NGS Coastal Mapping Program

Shoreline and Nearshore Bathymetry

Mike Aslaksen
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National Geodetic Survey

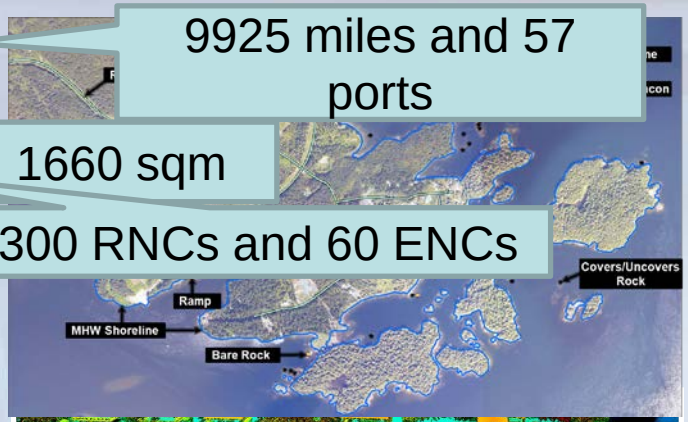
National Oceanic and Atmospheric Administration

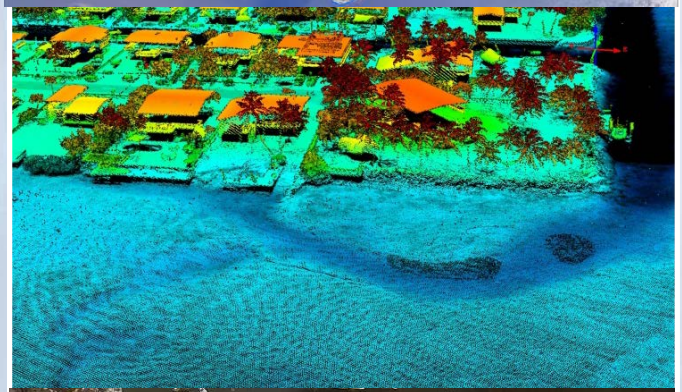
Outline

- Background
- Products
  - Topobathy lidar
  - Coastal Imagery
  - Shoreline
    - Geographic Cells (GCs)
    - Continuously Updated Shoreline Product (CUSP)
  - Coastal Oblique Imagery
  - Emergency Response Imagery
  - Supplemental
- Questions

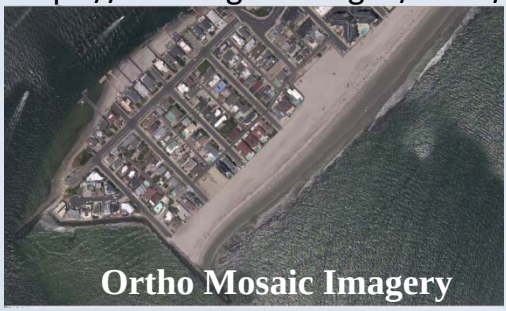
NOAA's Coastal Mapping Program

- **Define the National Shoreline and nearshore elevation data**
- **NOAA nautical charts**
- **Other important applications:**
  - **Used in defining the United States' territorial limits**
  - **Coastal resource management**
  - **Storm surge and coastal flooding modeling**
  - **GIS analysis**
  - **Benthic habitat mapping**
- **Coastal Intelligence and Resiliency…**
- **Emergency Response**





Shoreline
https://www.ngs.noaa.gov/NSDE/



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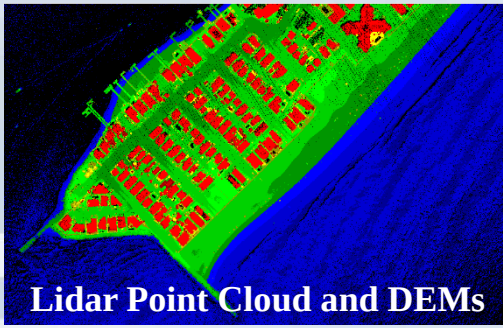

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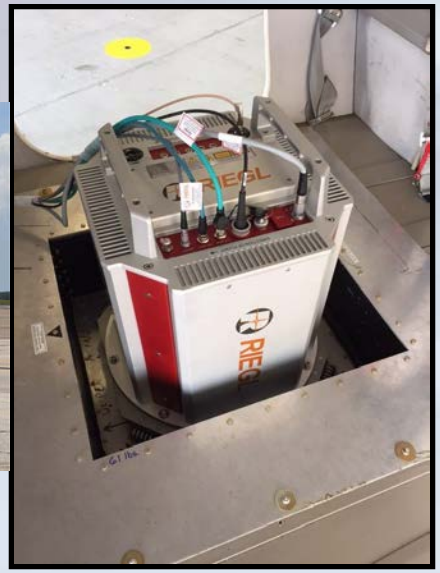
How do we do it?

- **NOAA and contract aircraft**
- **Trimble DSS580 Dual Cam & DSS500 Dual Oblique Cam**
  - –RGB & NIR cameras (NIR in DSS580 only)
  - –35cm GSD at 10,500’ flying height
  - –In-flight image processing
- **RIEGL LIDARs**
  - –Topographic LIDAR (LMS-Q680i)
  - –Topobathymetric System (VQ-880G)
- **Satellite Imagery**
- **Private sector contracts**
  - –**Shoreline Mapping IDIQ contract**
  - –**3 Prime contractors(Quantum Spatial, Dewberry, Fugro)**
  - –**Re-compete planned for fall 2018**



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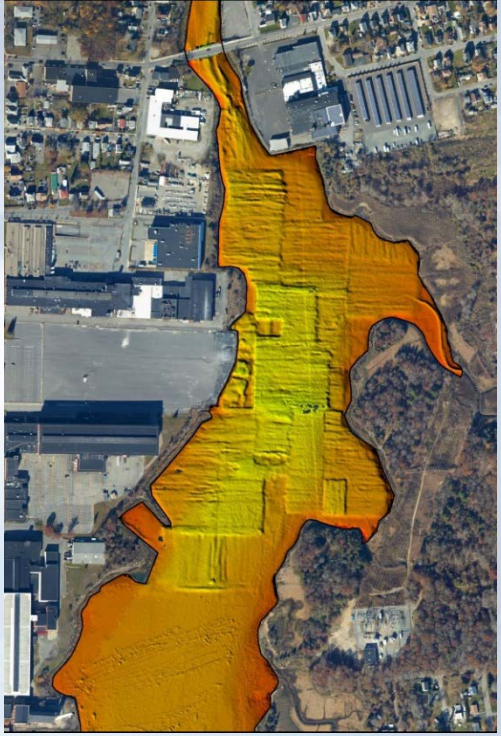
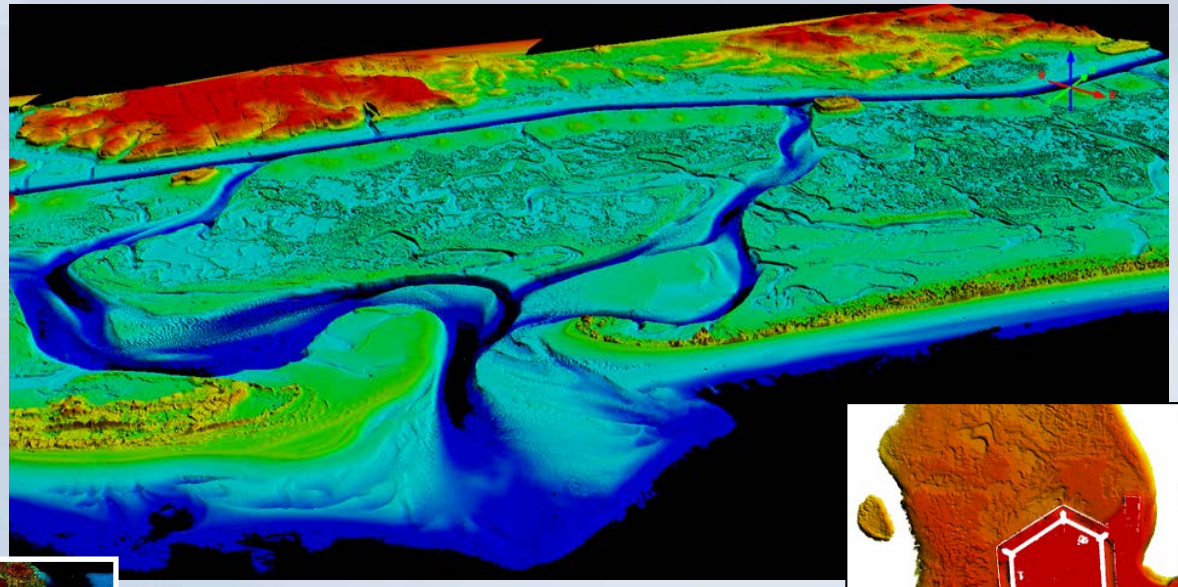
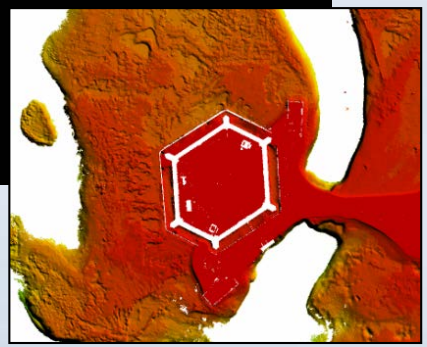
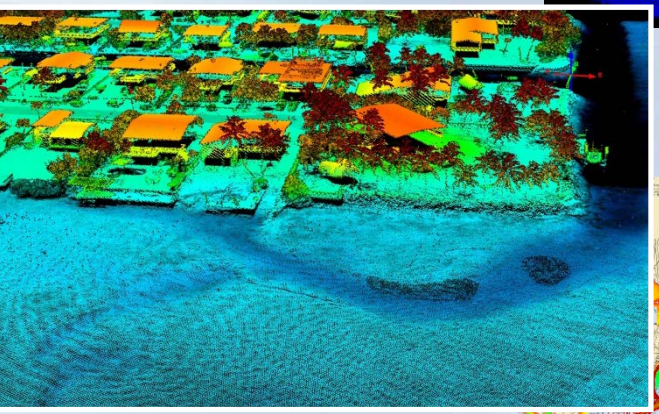
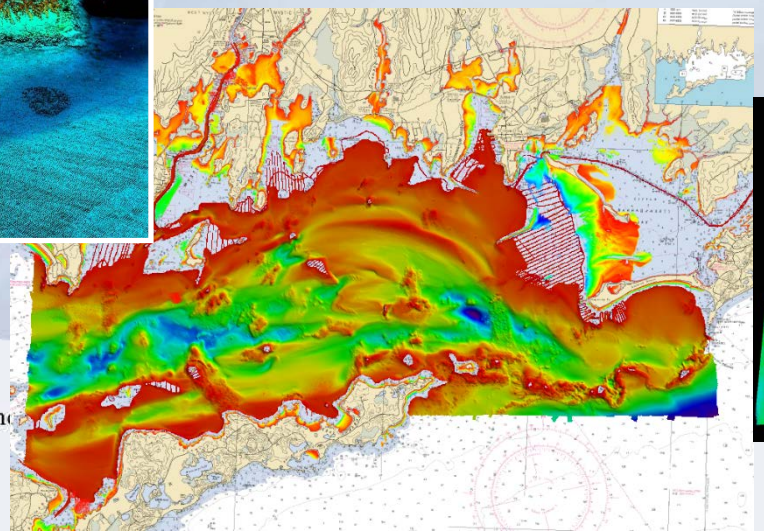
RSD's Topobathy lidar data

