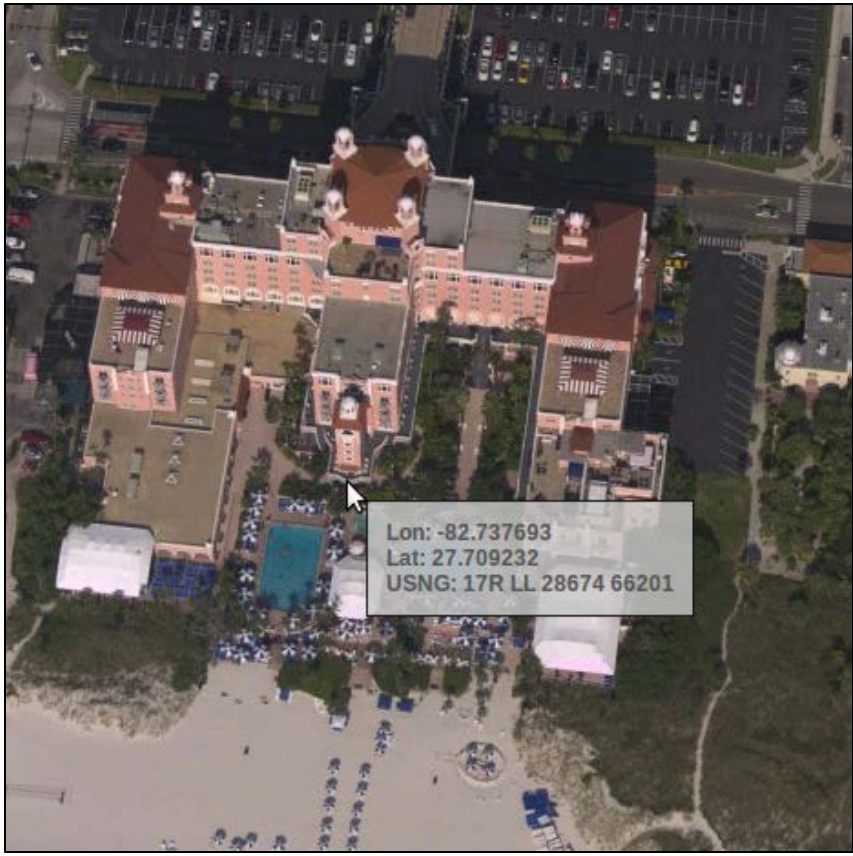
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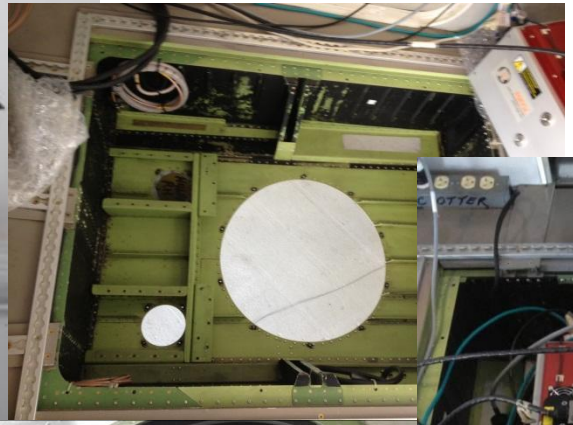
