NOAA Update

Mike Aslaksen

Chief, Remote Sensing Division

NOAA's National Geodetic Survey

15th Annual JALBTCX Airborne Coastal Mapping & Charting Technical Workshop

National Oceanic and Atmospheric Administration

Outline

- FY13/14 metrics
- Topobathy Lidar and NOAA's Coastal Mapping Program
  - VDatum, Kd analysis, satellite derived bathy
- Sandy Supplemental Project Update
- Riegl VQ-880G and DSS upgrade
- Oblique imagery capability
- FY15 President's Budget
- Closing

National Ocean Service

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NOAA Coastal Services Center
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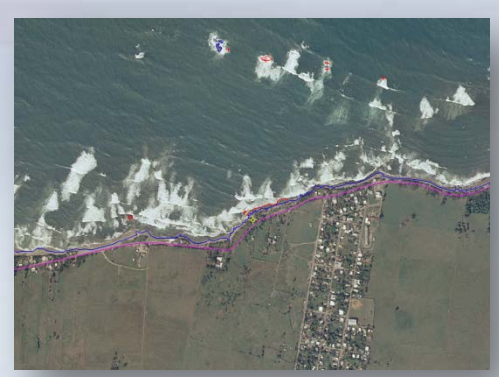
Office of Ocean and Coastal Resource Management
*Margaret Davidson**

*Acting

Background

- U.S. Department of Commerce
  - National Oceanic Atmospheric Administration (NOAA)
    - National Ocean Service
      - National Geodetic Survey
        - Remote Sensing Division
- Primary programs
  - Coastal Mapping Program
  - Aeronautical Survey Program
  - Emergency Response



National Oceanic and Atmospheric Administration

CMP FY13 Metrics

- 7200 miles* of shoreline compiled (4.4% of US)
- Updated shoreline for >86 nautical charts
- Shoreline updates compiled for >32 ENCs
- 30 ports updated with new shoreline
- 14 ports analyzed for change (CSCAP)

*miles measured at 1:80,000 scale

FY13 CMP Year-end Shoreline Mileage Summary

DONE (QA / Released)	
VI1101 Turner Bay, St John	4
VI1102 Christiansted Harbor, St Croix	14
VI1103 Frederiksted Harbor, St Croix	3
PR1102 Port of Tallaboa	32
VA1103 Ⓟ Port of Reedville CSCAP-NC	21
PR1103 Port of Yabucoa	13
ME0701B Blue Hill Neck-Skillings R/Contract	140
AK1016 Security Bay NTM	44
ME0701C Mt Desert Island/Contract	193
AK0904 Revillagigedo Ch. NTM/Contract	225
WA1102 Ⓟ Port Angeles CSCAP-NC	13
WA1205 Ⓟ Everett CSCAP-NC	34
VI1104 Anguilla Harbor, St Croix	20
AK1015 @ Approaches to Kuskokwim NTM	197
ME1001 Whiting Bay to Cobscook Bay	37
TX1108 Arroyo Colorado	91
ME0701D Schoodic Peninsula/Contract	136
VA0501D Mouth of York R./Contract	397
FL0703B Escambia R. - Blackwater R./Contract	217
AK0902A Controller Bay Contract/NTM	167
AK1101 @ Nushagak Bay NTM	236
MD0701A Potomac R. to Mob Neck/Contract	363
MD0501B Ⓟ Ches Bay, Baltimore/Contract	264
VA0501B SW Ches Bay to Gwynn I./Contract	258
FL1201 Ⓟ Port Canaveral CSCAP	27
AL1101 Ⓟ Port of Mobile CSCAP	54
AK1107B Sumner Strait NTM	55
TX1105 ⓅⓅ Galveston and Texas City CSCAP	68
DONE (1:80k miles) ...	**7200**
Pct of FY13 goal ...	107.9%
Pct of US ...	4.3%