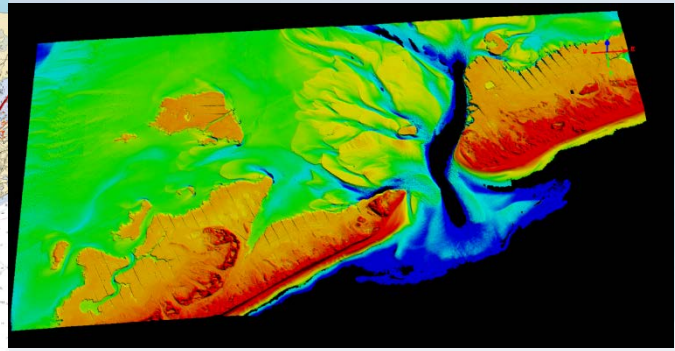






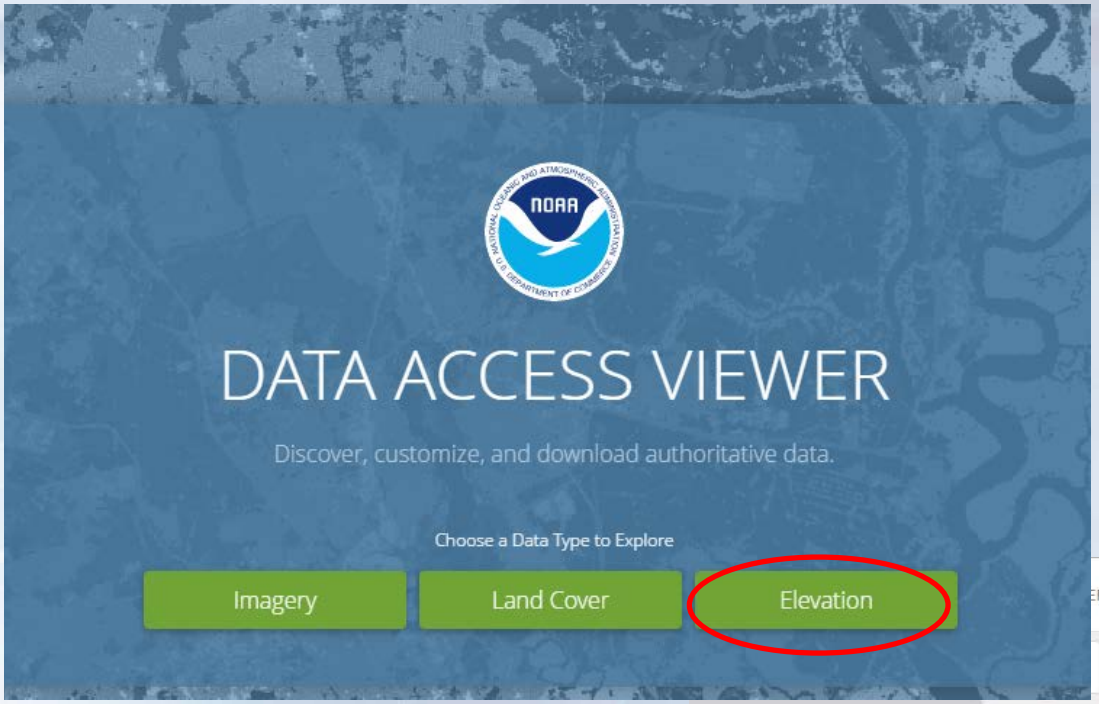


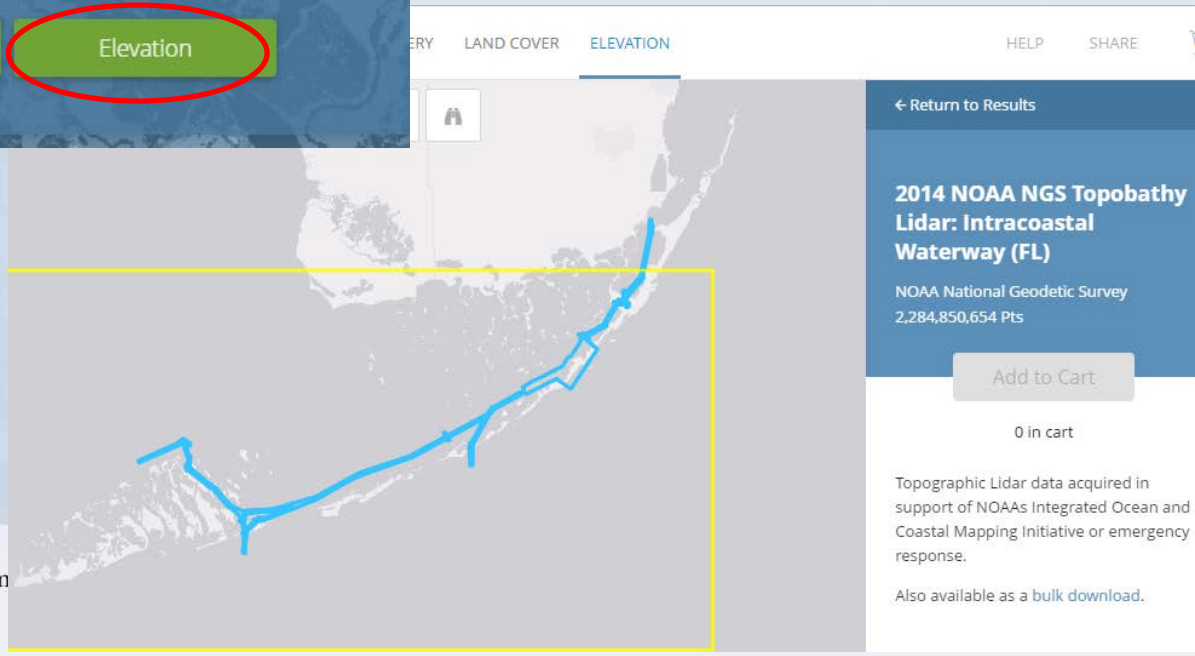




National Oceanic and

NOAA Digital Coast





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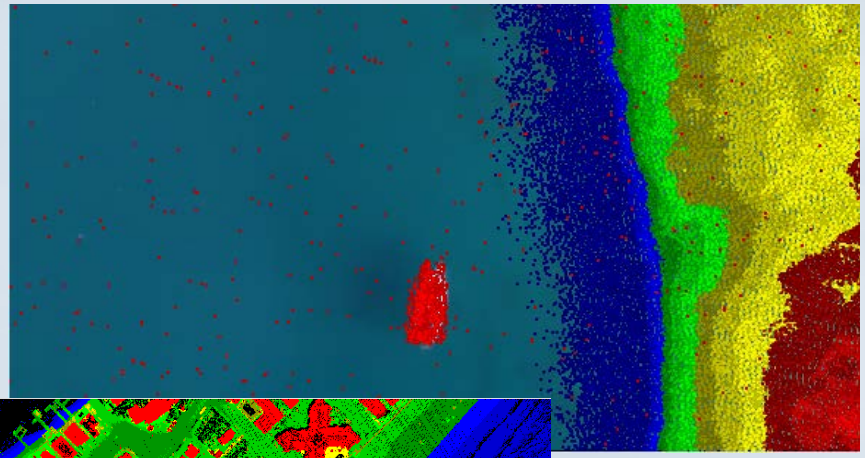
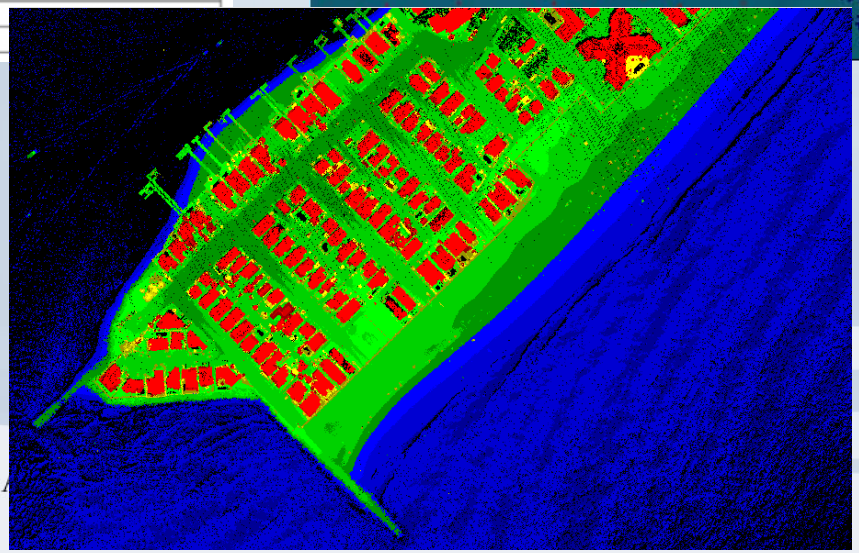
Lidar Data Formats

Topobathy lidar classified point-cloud data in ASPRS standard LAS 1.2 format, and topobathy DEMs (1-meter) in IMG format are provided to NOAA's Digital Coast website for distribution to the public.

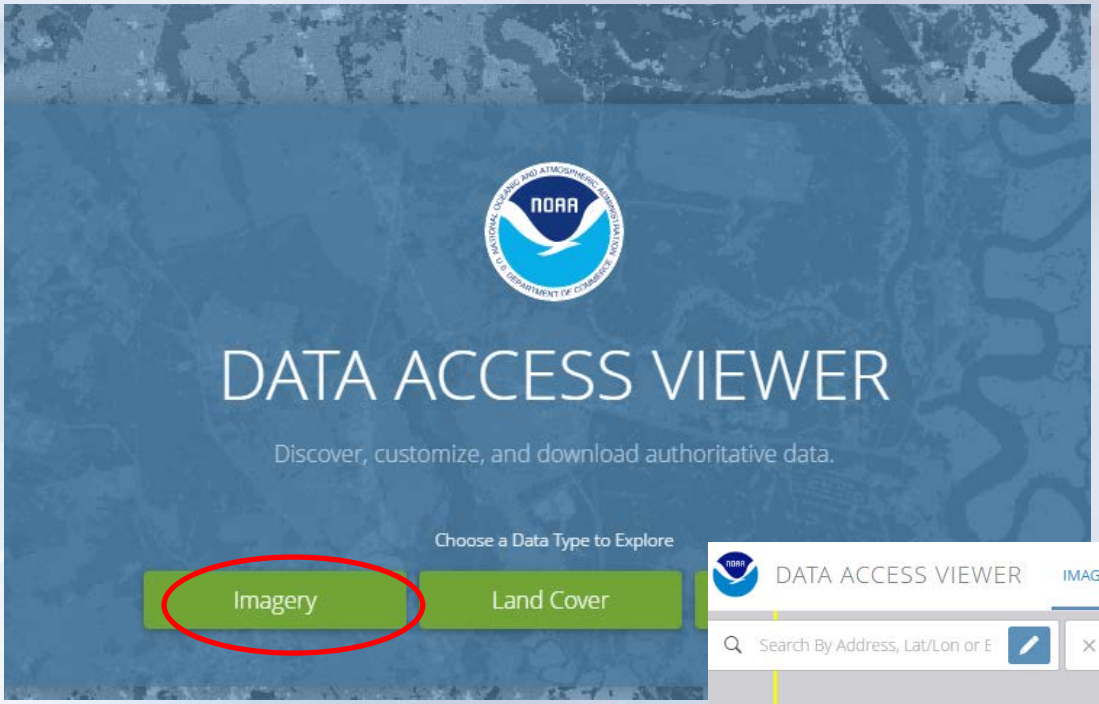
ASPRS Standard LIDAR Point Classes

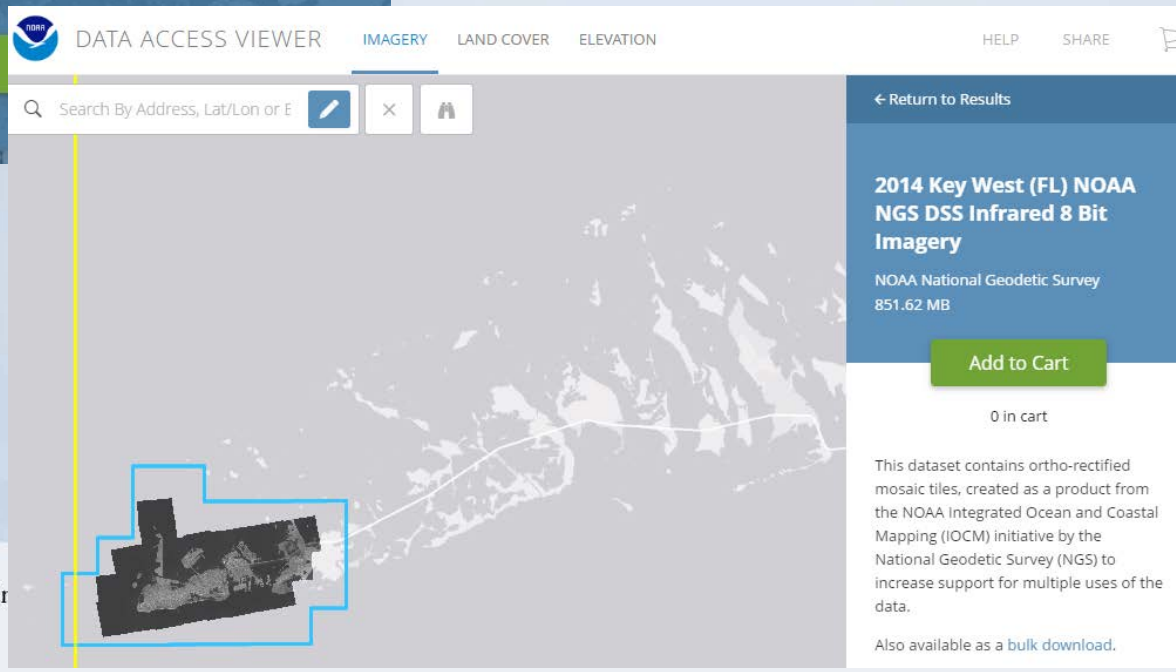
Classification Value (bits 0:4)	***Meaning***
0	Created, never classified
1	Unclassified[1]
2	Ground
3	Low Vegetation
4	Medium Vegetation
5	High Vegetation
6	Building
7	Low Point (noise)
8	Model Key-point (mass point)
9	Water
10	*Reserved for ASPRS Definition*
11	*Reserved for ASPRS Definition*
12	Overlap Points[2]
13-31	*Reserved for ASPRS Definition*





NOAA Digital Coast





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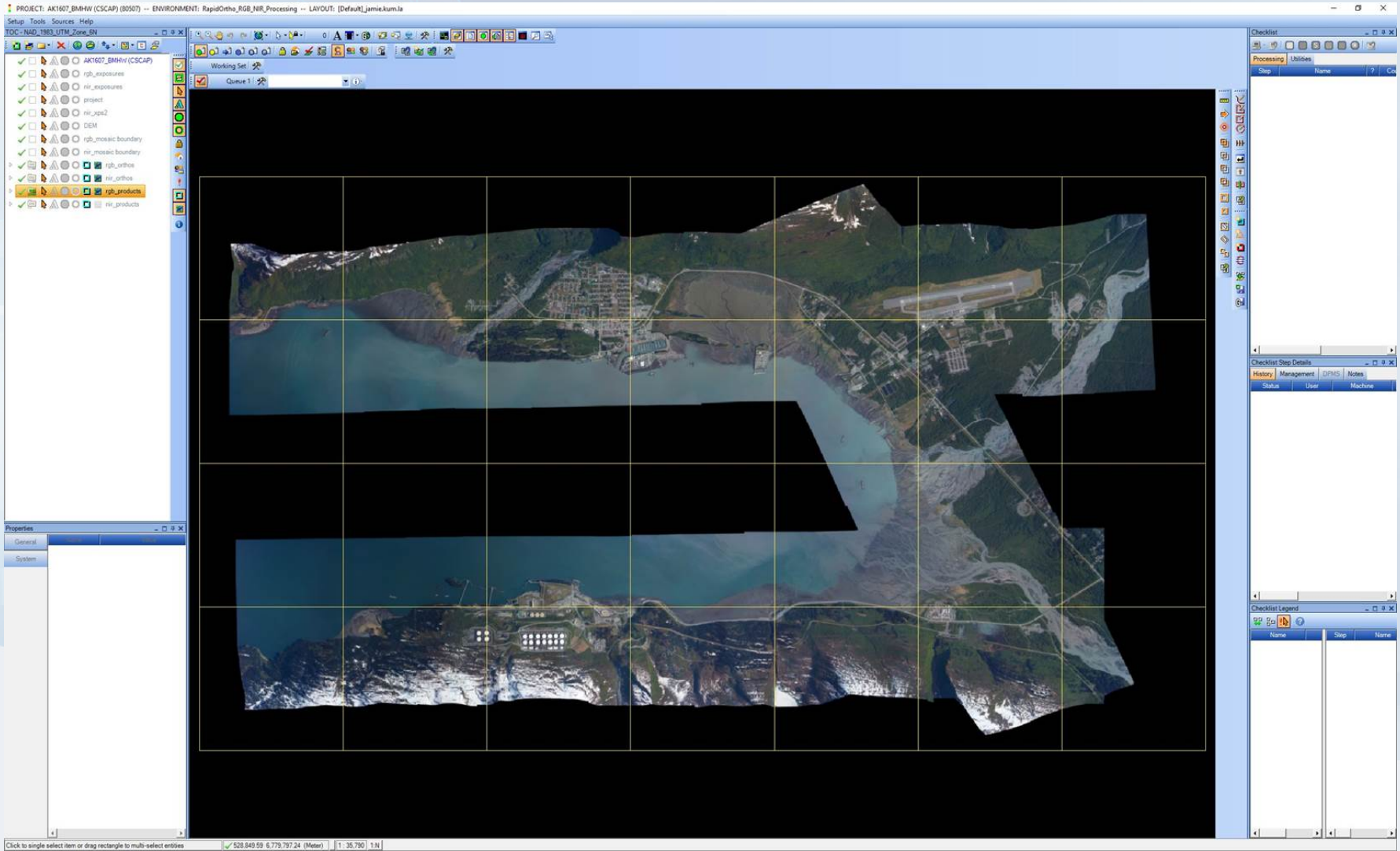
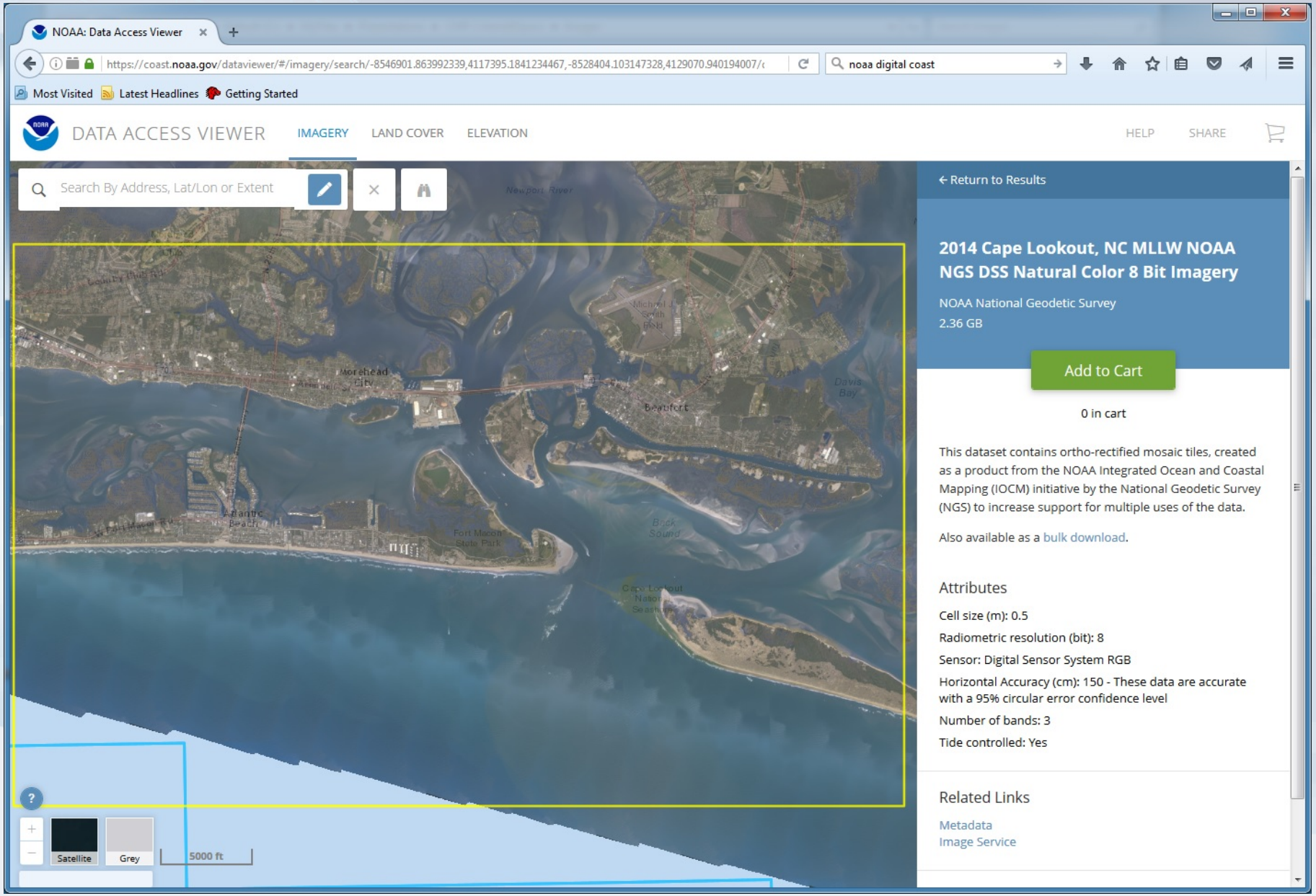
Orthoimagery Format