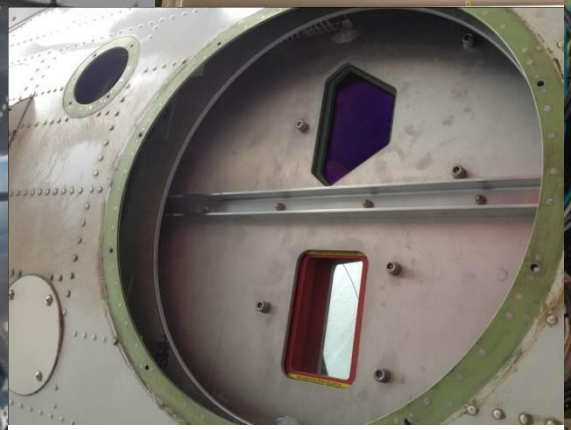
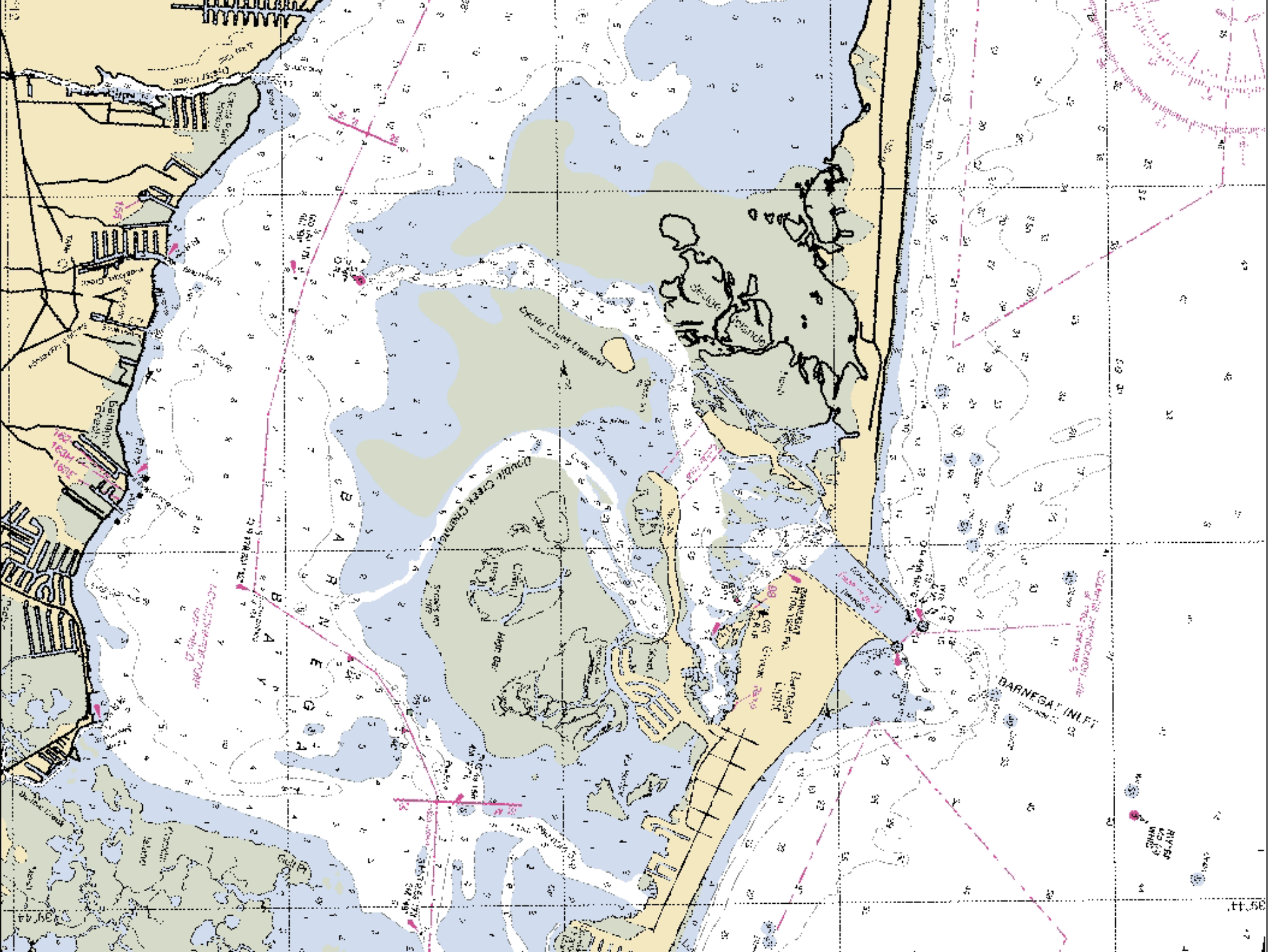
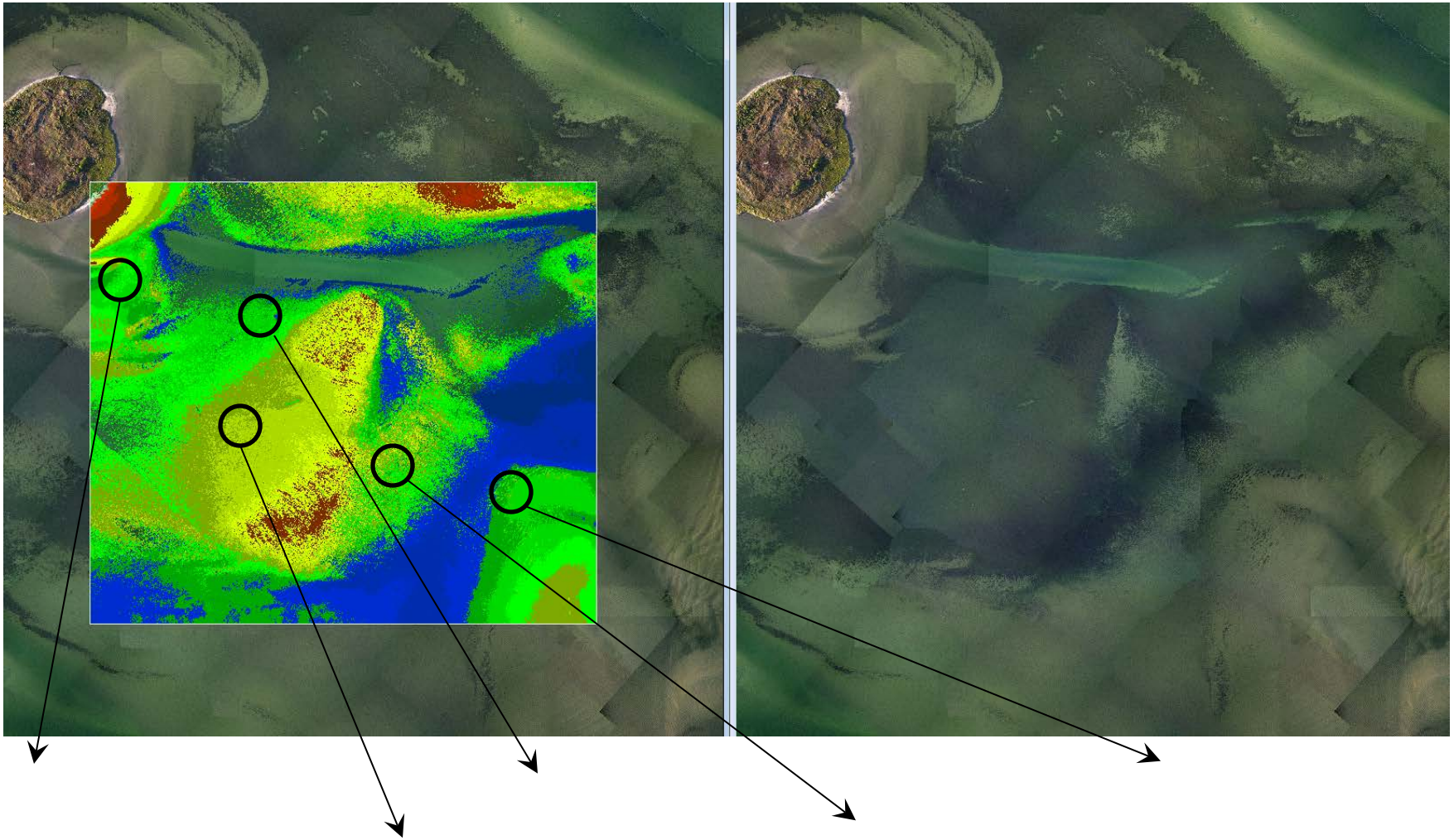
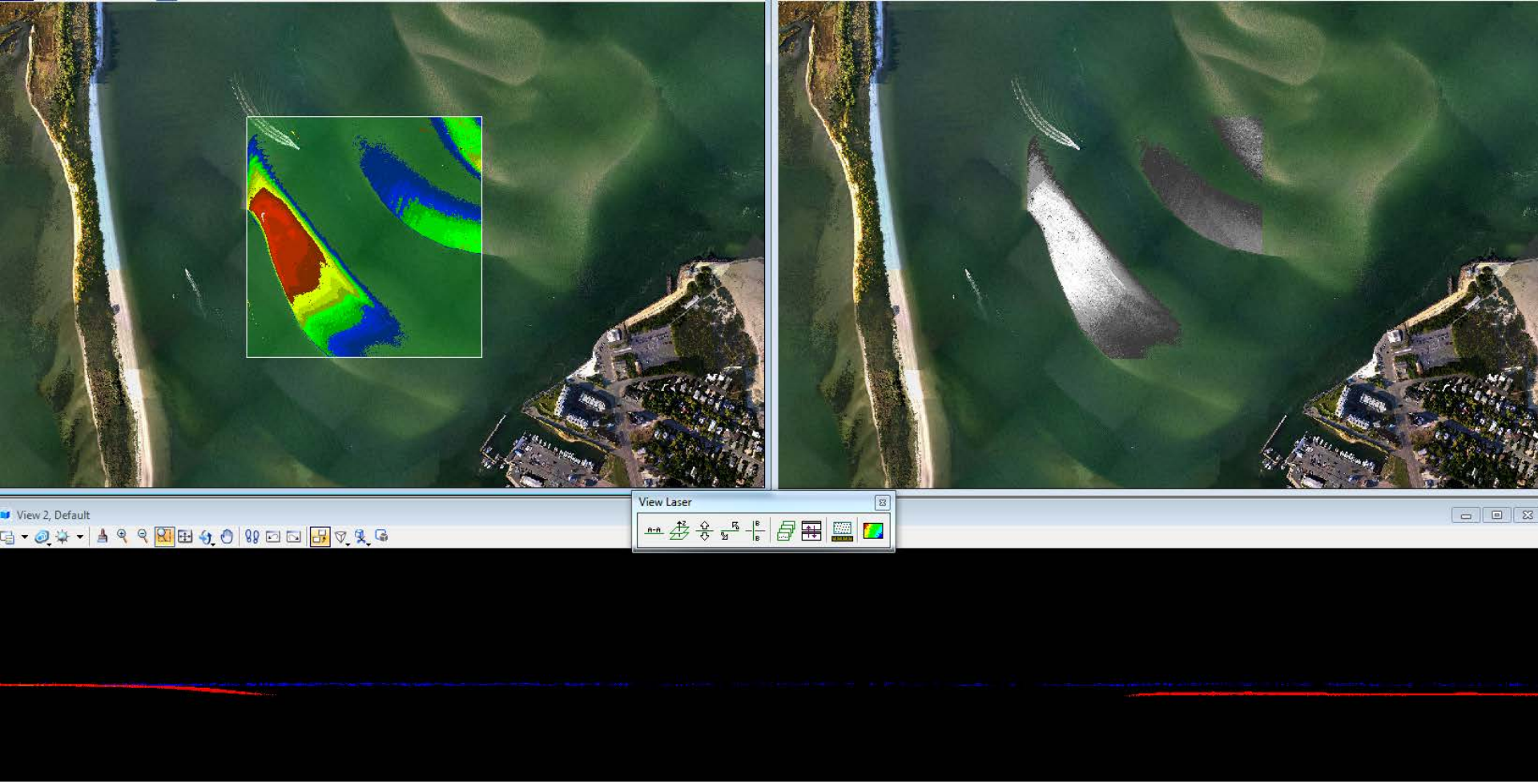