DONE (cont'd)	
LA0702A Miss R Gulf Outlet AFE/NTM	521
VA0701A James R., Pig Pt to Hog Pt/Contract	357
VA1302 Northend Pt	3
LA1303 Wine Island Pass	5
WA1204 Ⓟ Port of Tacoma CSCAP	53
MA1103 Ⓟ New Bedford CSCAP-NC	24
NY1104 Fire Island	125
AK1003 Beecher Pass NTM	70
AK1105A Marmot& N. Afognak Is. NTM	218
MD0701D Ⓟ Potomac R., Wash. DC/Contract	161
LA0703G Northern Barataria Bay AFE/NTM	417
VA1303 Gloucester Pt./York River	2
MD1301 Piney Pt./Potomac River	1
WA1301 Neah Bay	4
FL1304 St. Augustine Inlet	23
ME1108 Ⓟ Searsport CSCAP-NC	13
OR1301 NOAA pier, Newport	1
CA1001 ⓅⓅ Ports of LA/Long Beach CSCAP	89
WA1202 Ⓟ Port of Bangor CSCAP	6
CT1101 Ⓟ Port of Stamford CSCAP-NC	17
MD1302 Pleasure Island	1
NC0801D Hatteras Island IOCM	143
ME1107 Ⓟ Portland CSCAP	19
MS1101 Ⓟ Gulfport CSCAP	6
NY1302 Ⓟ NY Harbor/chart 12334 chgs only	55
LA1101 Ⓟ Intracoastal City CSCAP	40
VA0602A York R., Yorktown/Contract	112
LA1002K Ⓟ Baton Rouge CSCAP	142
NEARLY DONE ...	**67**
Pct FY13 ...	1.0%

DONE (cont'd)	
MD1102 Ⓟ Baltimore CSCAP	64
CA0807 Dana Point Harbor (chgs)	8
GA1002 Ⓟ Port of Savannah CSCAP	77
VA0602B York R., Gloucester Pt/Contract	155
TX1104 Colorado River	110
OR1204 Ⓟ Port of Astoria CSCAP	76
VA1102 ⓅⓅ Richmond/Hopewell CSCAP	61
LA1002J Ⓟ Port of South Louisiana CSCAP	88
WA1203 ⓅⓅ Bremerton/Manchester CSCAP	34
LA1002I Ⓟ Port of New Orleans CSCAP	224
VA0602C Mattaponi River/Contract	144
ME0702B Tibbett Narrows to Englishman Bay	208
NEARLY DONE (<3 months)	
TX1002C Ⓟ Port Arthur CSCAP	67
DC1301 Ⓟ Port of Wash DC CSCAP	55
CA1207 Ⓟ Port of Redwood City CSCAP	31
OTHER PROJECTED	
TX1002D Ⓟ Sabine Pass CSCAP	76
CA1208 Ⓟ Port of Richmond CA CSCAP	58
TX1107 Ⓟ Matagorda Ship Channel CSCAP	95
LA1002H Ⓟ Port of Plaquemines CSCAP	160
VA1301 ⓅⓅ Hampton Rds/Newpt News CSCAP	271
TX1002A Ⓟ Port of Beaumont CSCAP	205
TX1002B Ⓟ Port of Orange CSCAP	135
GA1004 Ⓟ Port of Brunswick CSCAP	215
LA1002E Miss R, Wilder Flats to Duvic/Contract	82
LA1002F Miss R, Duvic to Triumph/Contract	263
OR1205 ⓅⓅⓅⓅ Portl, Longv, Kalama, Vancv CSCAP	300
OTHER PROJECTED ...	**1860**
Pct FY13 ...	27.9%

FY13 compilation...	*Miles:*	*Ports:*
Done	7200	30
Imminent	0	0
Likely	0	0
In doubt	2013	13
Total projected	9213	43

***Expected** for FY13*

Miles:	Ports:
7200	30
107.9%	100.0%

FY13 CMP Goal (100%)

Percent of US shoreline:	**4.0%**
Miles @1:80,000:	**6675**
MTS ports:	**30**
Miles needed for FY13:	**-525**
MTS ports needed:	**0**

FY14 CMP Year-end Shoreline Mileage Summary

DONE (QA / Released)	
CA1207 ℗ Port of Redwood City CSCAP	31
CA1208 ℗ Port of Richmond CA CSCAP	58
AK1103A N Tlevak Strait Contract/NTM	217
AK1103B S Tlevak Strait Contract/NTM	177
AK1014 @ Cape Newenham NTM	112
CA1302 ℗ Port of San Diego CSCAP	83
TX1002C ℗ Port Arthur CSCAP	67
OR1208A Columbia River to Thirteenmile Pt	12
FL1107 ℗ Port of Miami CSCAP	307
LA0702B MRGO to Terreaux Boeufs AFE/NTM	541
AK1108 @ Pribilof Islands NTM	81
AK1202A @ Point Barrow NTM	115
FL1306 St George I./East Pass	37
FL1405 ℗ Port Manatee	11
SC1106 ℗ Port of Charleston CSCAP	269
SC1302 ℗ Port of Charleston CSCAP	175
CA1301 ℗ Port of Oakland CSCAP	43
FL1406 Fort Matanzas	39
ME0702C Machias Bay	168
OR0804 Salmon River	11
ME1101A Monhegan Island	6
ME1101D Thomaston Harbor	4
LA1301A S. shore of Prien Lake	2
NJ1301 Barnegat Inlet (w/lidar)	44
MS1401 Ship I. to Petit Bois I.	61
NJ1102A Cape May (w/lidar)	262
AK1403 Atka pier extension	1
SC0902 ℗ Port of Georgetown CSCAP	134
SC1408 Charleston Approach (chgs only)	123
ME1101B Friendship Harbor	27