GeoCue is used as a workflow manager to coordinate the production of 2.5 km square orthomosaic tiles in GeoTiff format (UTM projection) using OrthoVista and RapidOrtho software.



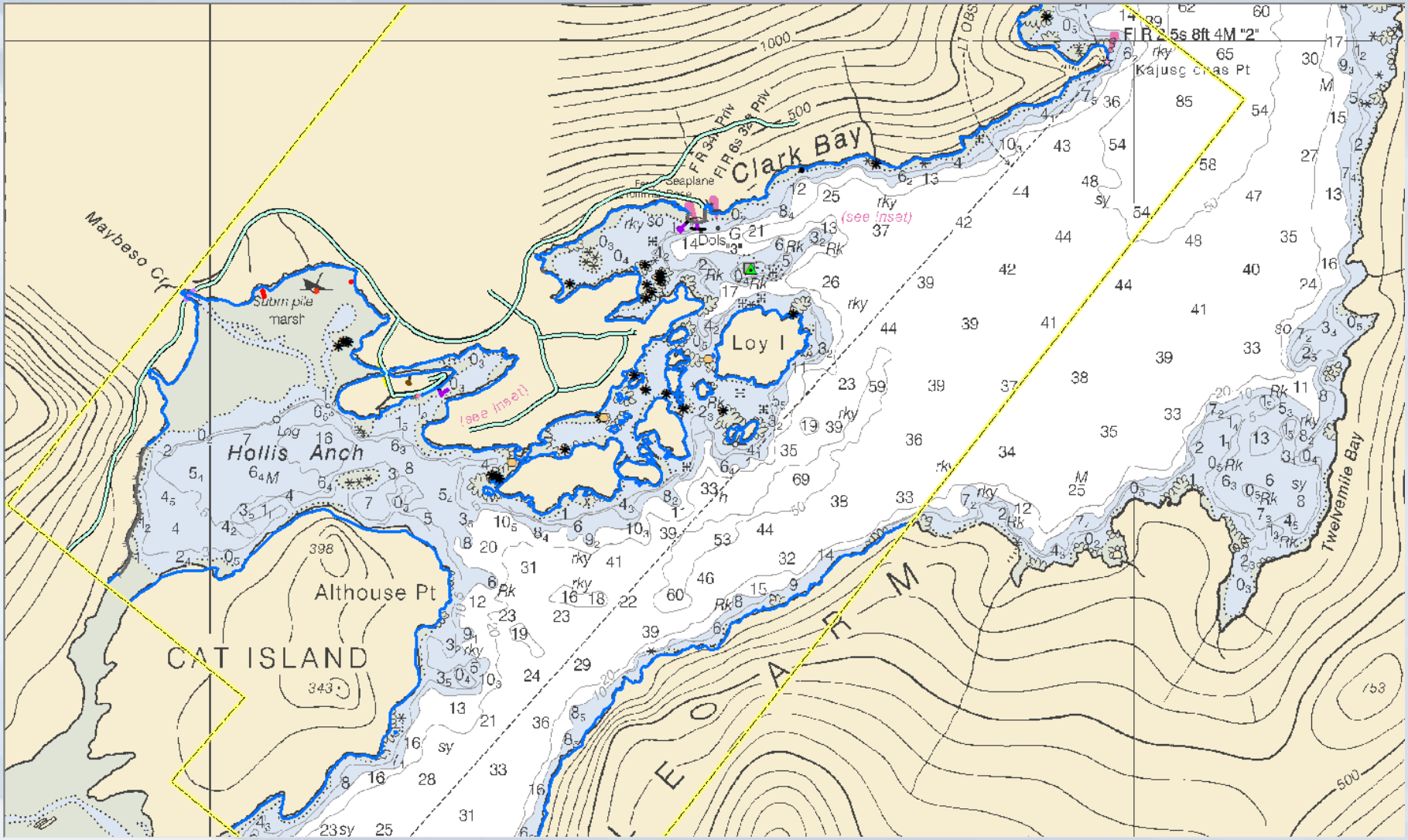
Orthomosaic Imagery on Digital Coast



Access to NGS Data on Digital Coast

- **Data Registry (Imagery and Lidar)**
  - https://coast.noaa.gov/dataregistry/search/collection
- **Data Access Viewer (Imagery and Lidar)**
  - https://coast.noaa.gov/dataviewer/#
- **Coastal Lidar Datasheet**
  - https://coast.noaa.gov/htdata/lidar1_z/geoid12a/data/

Geographic Cells



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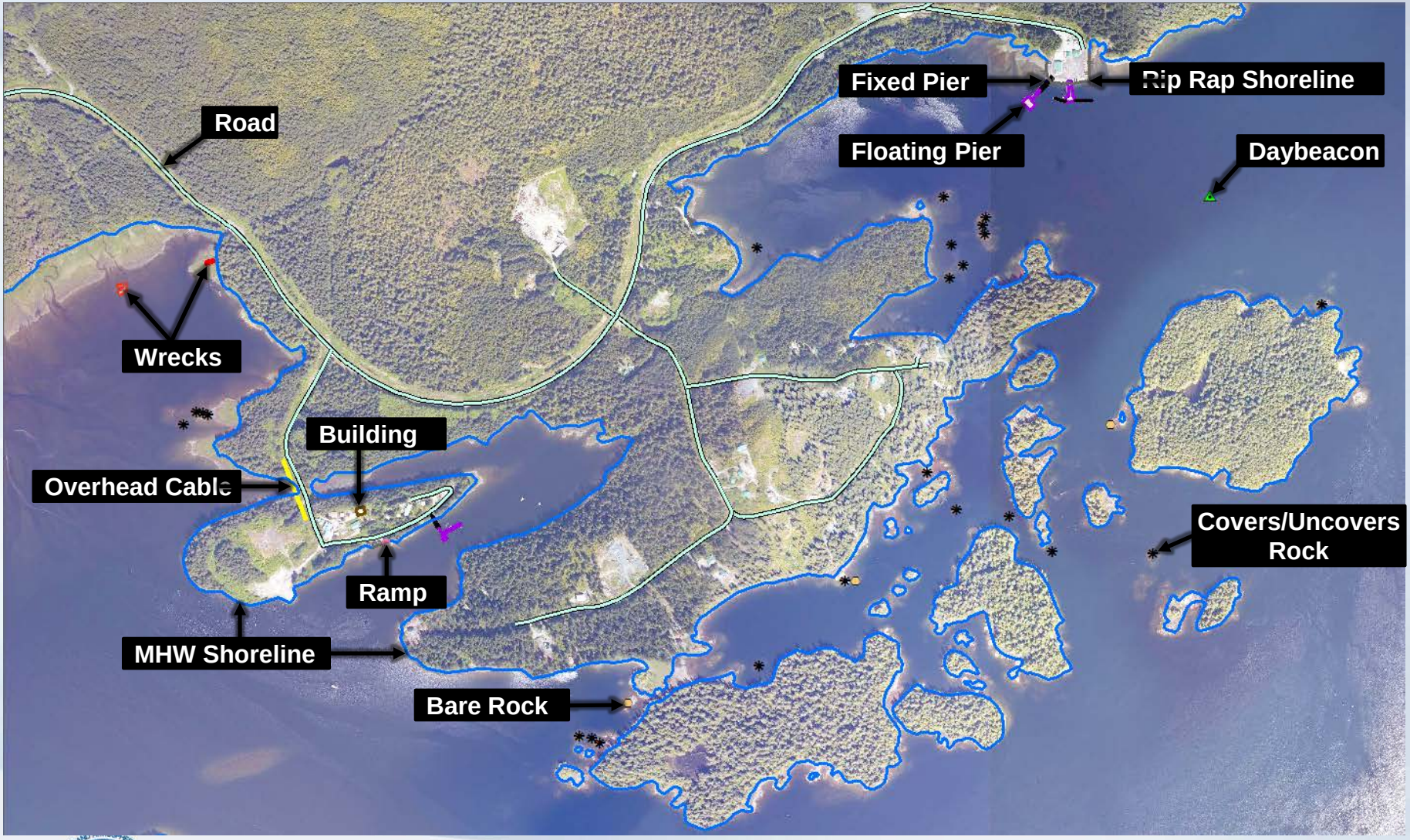
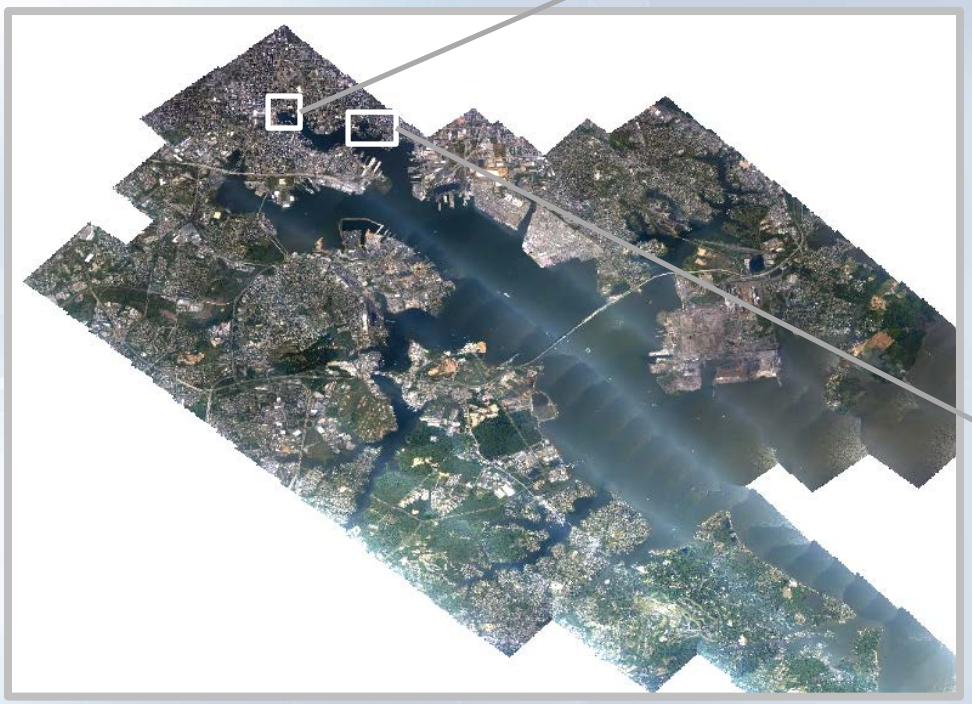


National Oceanic and Atmospheric Administration

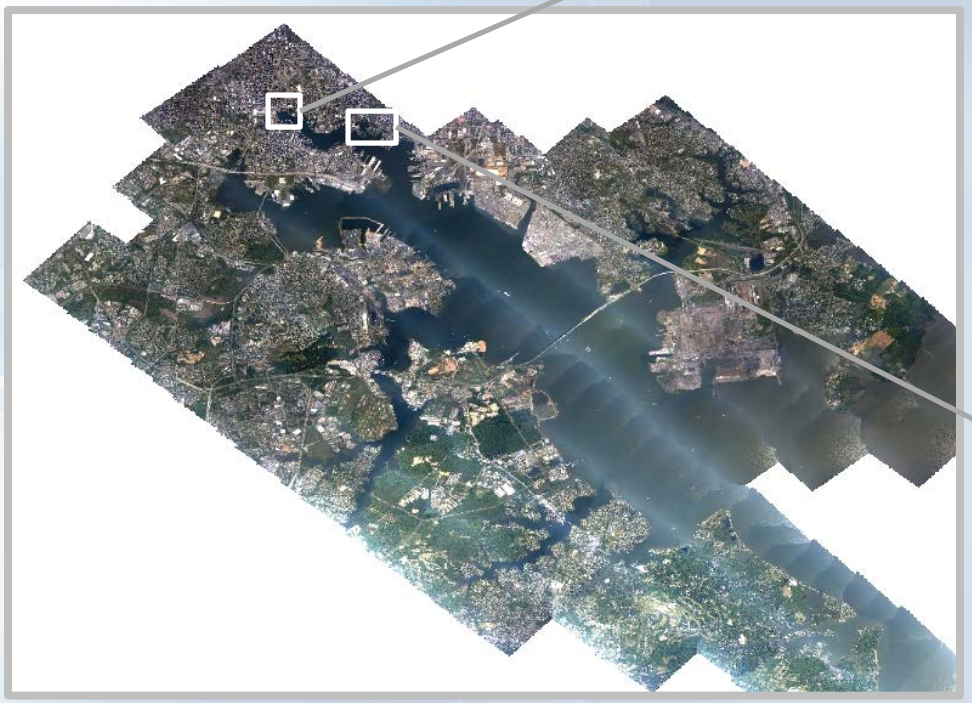
High Resolution Digital Aerial Imagery and Shoreline