BARNEGAT BAY
Double Creek Channel
Double Creek
High Bar
Barnegat Light
BARNEGAT INLET

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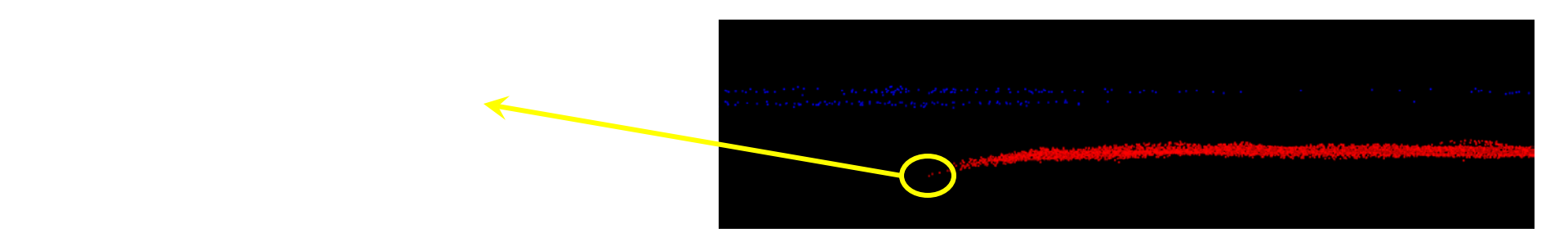
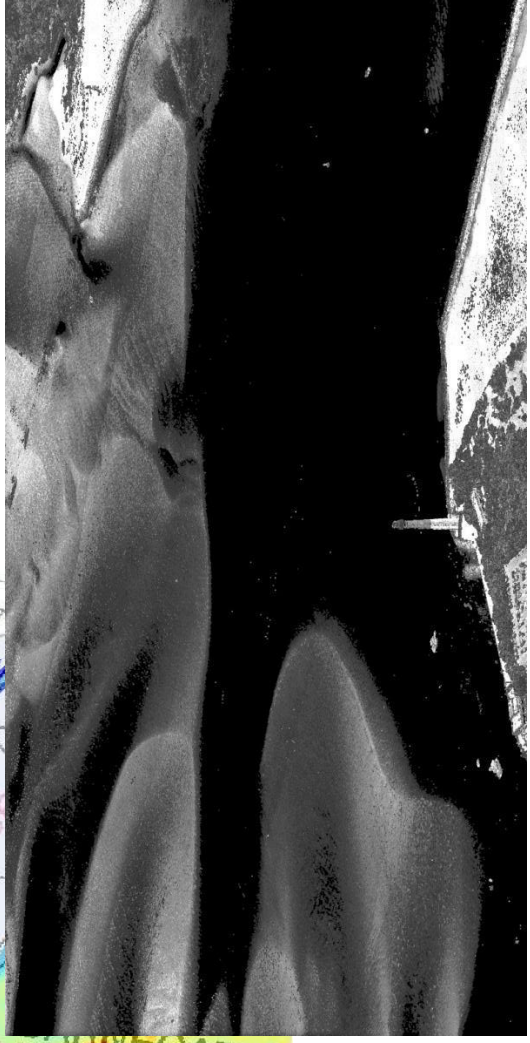
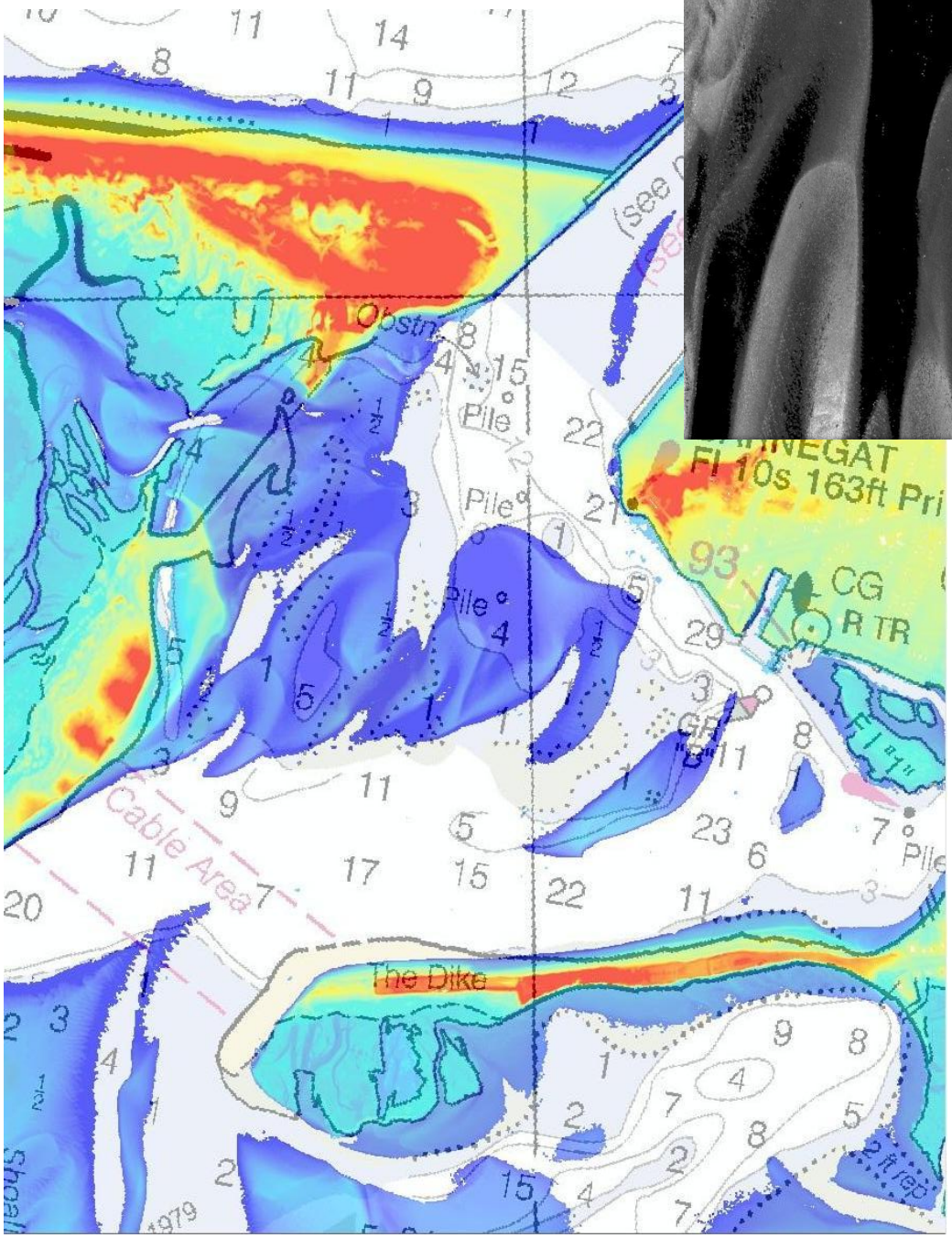
View Laser