CONT'D	
MD0402C Kent Island and Wye R./Contract	270
WA0301A ℗ Columbia R to Cathlamet/Contract	169
VA0402A Pocomoke Sound/Contract	336
VA0602D Pamunkey R./Contract	251
NC1401A Pamlico Beach to Woodstock Pt	30
IL1402 31st Street Harbor, Chicago	1
AK1106A @ NE Nunivak Island NTM	225
DC1301 ℗ Port of Wash DC CSCAP	55
GU1401 ℗ Apra Harbor CSCAP	35
MP1401 ℗ Saipan CSCAP	49
OR1205 ℗℗℗℗ Portl, Longv, Kalama, Vancv CSCAP	295
AK1404 Hoonah Harbor	10
FL1104 ℗ Jaxville/Mayport CSCAP	445
FL1419 ℗ Port Everglades (chgs only)	12
CA1213A SF Bay Bridge	2
LA1002E Miss R, Wilder Flats to Duvic/Contract	82
FL1420 ℗ Lake Worth/Palm Beach (chgs only)	82
ME1101F Carvers Harbor	15
ME1101C Port Clyde and Tenants Harbors	29
NY0801 ℗ Hudson Riv./Albany (NY1403 CSCAP)	40
TX1002D ℗ Sabine Pass CSCAP	76

NEARLY DONE (<6 months)	
LA1002H ℗ Port of Plaquemines CSCAP	160
LA1002F Miss R, Duvic to Triumph/Contract	263
VA1301 ℗℗ Hampton Rds/Newpt News CSCAP	271
AK1013B Willard/Fillmore Inlets NTM	227
AK1104 @ Unga Strait to Wosnesenski I. NTM	106
MD0502A West R. & Herring Bay/Contract	104

OTHER PROJECTED	
AK1102 @ Morzhovoi Bay to Isanotski Str NTM	289
LA0702C Breton Sound/Black Bay	456
MD0502B Patuxent River/Contract	279
MD0502C Point Lookout/Contract	92
TX1002A ℗ Port of Beaumont CSCAP	205
ME1101G North Haven Harbor	29
TX1107 ℗ Matagorda Ship Channel CSCAP	95
NJ1102B Ocean City (w/lidar)	150
CA1303 ℗℗ Ports of LA/Long Beach CSCAP	139
HI1301 ℗℗ Ports of Honolulu/Pearl Hbr CSCAP	84
GA1004 ℗ Port of Brunswick CSCAP	215
TX1002B ℗ Port of Orange CSCAP	135
AK1401 ℗ Port of Anchorage CSCAP	14
AK1402 ℗ Port of Ketchikan CSCAP	17
CA1206 ℗ Camp Pendleton CSCAP	8
NY1401 ℗ Port of Buffalo CSCAP	35
OR1206 ℗ Coos Bay CSCAP	260
NY1402 ℗ Port of NY/NJ CSCAP	210
CA0808 Oceanside Harbor	7
MD0404A Cambridge to Hooper I./Contract	356
MD0404C Tangier Sound/Contract	307
VA0601A South Rappahannock/Contract	182
VA0601B Rappahannock/Contract	216
VA0601C North Rappahannock/Contract	309
FL1401 ℗ Port of Key West CSCAP	97
LA1002A Mississippi R., SW Pass/Contract	353
LA1002B Mississippi R., Main Pass/Contract	554
LA1002G Miss., Buras toSixty Mile Pt/Contract	194
LA1002C Mississippi R., Pass a Loutre/Contract	479
LA1002D Mississippi R., South Pass/Contract	502

DONE (1:80k miles) ...	5727	**NEARLY DONE ...**	1131	**OTHER PROJECTED ...**	6268
% of US shoreline ...	3.4%	% of milestone ...	16.1%	% of milestone ...	89.5%
% of milestone ...	81.8%				