Baltimore, MD

National Oceanic and Atmospheric Administration

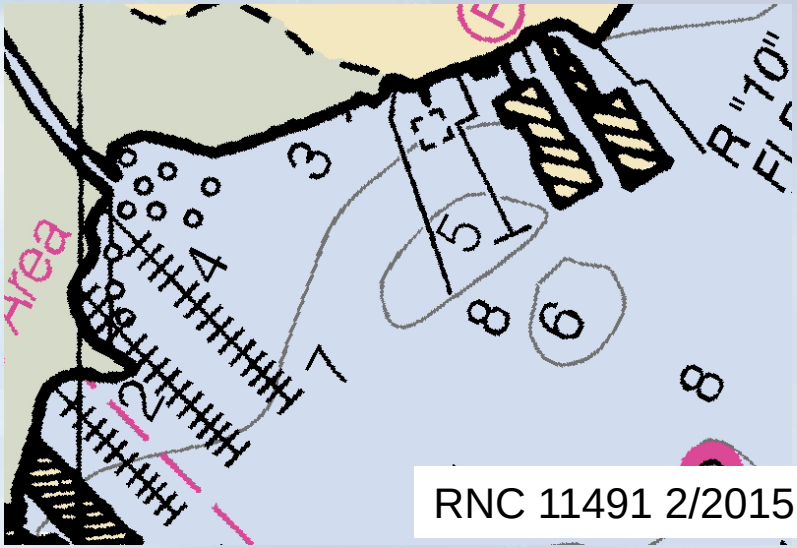
High Resolution Digital Aerial Imagery and Shoreline



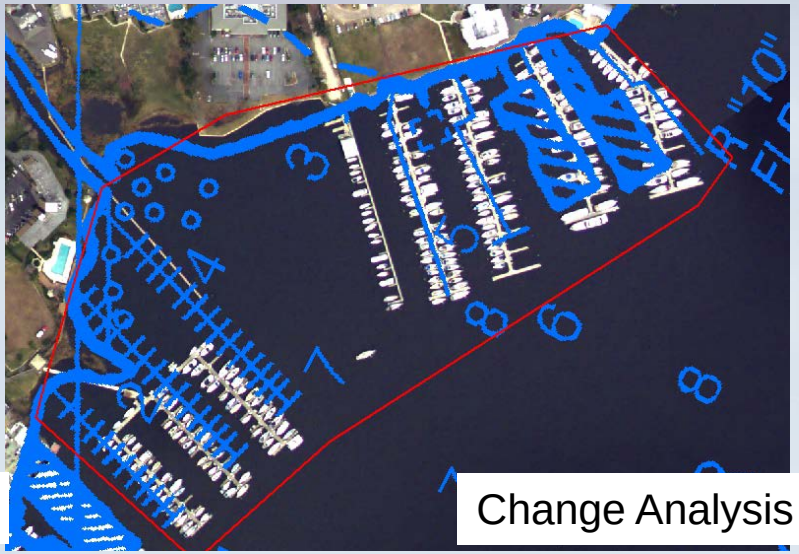
Baltimore, MD

National Oceanic and Atmospheric Administration

Coast and Shoreline Change Analysis Program (CSCAP) Jacksonville, FL

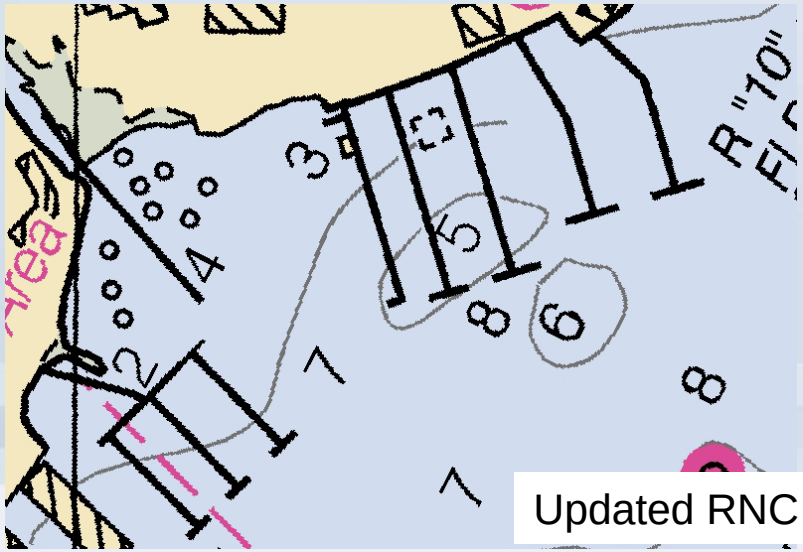


RNC 11491 2/2015



Change Analysis

Shoreline Compilation (GC 11196)



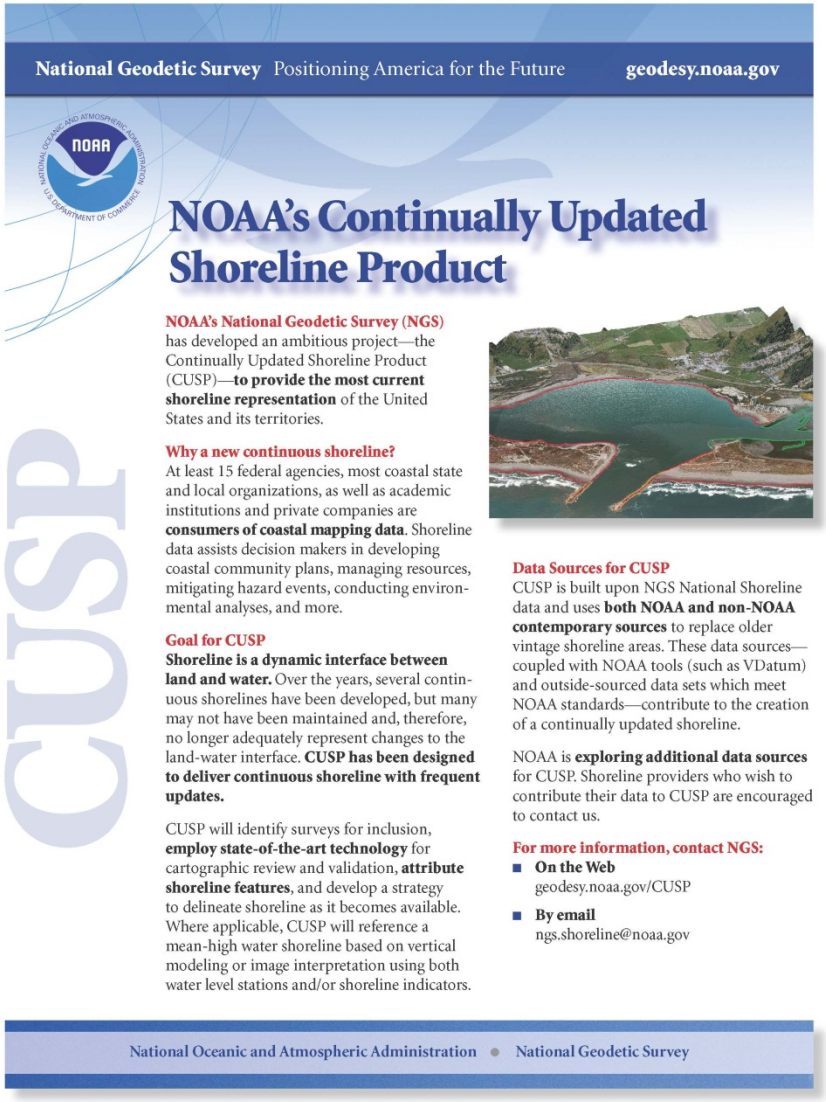
Updated RNC

Continually Updated Shoreline Product (CUSP)

https://www.ngs.noaa.gov/NSDE/

National Oceanic and Atmospheric Administration

Continually Updated Shoreline Product



National Geodetic Survey Positioning America for the Future geodesy.noaa.gov

NOAA's Continually Updated Shoreline Product

CUSP

NOAA's National Geodetic Survey (NGS) has developed an ambitious project—the Continually Updated Shoreline Product (CUSP)—**to provide the most current shoreline representation** of the United States and its territories.

Why a new continuous shoreline?
At least 15 federal agencies, most coastal state and local organizations, as well as academic institutions and private companies are **consumers of coastal mapping data**. Shoreline data assists decision makers in developing coastal community plans, managing resources, mitigating hazard events, conducting environmental analyses, and more.

Goal for CUSP
Shoreline is a dynamic interface between land and water. Over the years, several continuous shorelines have been developed, but many may not have been maintained and, therefore, no longer adequately represent changes to the land-water interface. **CUSP has been designed to deliver continuous shoreline with frequent updates.**

CUSP will identify surveys for inclusion, **employ state-of-the-art technology** for cartographic review and validation, **attribute shoreline features**, and develop a strategy to delineate shoreline as it becomes available. Where applicable, CUSP will reference a mean-high water shoreline based on vertical modeling or image interpretation using both water level stations and/or shoreline indicators.

Data Sources for CUSP
CUSP is built upon NGS National Shoreline data and uses **both NOAA and non-NOAA contemporary sources** to replace older vintage shoreline areas. These data sources—coupled with NOAA tools (such as VDatum) and outside-sourced data sets which meet NOAA standards—contribute to the creation of a continually updated shoreline.

NOAA is **exploring additional data sources** for CUSP. Shoreline providers who wish to contribute their data to CUSP are encouraged to contact us.

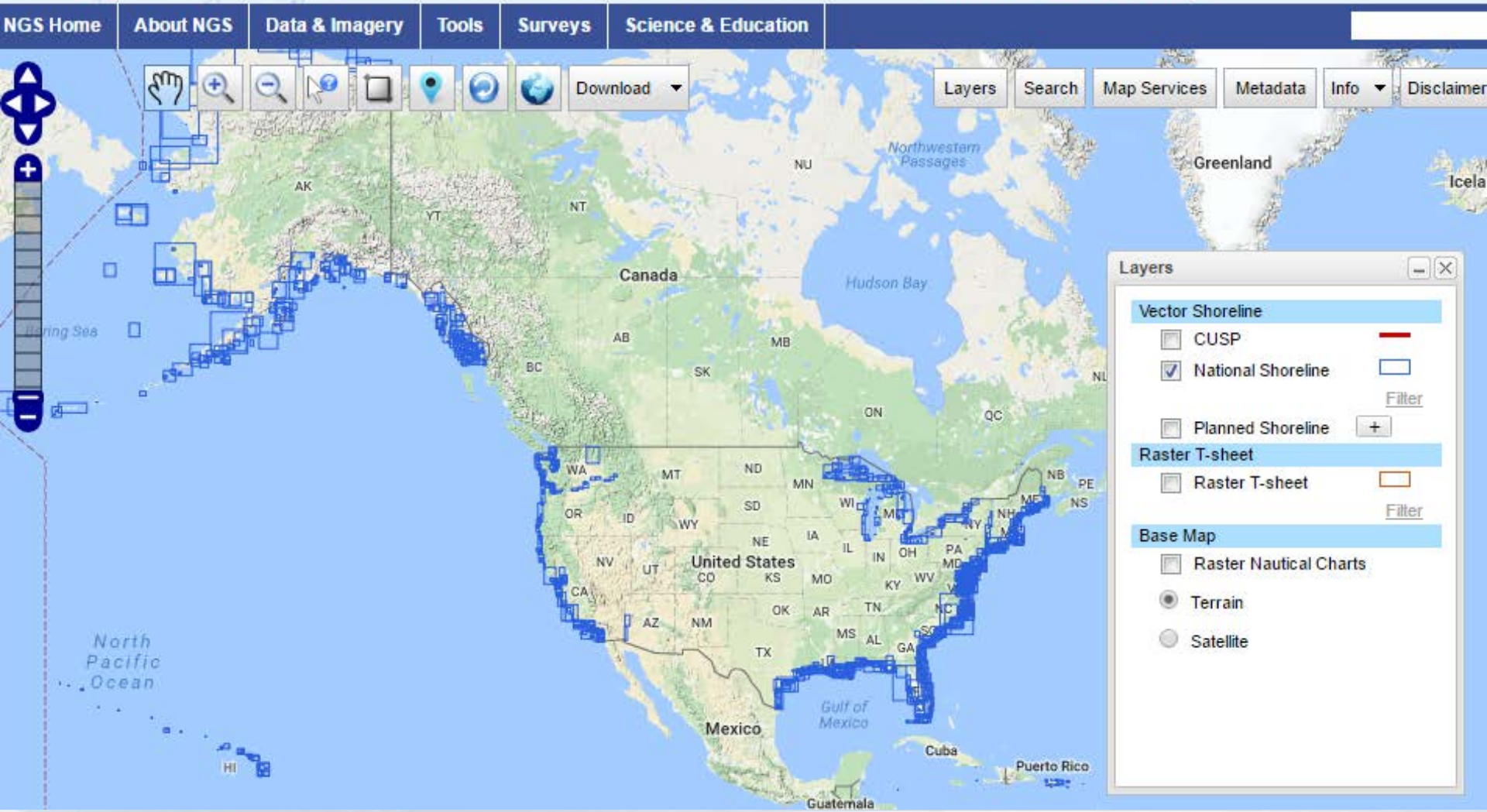
For more information, contact NGS:
- **On the Web**
  geodesy.noaa.gov/CUSP
- **By email**
  ngs.shoreline@noaa.gov

National Oceanic and Atmospheric Administration • National Geodetic Survey

- To provide the most current shoreline representation
- Designed to deliver continuous shoreline with frequent updates
- Employ state-of-the-art technologies
- Attributed shoreline features
- Referenced to Mean High Water datum where applicable
- Includes NOAA and non-NOAA contemporary sources