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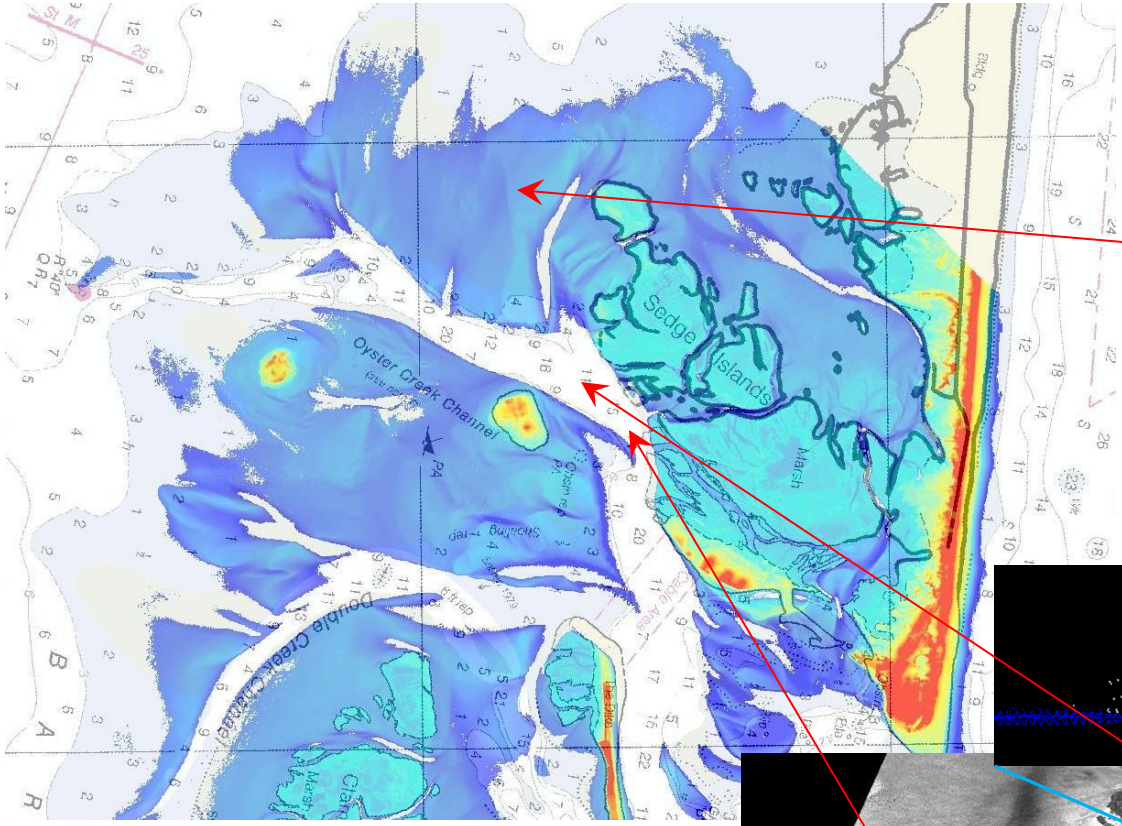
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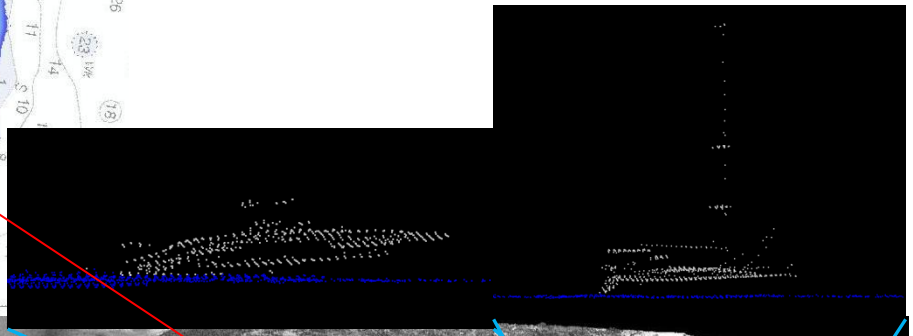
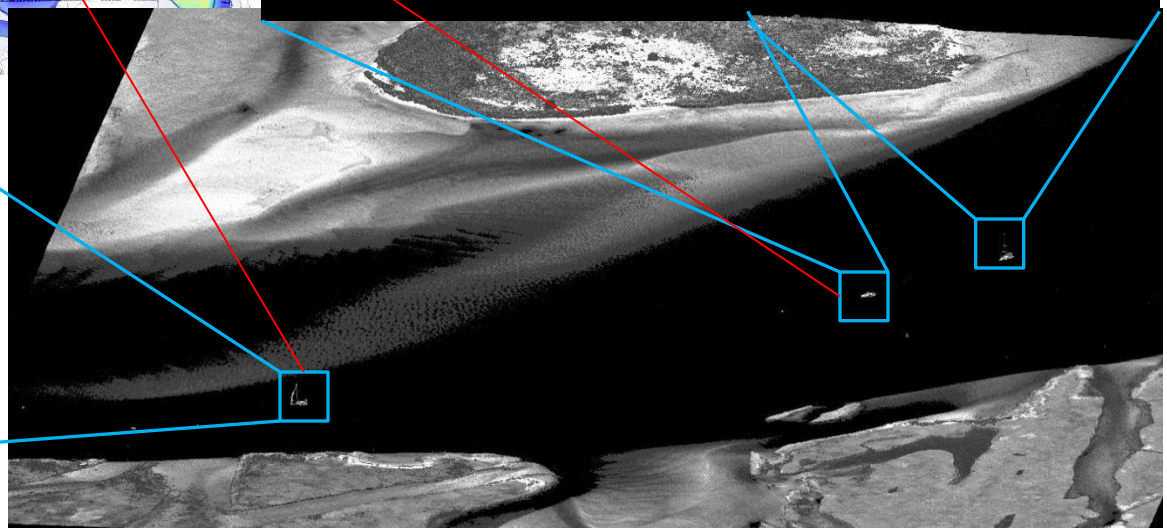
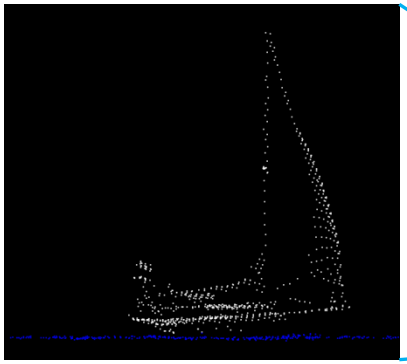
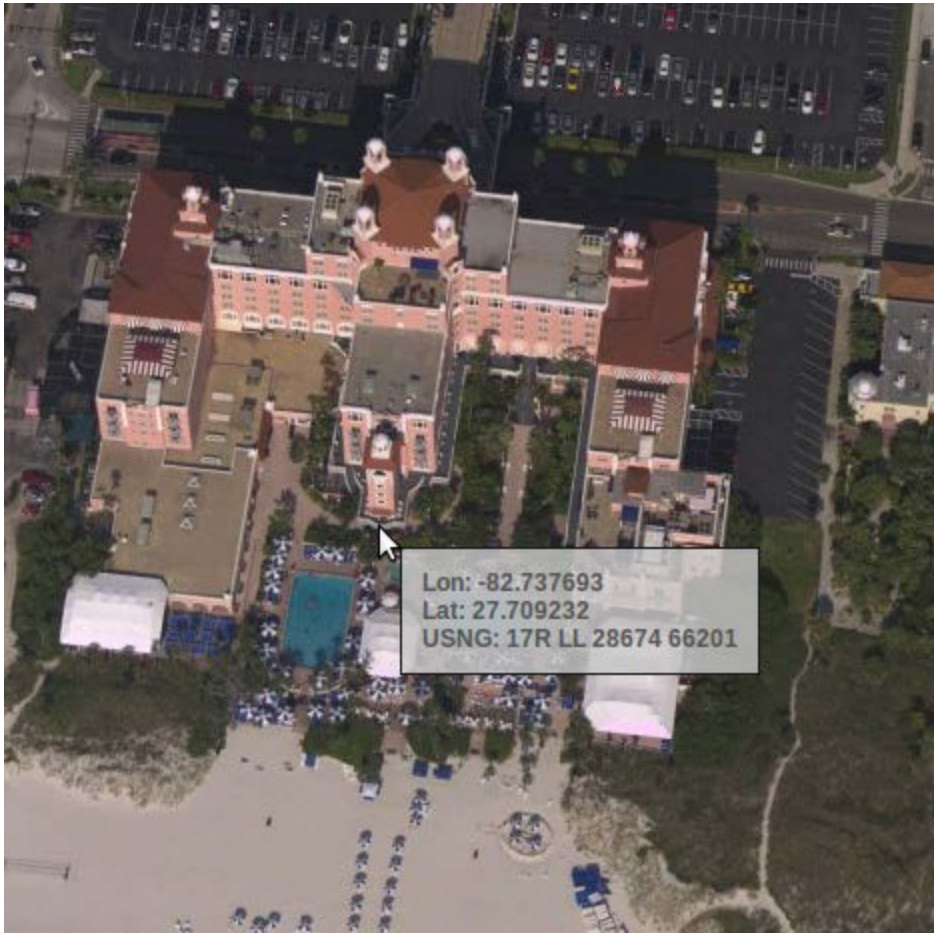
Oyster Creek Channel
Marsh
Double Creek Channel





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USNG: 17R LL 28674 66201

St. Pete Beach Oblique Test Imagery

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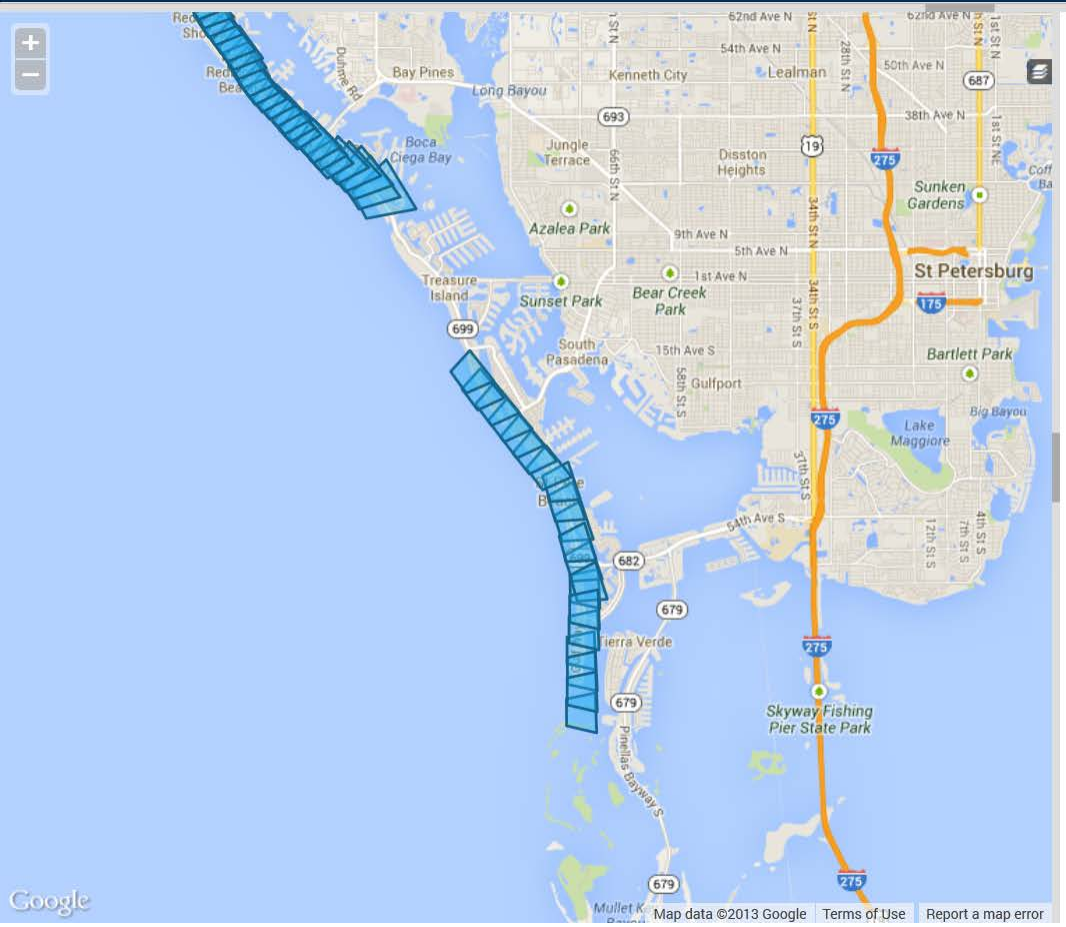
Search Address