NOAA Shoreline Data Explorer

National Geodetic Survey



https://www.ngs.noaa.gov/NSDE/

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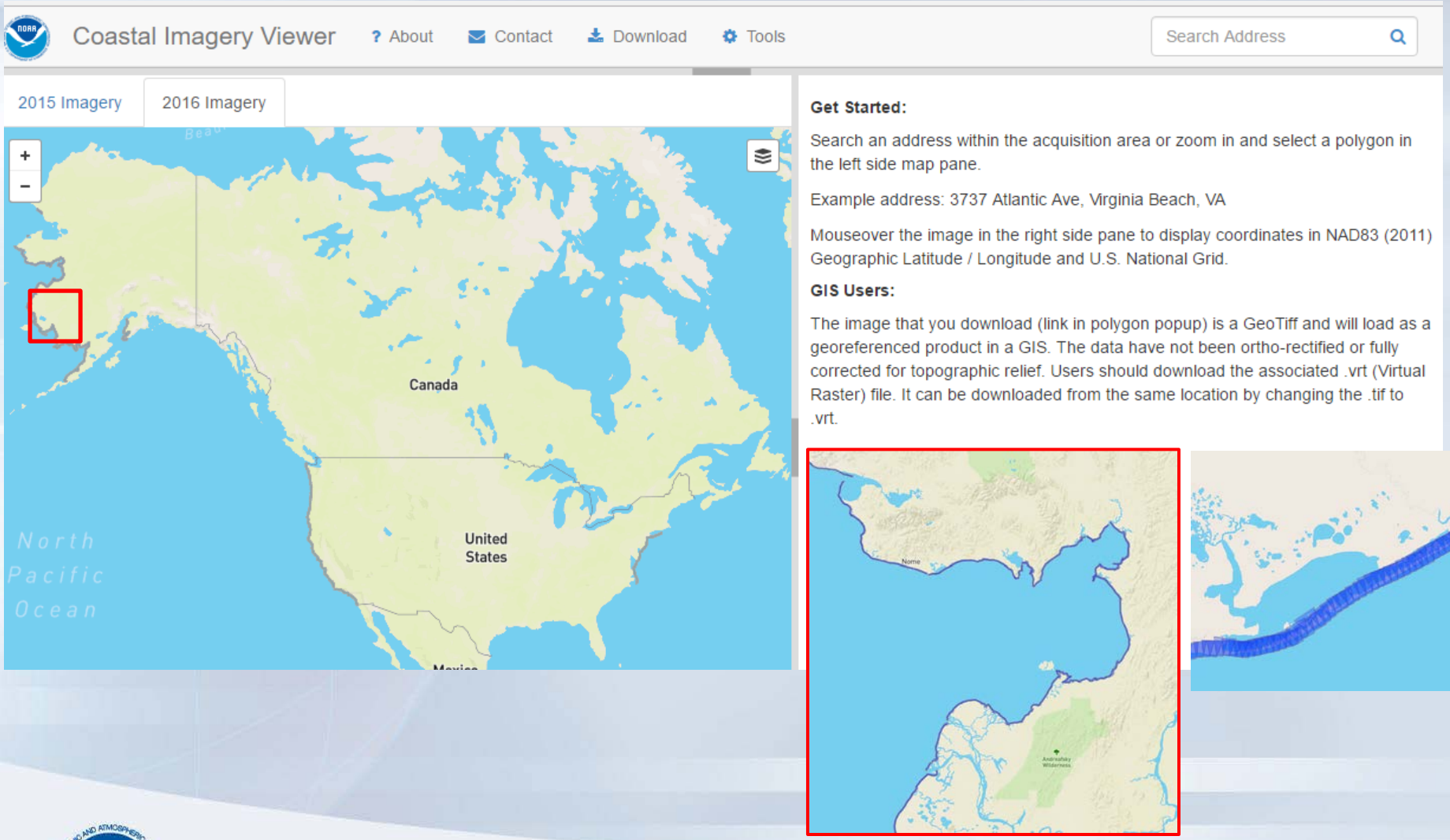
Coastal Oblique Imagery viewer



National Oceanic and Atmospheric Administration

https://geodesy.noaa.gov/storm_archive/coastal/viewer/index.html

NOAA Semi-Oblique Coastal Imaging

Hooper Bay Airport, May 27 2016

Emergency Response Imagery

National Geodetic Survey

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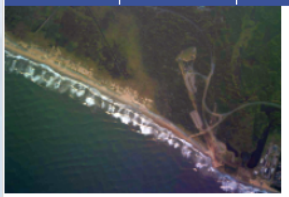

The imagery posted on this site was acquired by the NOAA Remote Sensing Division to support NOAA homeland security and emergency response requirements. In addition, it will be used for ongoing research efforts for testing and developing standards for airborne digital imagery.

Tips for navigating the Emergency Response Imagery Viewer.

Emergency Response Imagery:

Hurricane Florence (2018)
Tropical Storm Gordon (2018)
Hurricane Nate (2017)
Hurricane Maria (2017)
Hurricane Irma (2017)
Hurricane Harvey (2017)
Hurricane Matthew (2016)
Louisiana Flooding (2016)
Midwest U.S. Flooding (2015)
Illinois Tornadoes (2015)
Hurricane Arthur (2014)
Hurricane Sandy (2012)
Hurricane Isaac (2012)
Hurricane Irene (2011)
Joplin, MO Tornado (2011)
Tuscaloosa, AL Tornado (2011)
North Dakota Flooding (2011)
Hurricane Earl (2010)
Nor'Easter Nov09 (2009)
Hurricane Ike (2008)
Hurricane Gustav (2008)
Hurricane Humberto (2007)
Tropical Storm Ernesto (2006)
Hurricane Wilma (2005)
Hurricane Rita (2005)
Hurricane Ophelia (2005)
Hurricane Katrina (2005)
Hurricane Dennis (2005)
Hurricane Ivan (2004)
Hurricane Jeanne (2004)
Hurricane Isabel (2003)

Navigation
National Geodetic Survey
Pre-Event Imagery

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Comments and Policy Issues

Website Owner: National Geodetic Survey / Last modified Apr 03 2017

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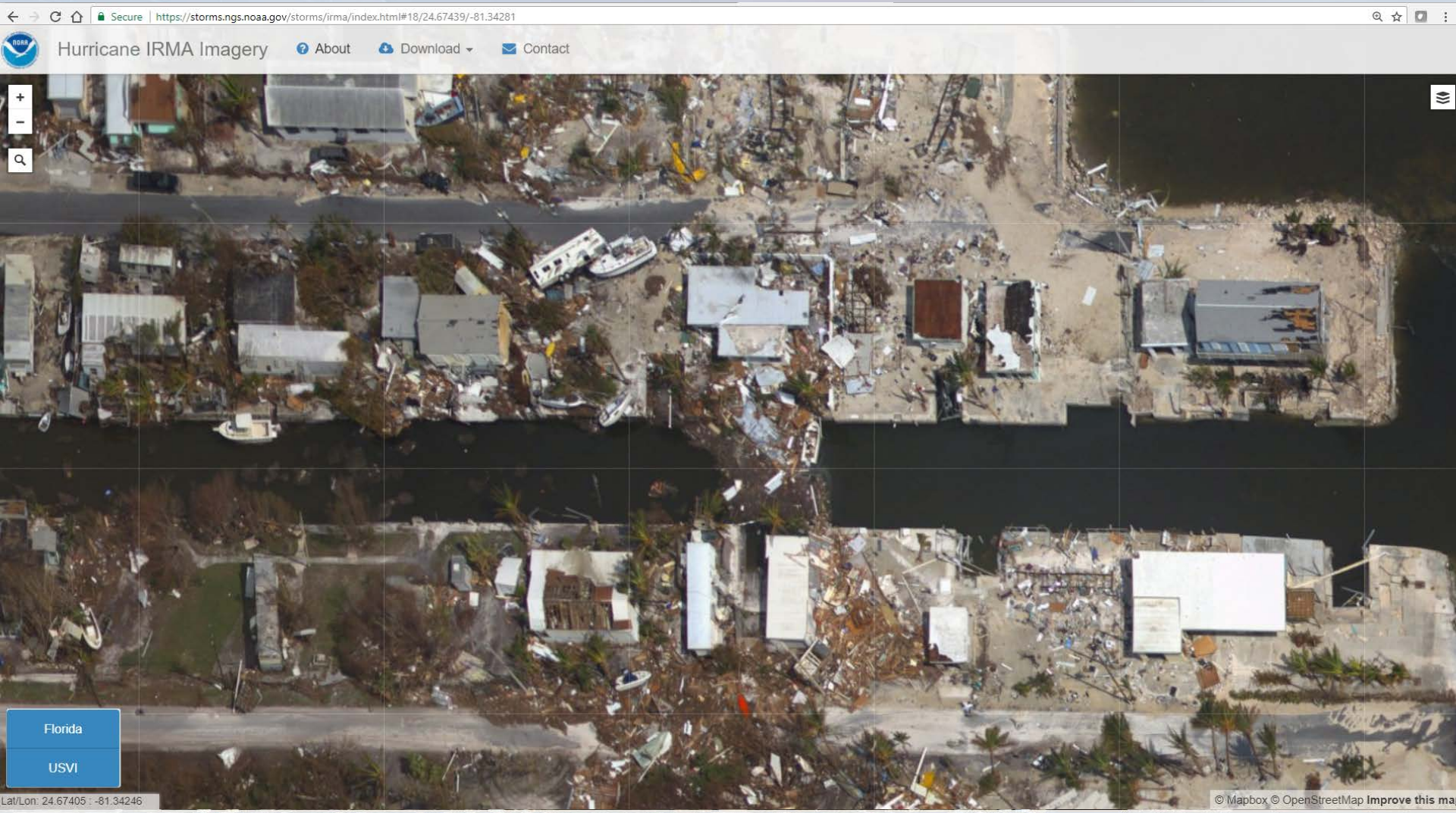
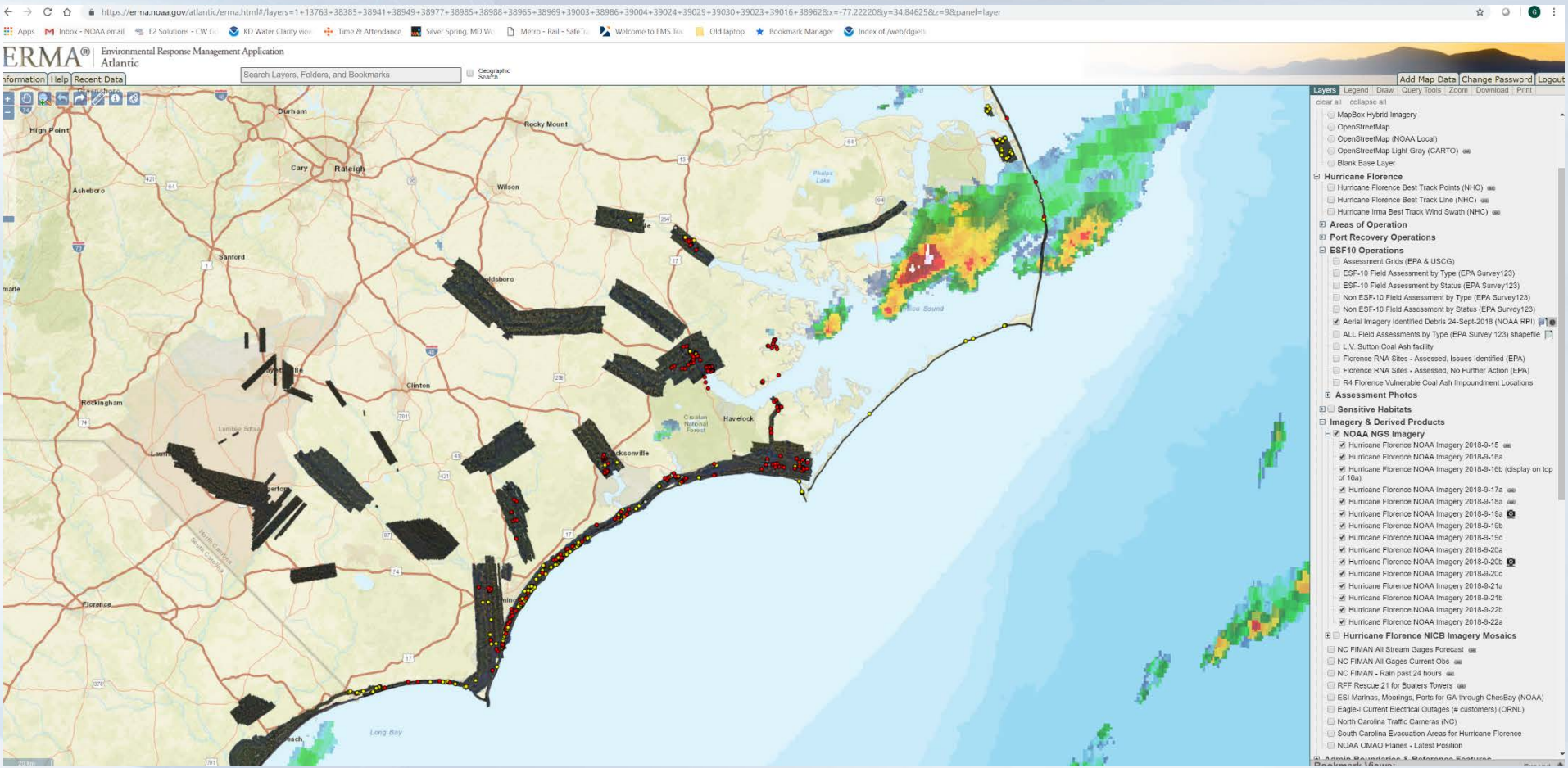
National Oceanic and Atmospheric Administration

https://storms.ngs.noaa.gov/



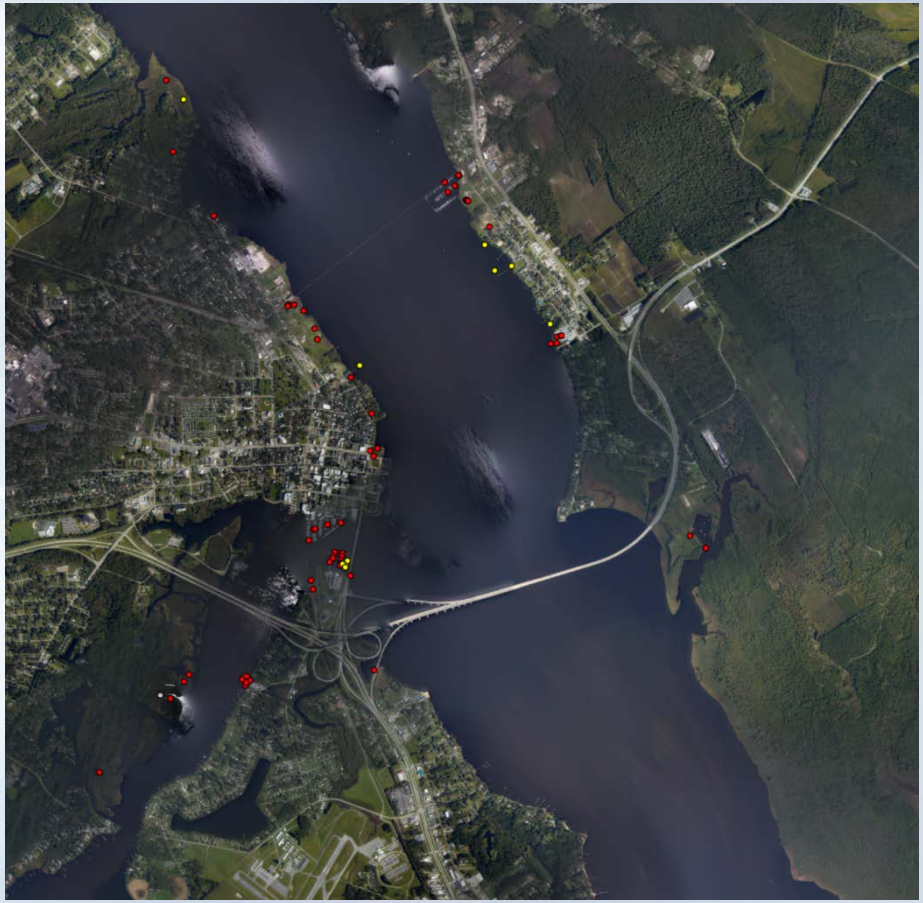
National Oceanic and Atmospheric Administration

Emergency Response to Florence

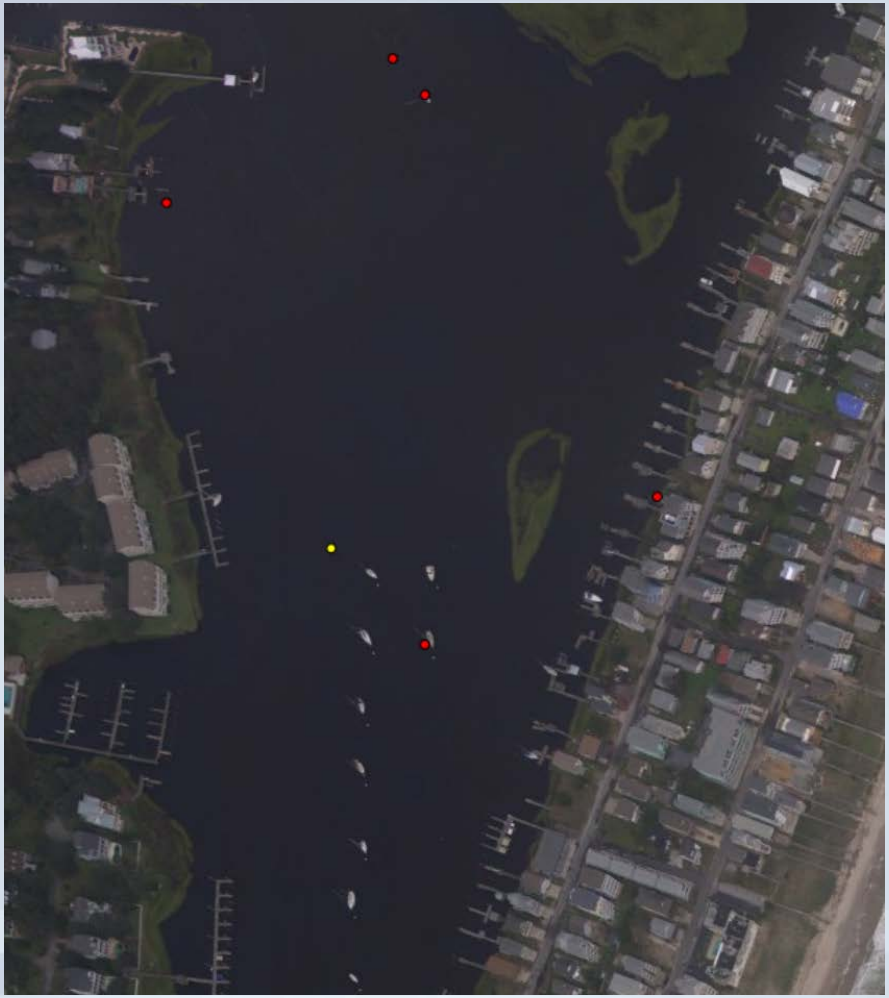


National Oceanic and Atmospheric Administration

Emergency Response to Florence



New Bern, NC



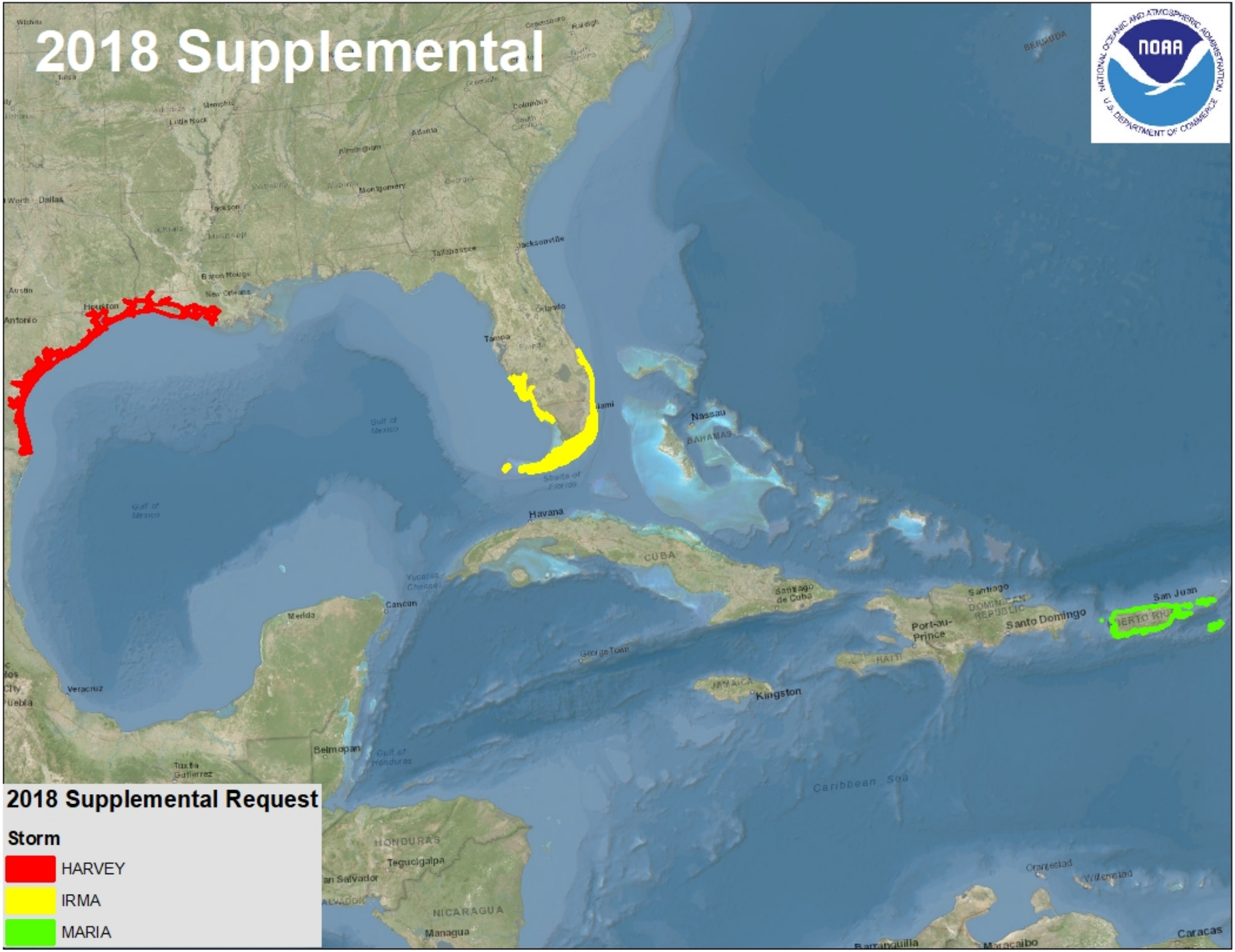
Carolina Beach

National Oceanic and Atmospheric Administration

Emergency Response Imagery

Near Rose Hill, NC

National Oceanic and Atmc


2018 Supplemental
2018 Supplemental Request
Storm
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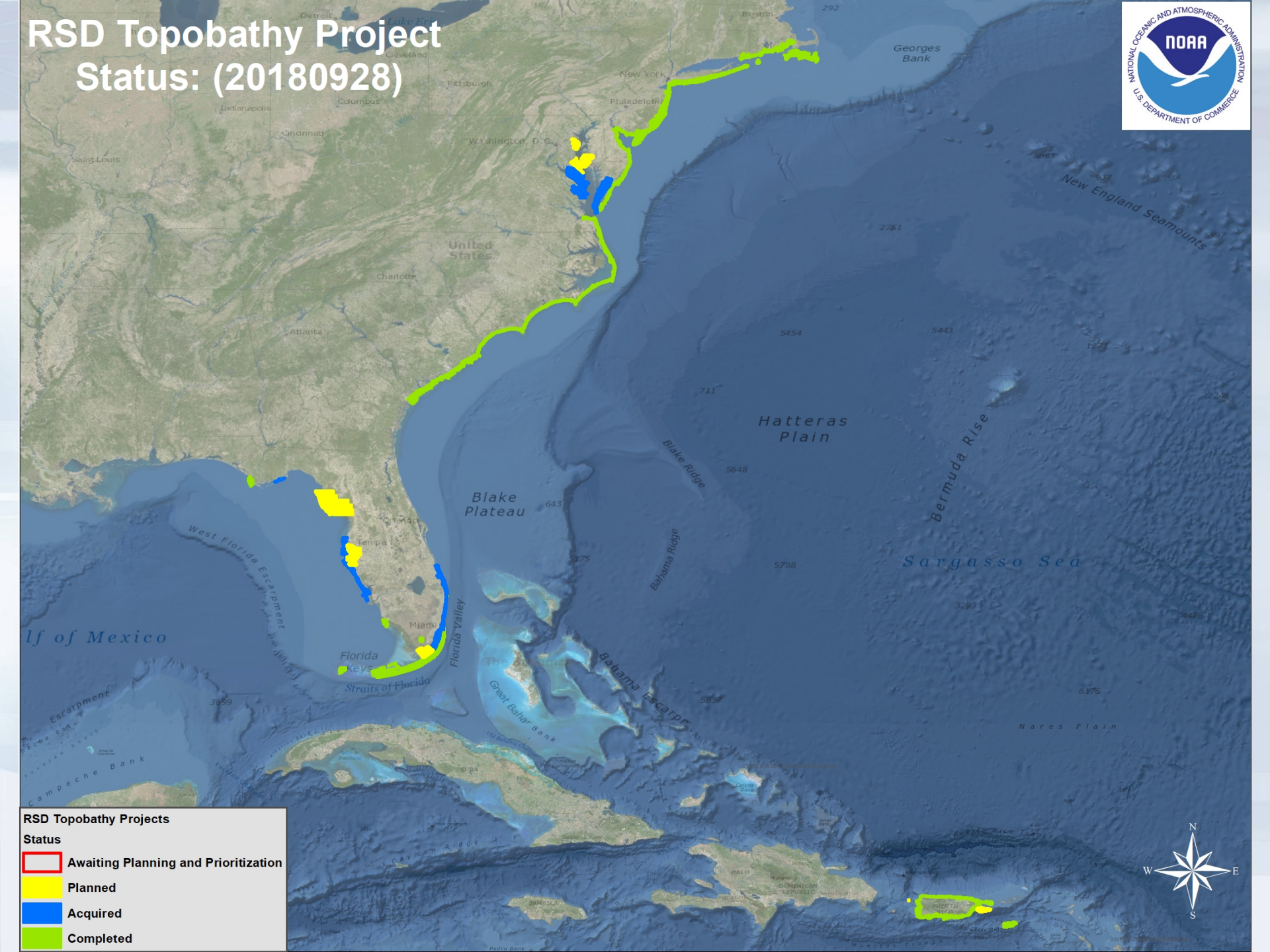
IRMA
MARIA
Houston
Miami
Nassau
BAHAMAS
Havana
CUBA
Cancun
Merida
Veracruz
Belmopan
HONDURAS
Tegucigalpa
NICARAGUA
Managua
Kingston
JAMAICA
HAITI
Port-au-Prince
Santo Domingo
DOMINICAN REPUBLIC
San Juan
Caribbean Sea
Caracas
Gulf of Mexico
Tampa
Orlando
Jacksonville
Atlanta
Dallas
New Orleans
BERMUDA

RSD Topobathy Project
Status: (20180928)



RSD Topobathy Projects

Status

- Awaiting Planning and Prioritization
- Planned
- Acquired
- Completed

Questions?

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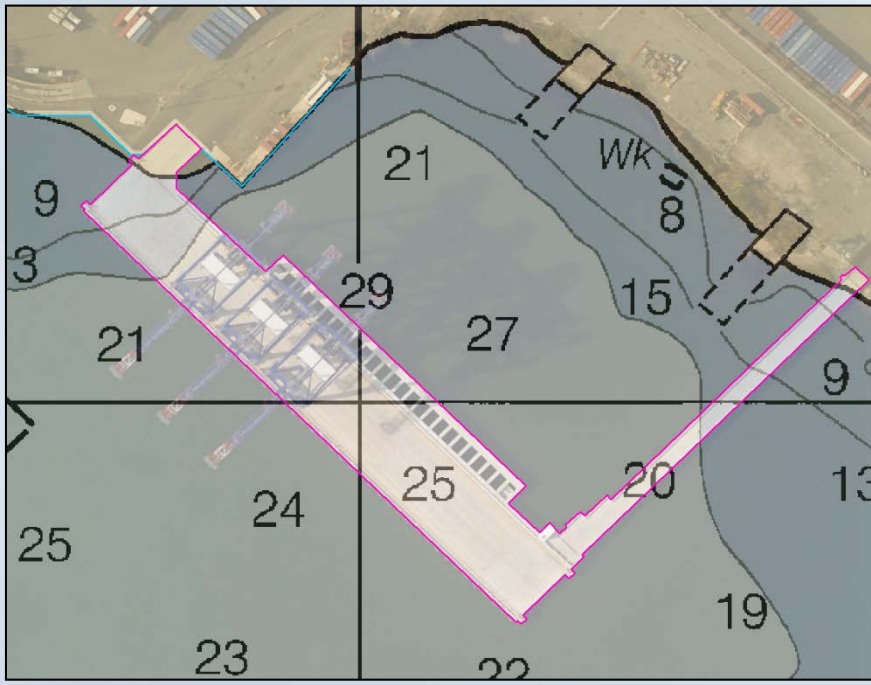
Chief, Remote Sensing Division
NOAA National Geodetic Survey
mike.aslaksen@noaa.gov

Shoreline Update Expedite (SUE)

- **Goal:** to provide the requested updates within 1-2 workdays.

- **Example workflow:**
  - Received request from MCD on Thu. Aug. 23, 2018 for an update to chart 25670, depicting a large uncharted pier.
  - Determined that RSD aerial imagery flown on 9/24/17 in response to Hurricane Maria had captured the new pier.
  - Compiled the features in ArcGIS using the orthoimagery accessed directly through the NGS Storm Imagery web map tile service (WMTS), and delivered the shapefile to MCD just 3.5 hours after their request.