Get Started:

Search an address within the acquisition area or select a polygon in the left side map pane

Example address: 3400 Gulf Boulevard, St. Pete Beach, FL

Mouseover the image in the right side pane to display coordinates in NAD83 (2011) Geographic Latitude / Longitude and U.S. National Grid

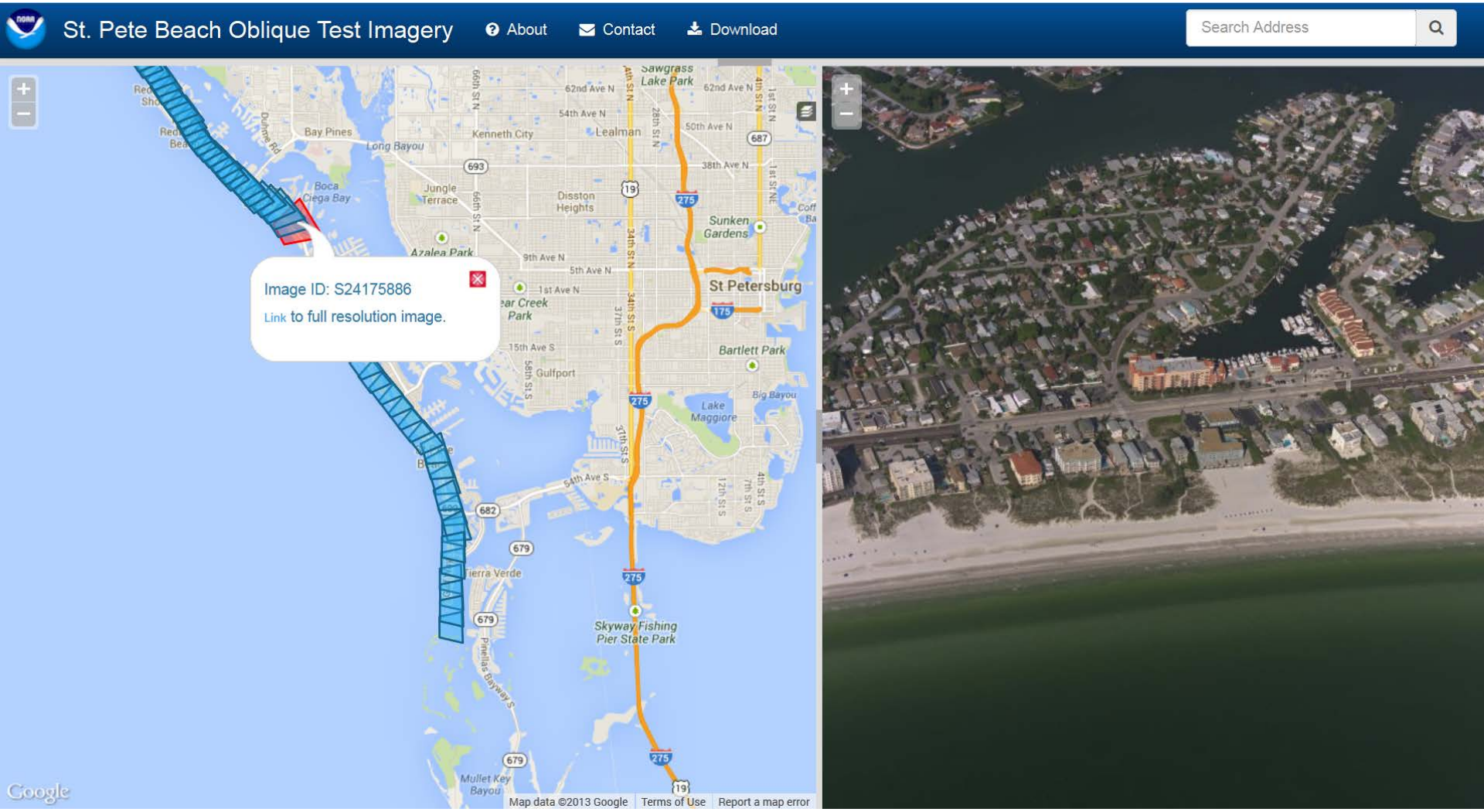

St. Pete Beach Oblique Test Imagery
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Image ID: S24175886
Link to full resolution image.
Sawgrass Lake Park
Bay Pines
Long Bayou
Kenneth City
Lealman
Boca Ciega Bay
Jungle Terrace
Disston Heights
Sunken Gardens
Azalea Park
St Petersburg
Bartlett Park
Gulfport
Lake Maggiore
Big Bayou
Tierra Verde
Skyway Fishing Pier State Park