SUE-00022
Isla Grande, San Juan, PR

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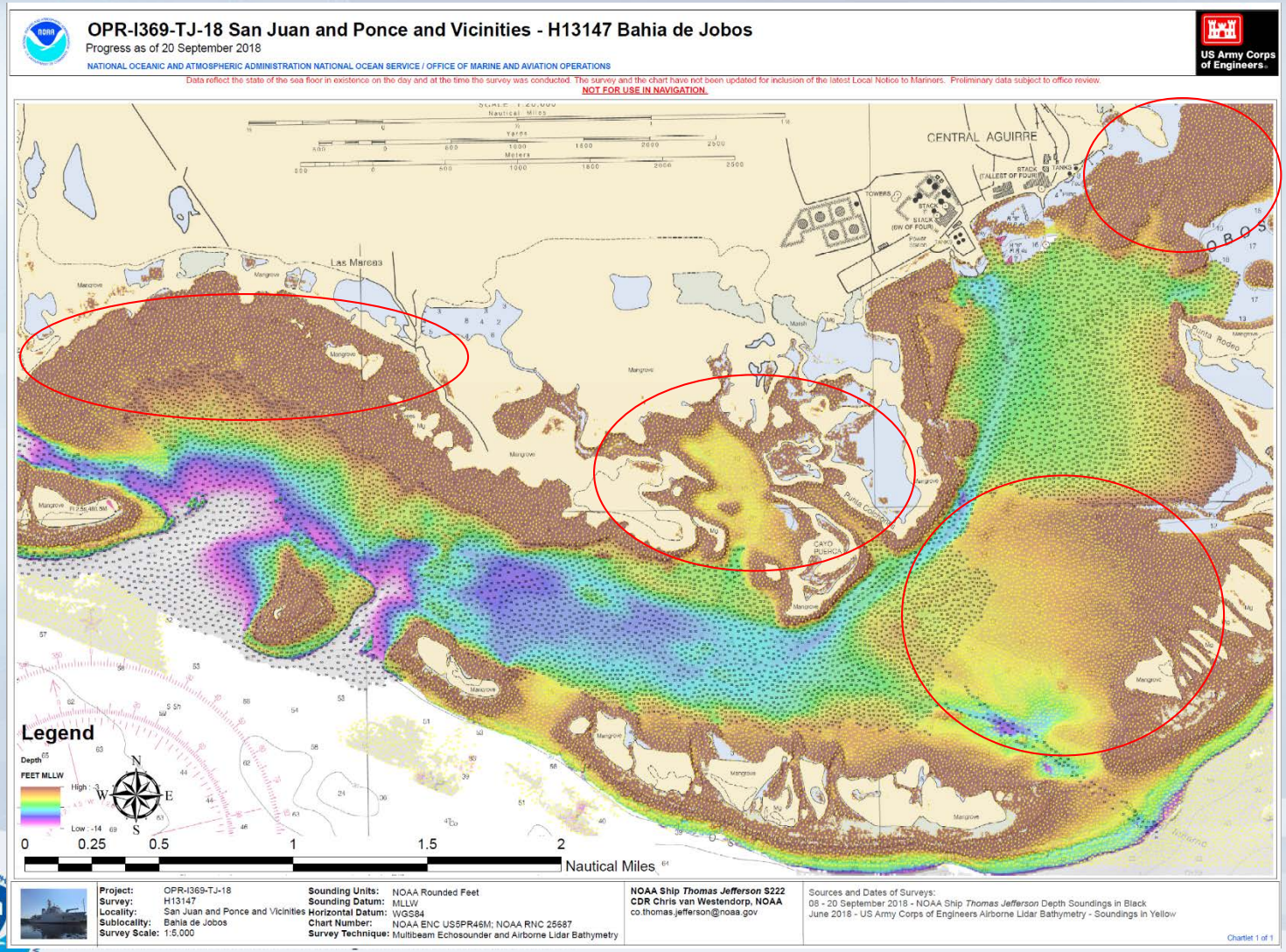
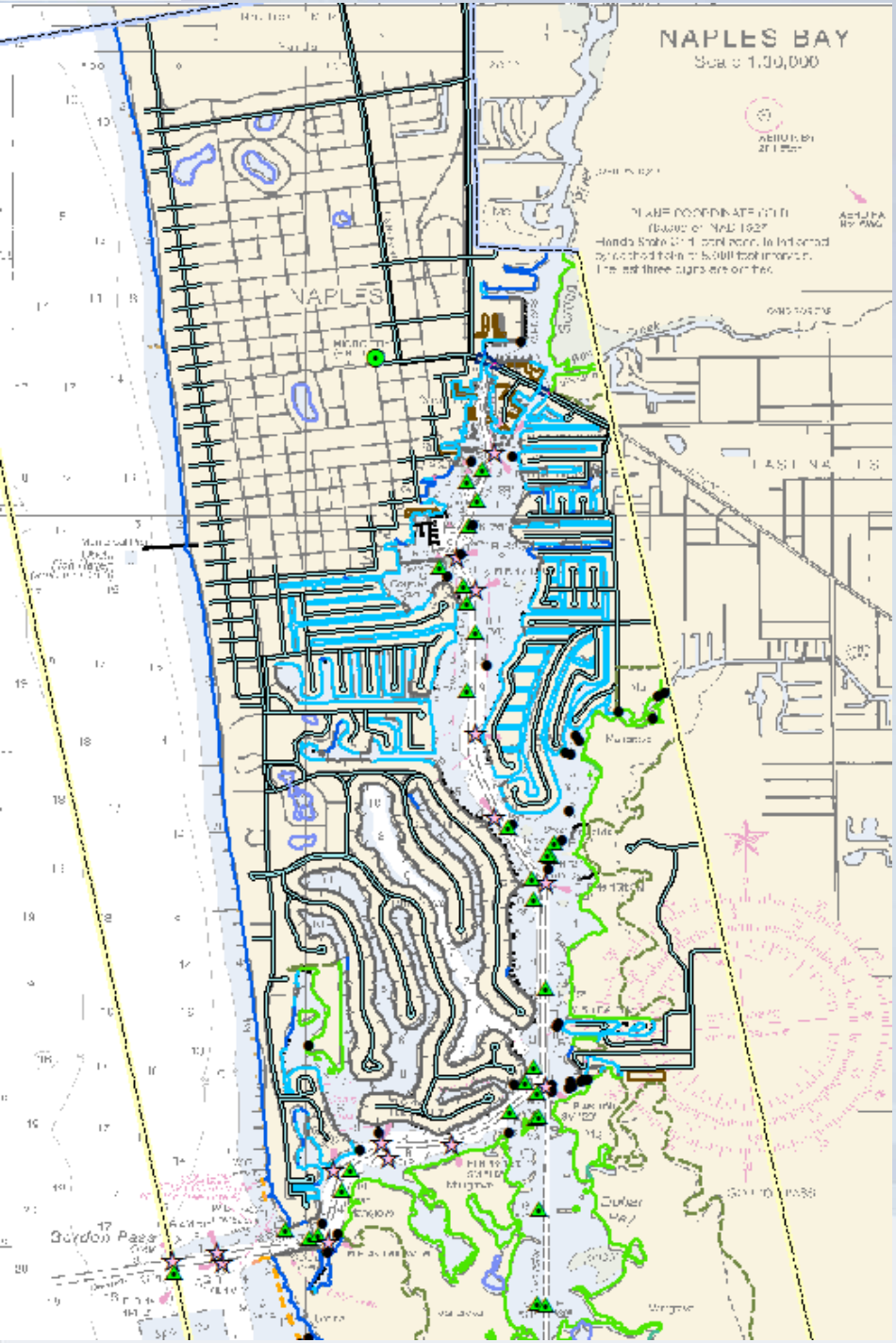
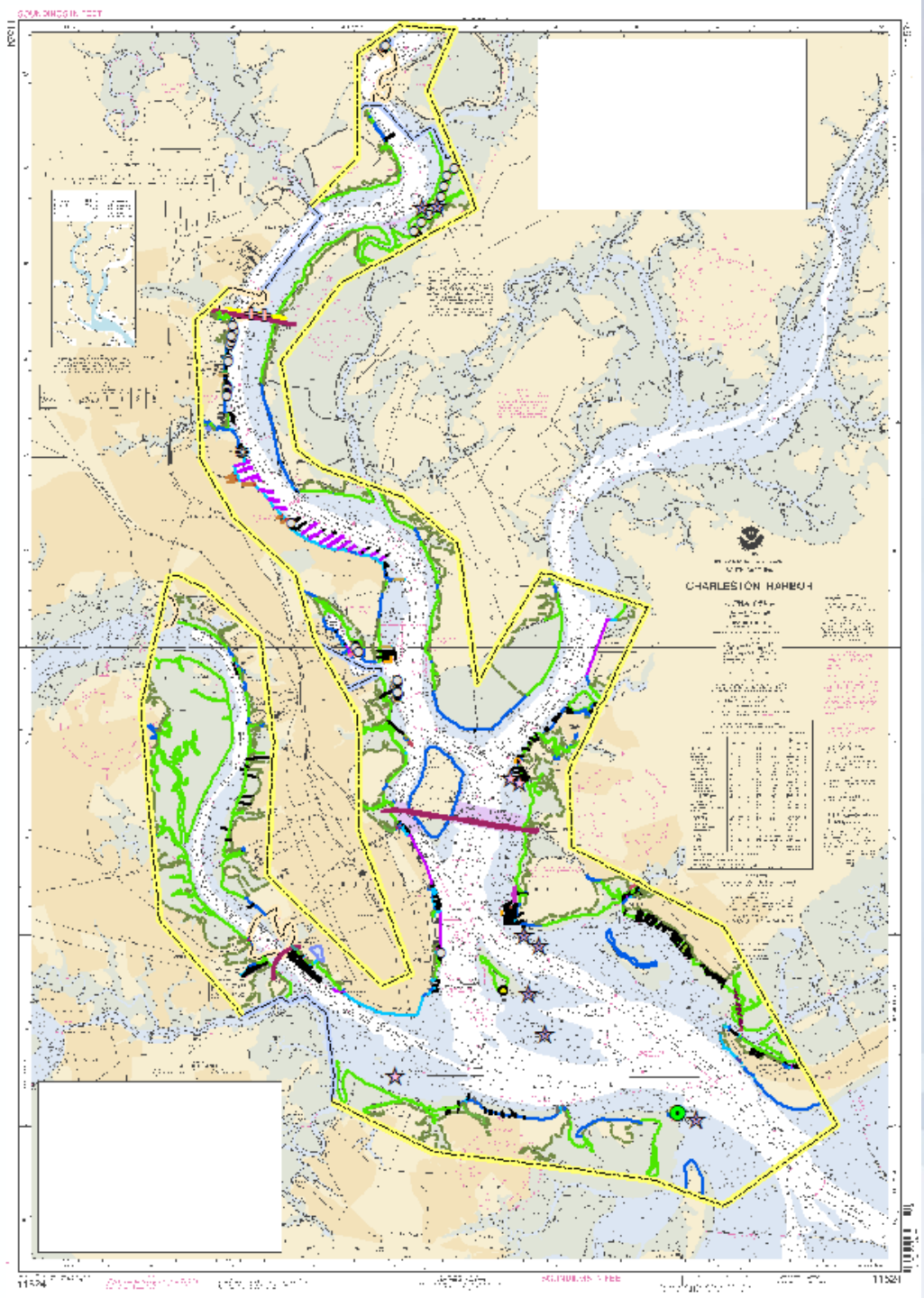
NOAA Sonar and lidar operations



Courtesy of LT Anthony Klemm



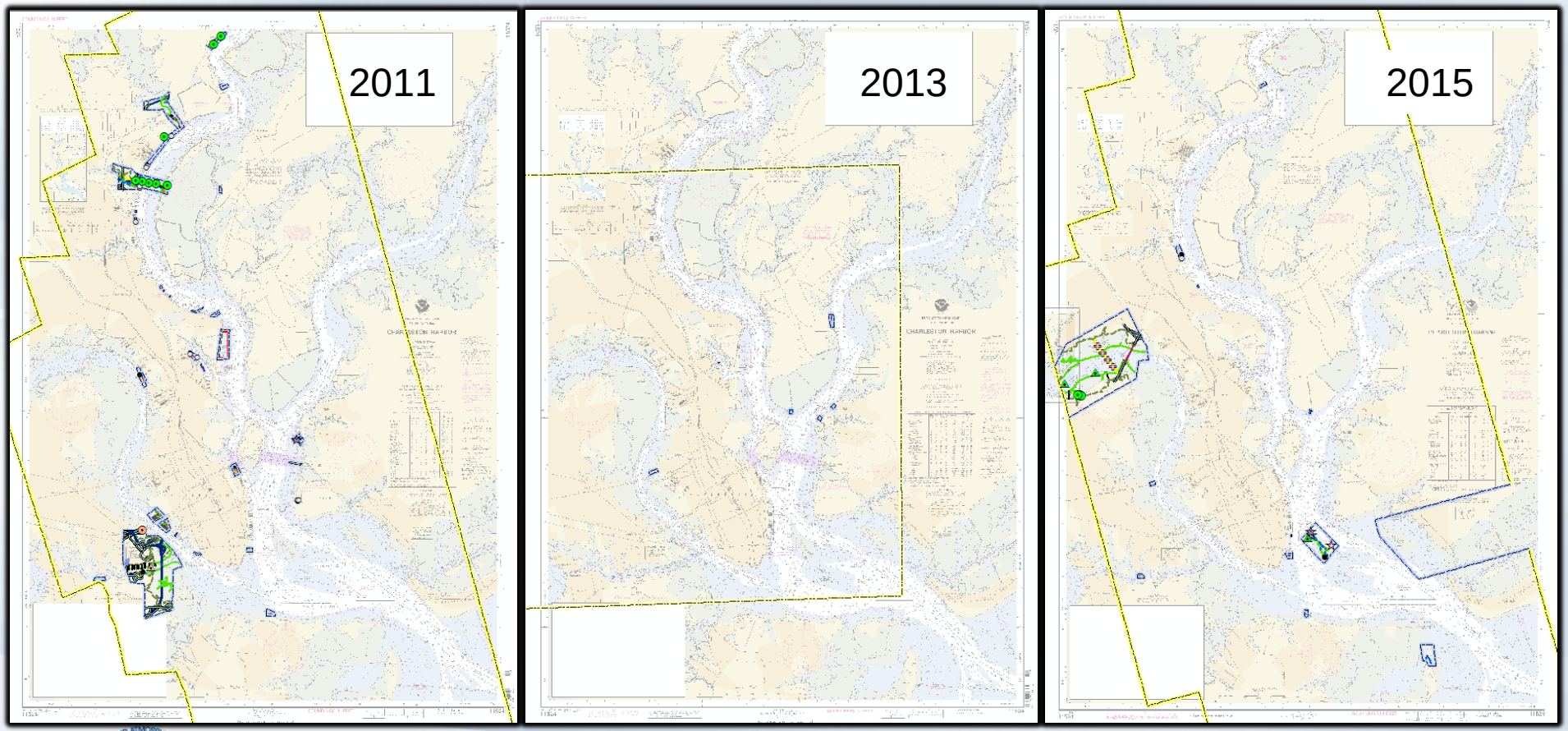
CMP Project with full shoreline compilation



Charleston Harbor near-full shoreline compilation in 2006

Coast & Shoreline Change Analysis Program (CSCAP)

Charleston Harbor



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Why of interest to NOAA & partners?

Uniquely suited for shoreline mapping

- **Seamless, high-resolution data across backshore, intertidal, and nearshore marine zones**
- **Fill in shallow water gap (shoreward of NALL line)**

IOCM! Map Once-Use Many Times!

- **SLR analysis, inundation modeling**
- **Habitat mapping**
- **Riverine mapping**
- **Coastal zone management, coastal science**

Increases efficiency and safety of launch and ship operations

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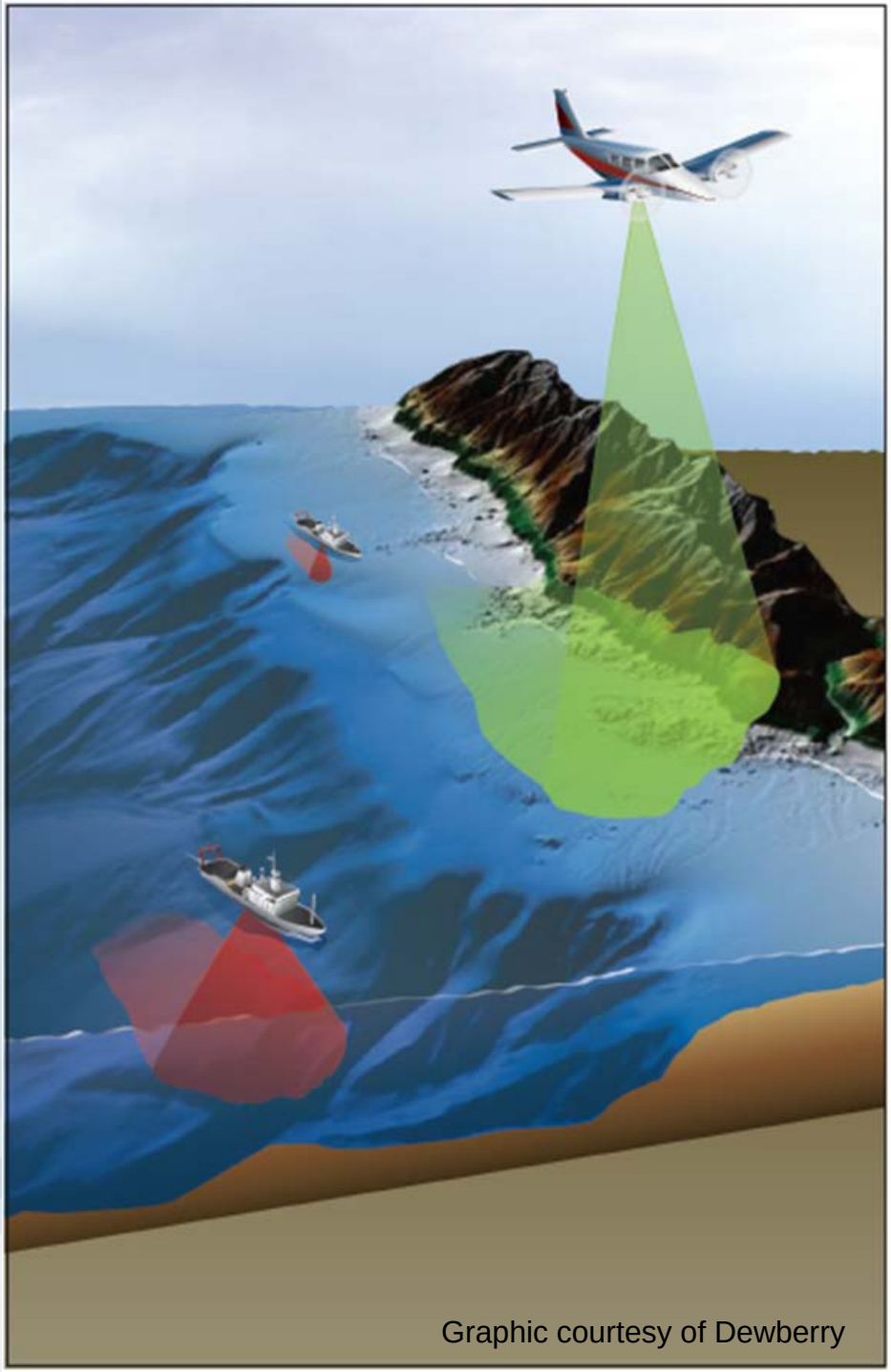


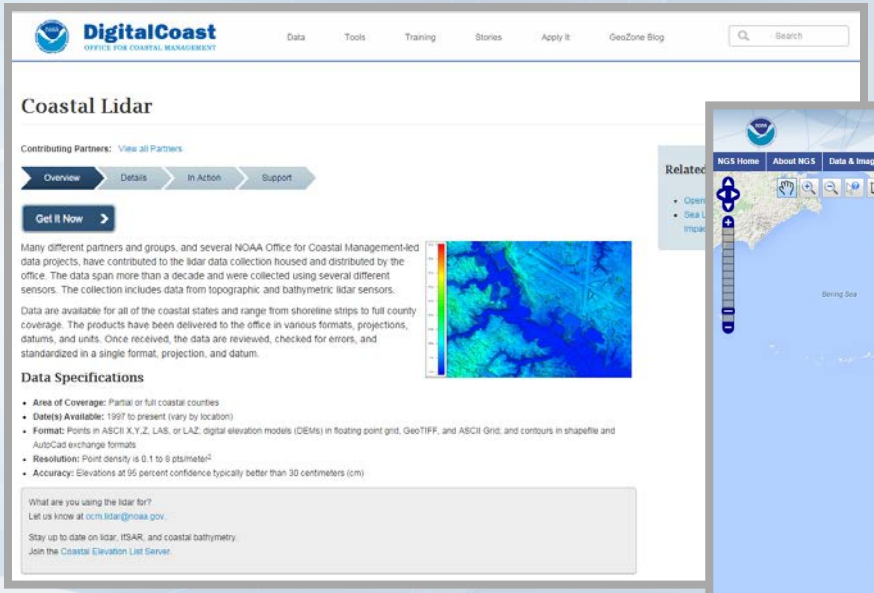
Graphic courtesy of Dewberry

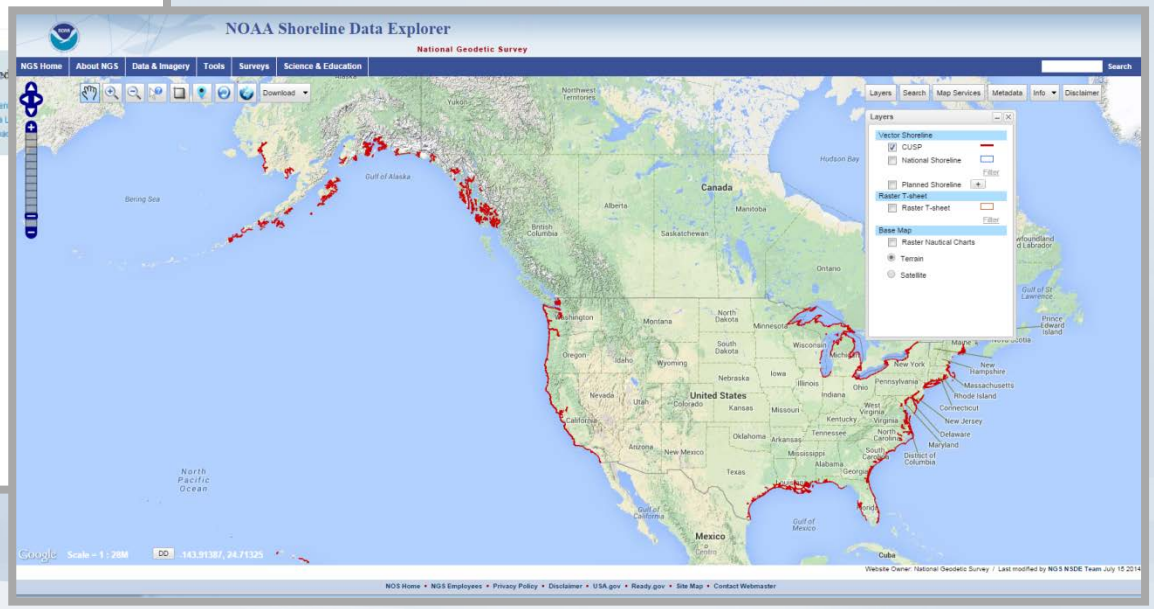
Data Distribution

Topobathy Lidar: https://coast.noaa.gov/dataviewer/#app=b23b&bda3-selectedIndex=2
Format: ASPRS LAS (http://www.asprs.org/Committee-General/LASer-LAS-File-Format-Exchange-Activities.html)

High Resolution Aerial Imagery:
https://coast.noaa.gov/dataviewer/#app=b23b&bda3-selectedIndex=2
Format: Geotiff

Shoreline: http://www.ngs.noaa.gov/NSDE/
Format: Shapefile





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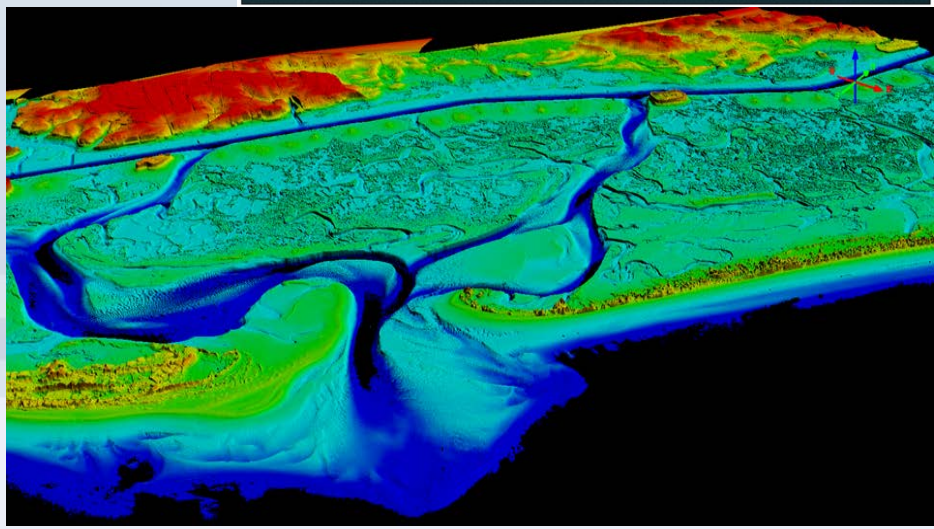
NOAA's Coastal Mapping Program

- Defines the National Shoreline and provides nearshore elevation data
- NOAA nautical charts updates
- Other important applications:
  - –Used in defining the United States' territorial limits
  - –Coastal resource management
  - –Storm surge and coastal flooding modeling
  - –GIS analysis
  - –Benthic habitat mapping
- Coastal Intelligence and Resiliency…

9925 miles and 57 ports

1660 sqm

300 RNCs and 60 ENCs



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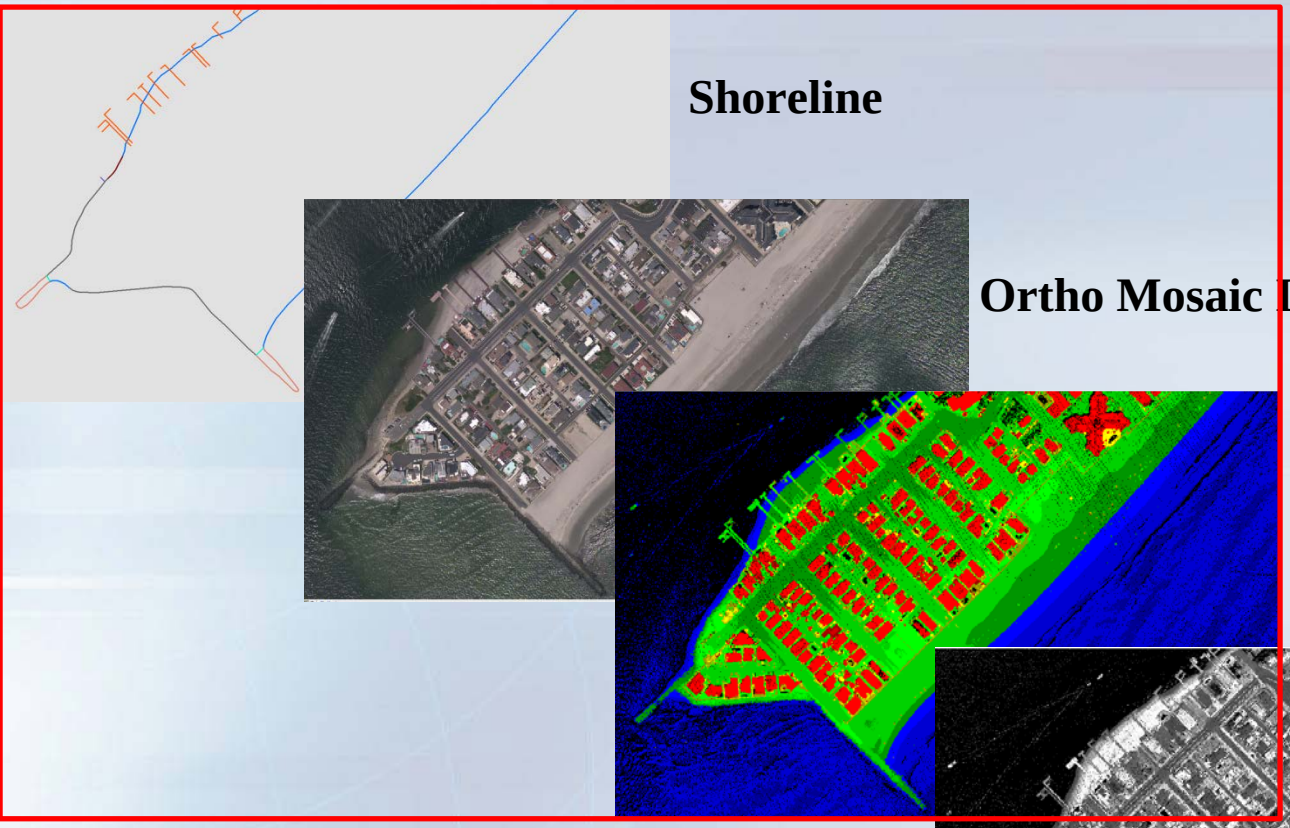
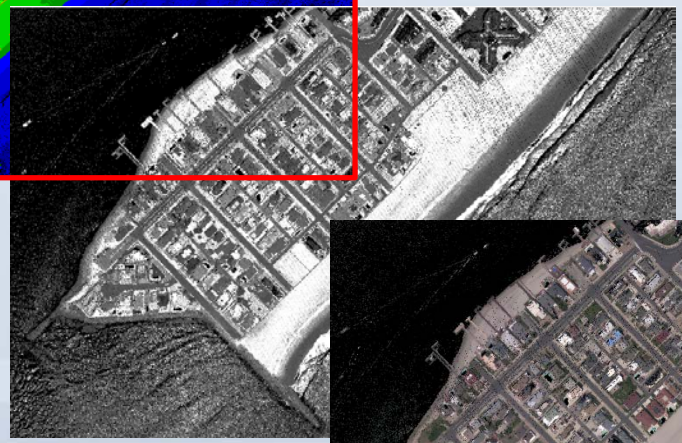
Products NGS delivers and derivatives



Shoreline

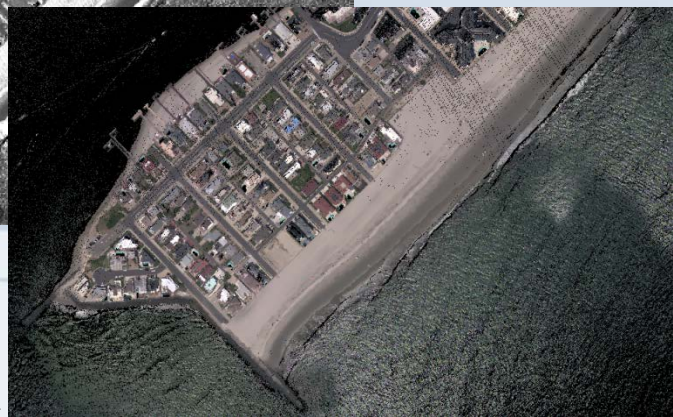
Ortho Mosaic Imagery

Lidar Point Cloud and DEMs (elevation)



Lidar Point Cloud (intensity)

Map once use many times!



RGB Colorized Lidar Point Cloud

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