Mullet Key Bayou
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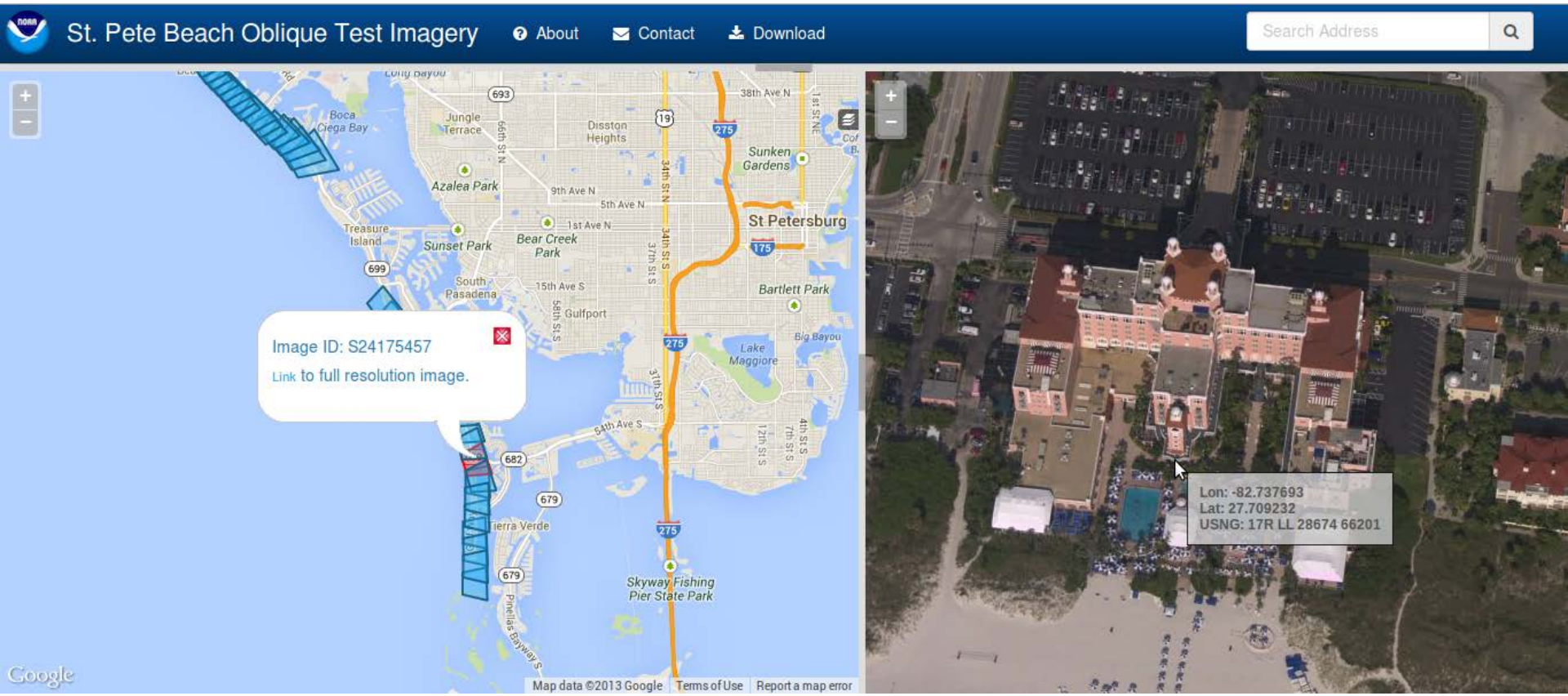
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St Petersburg
Azalea Park
Sunset Park
Bear Creek Park
Bartlett Park
Sunken Gardens
Skyway Fishing Pier State Park
Map data ©2013 Google
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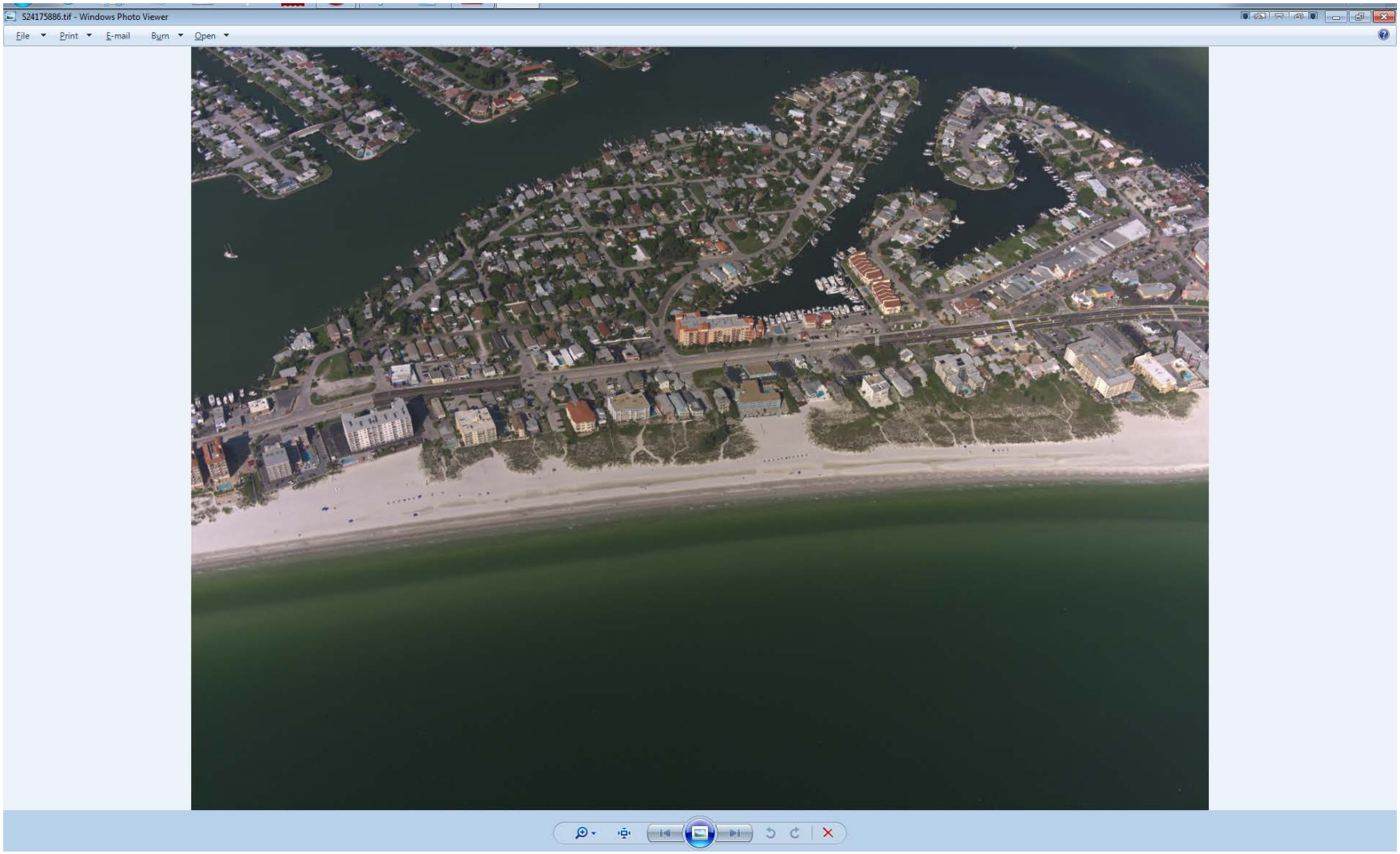
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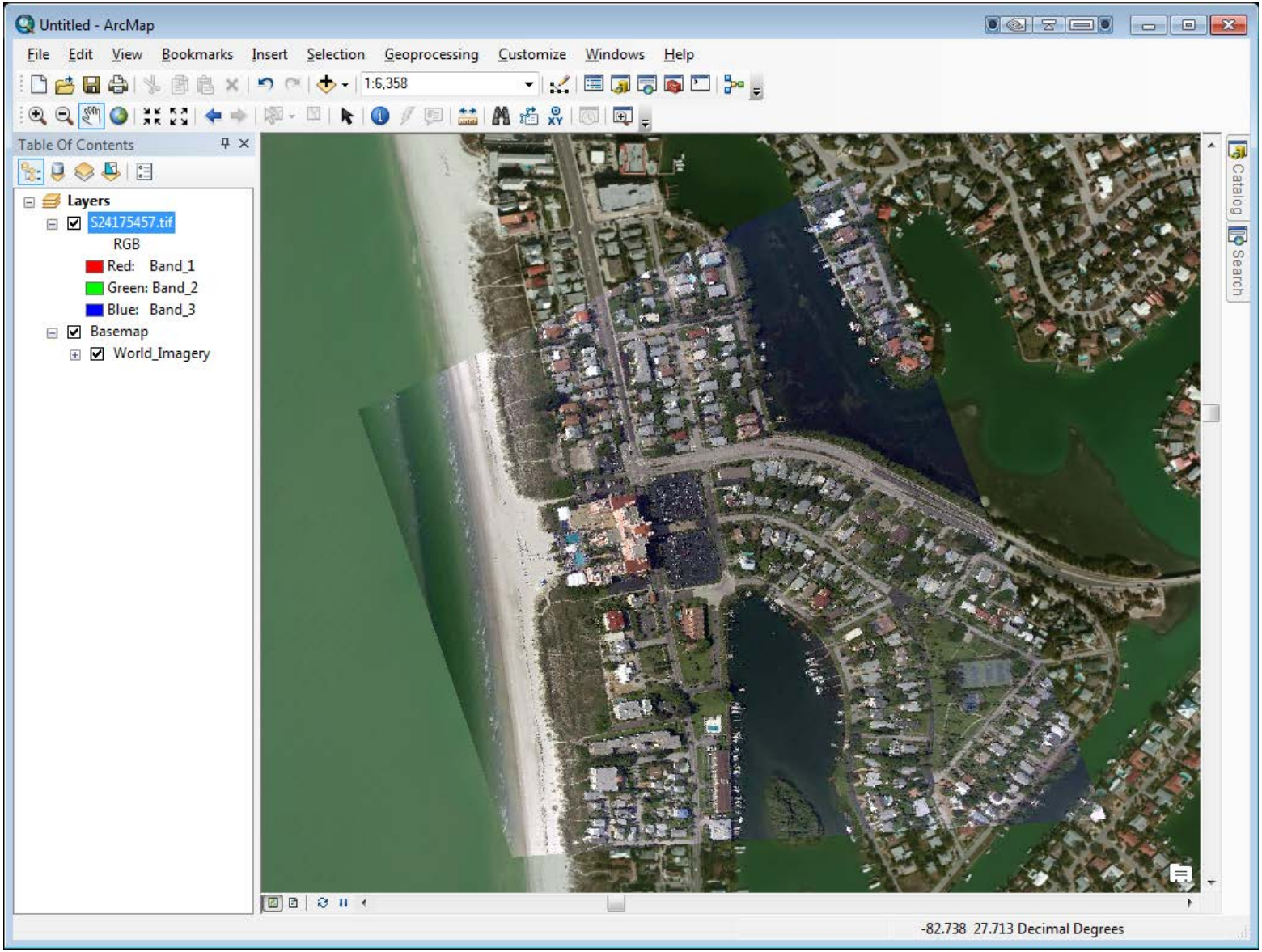
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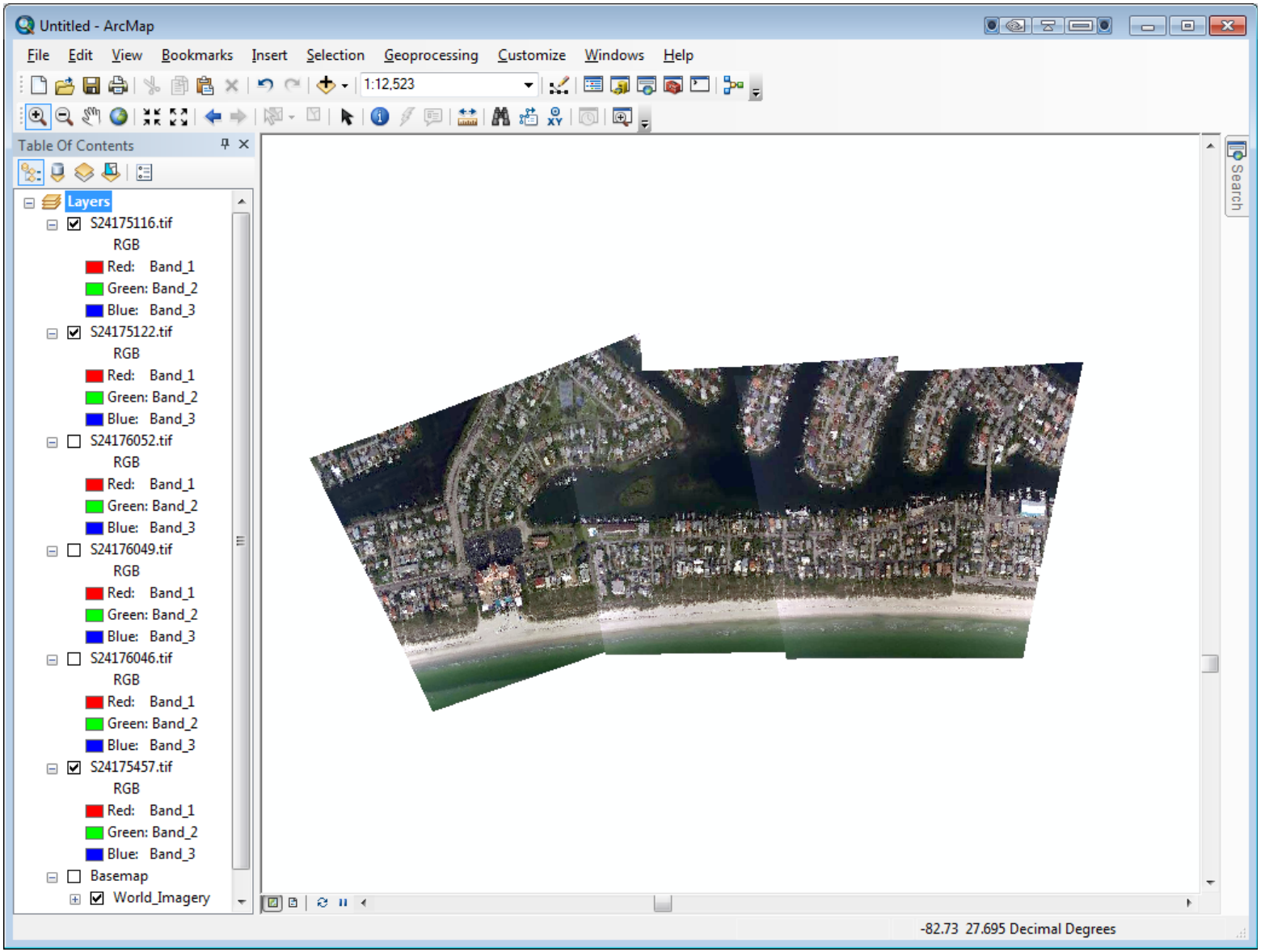
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Basemap
World_Imagery
Search
-82.73 27.695 Decimal Degrees

NOAA IOCM:
Pulling Together on Sandy Response

Improved End-to-End Response, Recovery, Restoration, and Resilience for a more resilient U.S. Coastal Zone

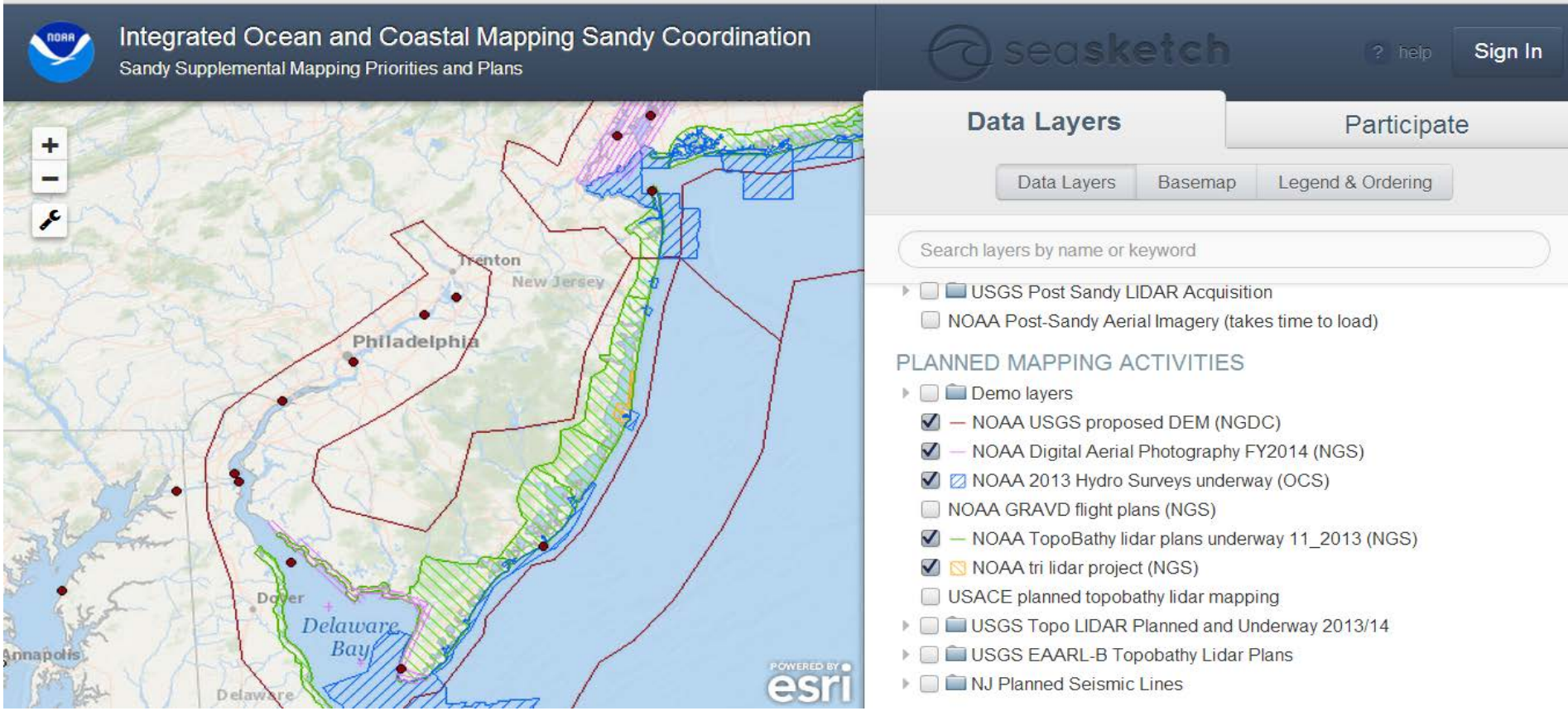
Connectivity of Mapping Efforts

Integrated Coastal Inundation Efforts

2013: NOAA IOCM and Sandy

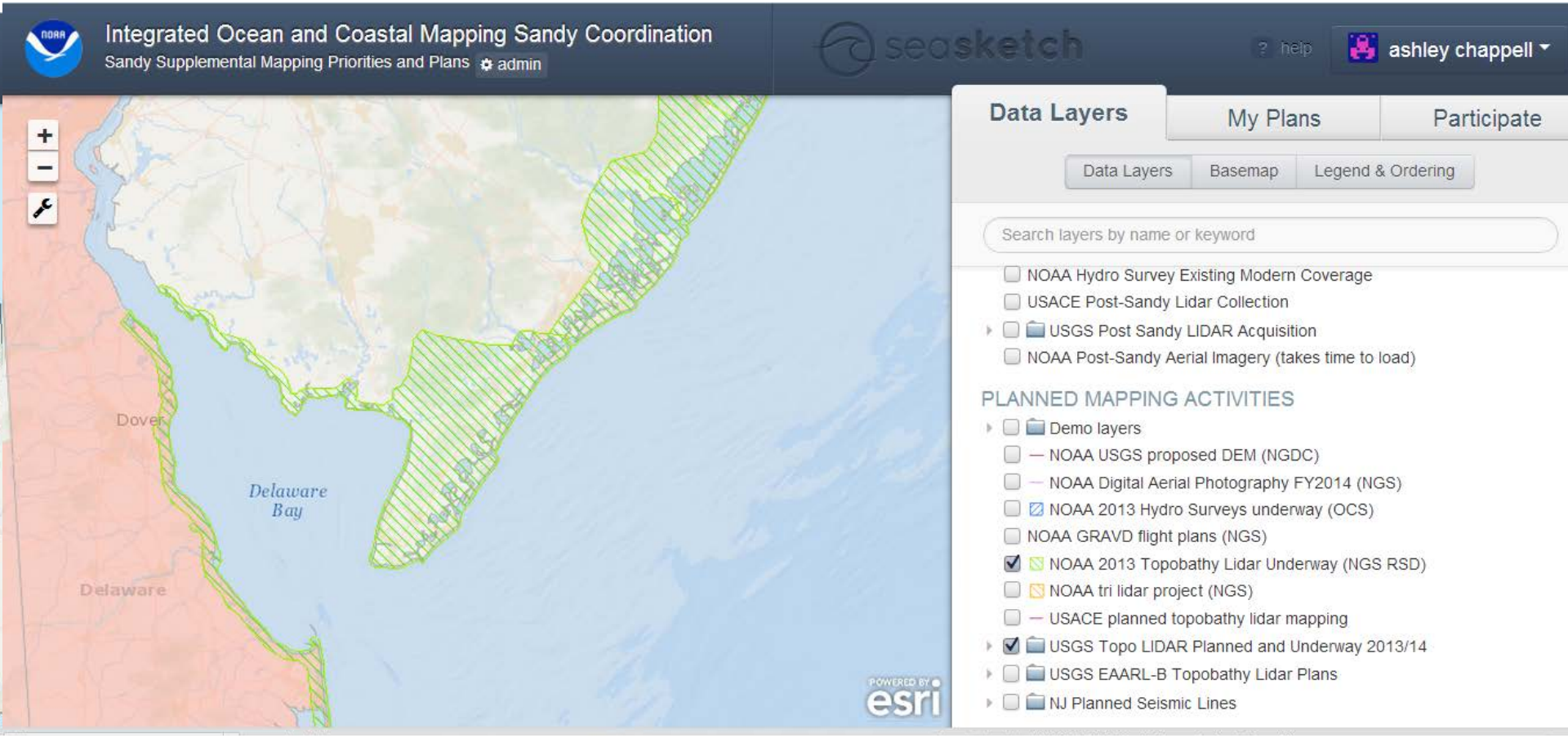
IOCM team started Supplemental planning coordination after immediate storm response settled

Initiated use of Seasketch to aid coordination within/outside NOAA

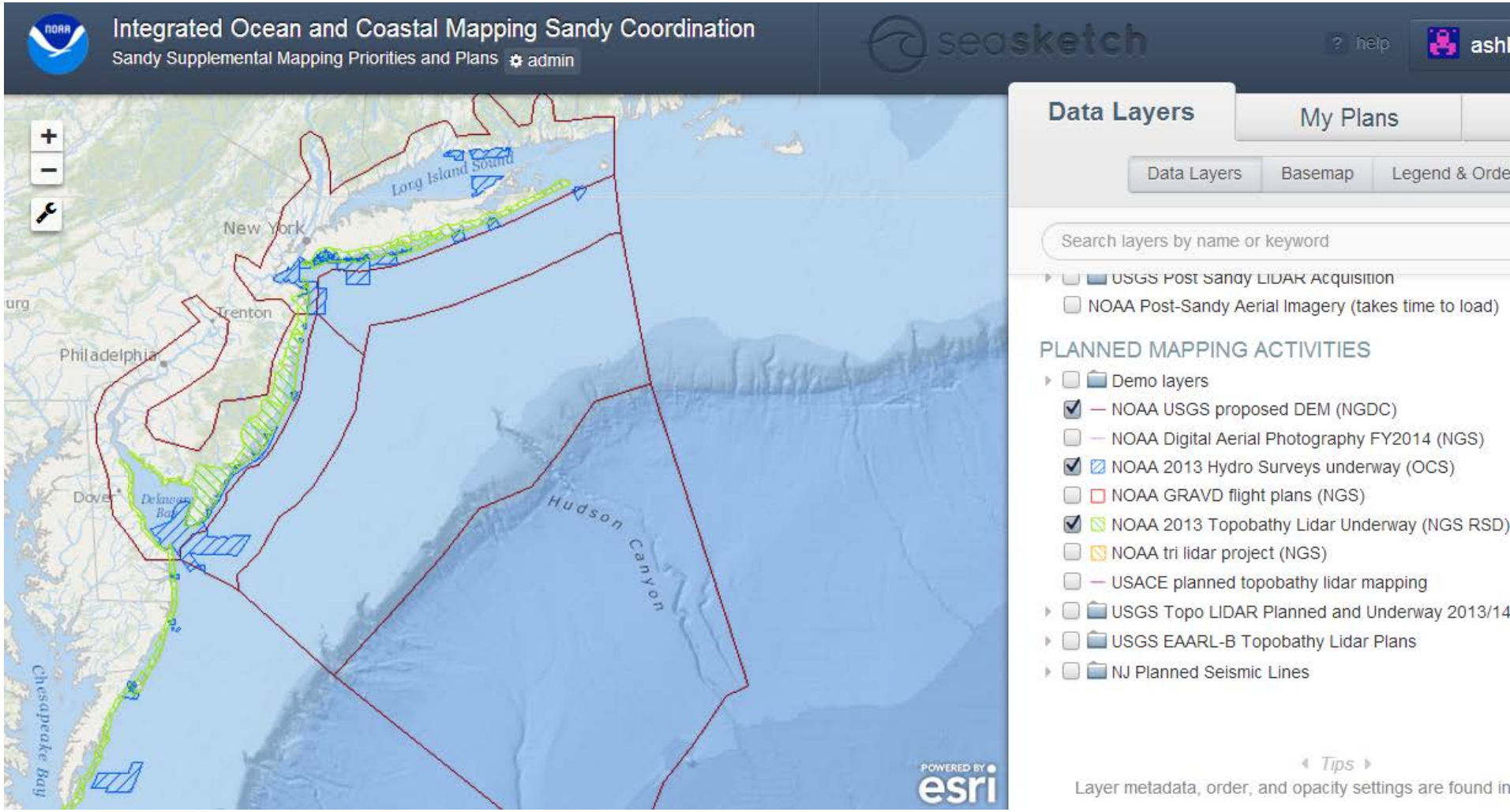


Mapping Coordination

- NGS Remote Sensing Division worked with partners to maximize topobathy lidar data collects
- USGS and NOAA discussed overlaps, modified plans for best outcome



Nat’l Geophysical Data Center Digital Elevation Models



$2M IOCM Center

- Integrated Ocean and Coastal Mapping Center Proof of Concept
- $1M grant to UNH for R&D elements
- $1M contract for data processing and multi-use product development
- Desired Outcomes:

Lessons Learned from Sandy

- Blue Skies planning needed
- Plan for better future Federal Funding Opportunity response
- Improved communication

Back-Up

NOAA Sandy Supplemental

Category	Planned ($M)
Mapping and Charting	$47.5
Repair and Replace Ocean Observing and Coastal Monitoring Assets	$6.7
Technical Assistance to Support State Assessment of Impacts	$2.9
Improve Weather and Hurricane Intensity Forecasting	$23.7
Laboratory and Cooperative Institute Research	$47.5
Fishery Disasters	$4.8
Improvements to Weather Forecasting Equipment and Supercomputers	$8.1
Facilities Damages	$8.6
Repairs and Upgrades to WP-3 Hurricane Hunters	$42.3
Accelerate NWS Ground Readiness	$12.4
Satellite Gap Mitigation	$105.5
Total	**$309.7***

Sandy Supplemental: An IOCM Approach


N68RF