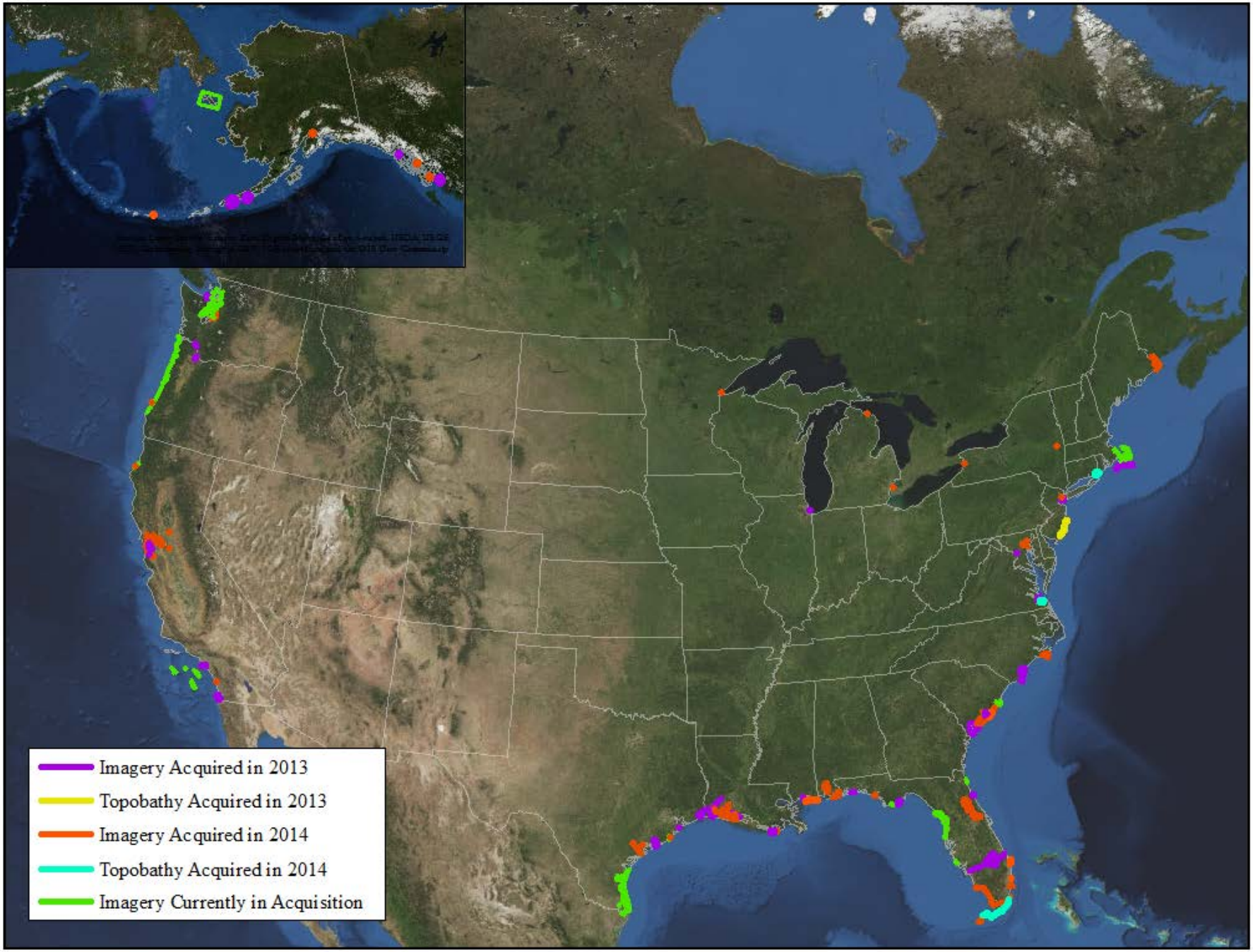
FY14 compilation...	*Miles:*	*Ports:*
Done	**5727**	**23**
Likely	**3850**	**17**
In doubt	**3549**	**1**
Total projected	**13126**	**41**

***Expected** for FY14*

Miles:	Ports:
9577	40
5.7%	22.9%

FY14 CMP Milestones

Percent of US shoreline:	**4.2%**
Miles @1:80,000:	**7005**
MTS ports:	**34**
Miles needed for FY14:	**1278**
MTS ports needed:	**11**


Imagery Acquired in 2013
Topobathy Acquired in 2013
Imagery Acquired in 2014
Topobathy Acquired in 2014
Imagery Currently in Acquisition

2013 Imagery

AK1102	Alaska
AK1103B	Alaska
AK1104	Alaska
AK1404	Alaska
CA1212A	West Coast
CA1213A	West Coast
CA1301	West Coast
CA1302	West Coast
FL1306	Gulf Coast
FL1406	South Atlantic
GU1401	Pacific Islands
IL1402	Great Lakes
LA1301A	Gulf of Mexico
LA1303	Gulf of Mexico
MP1401	Pacific Islands
MS1101	Gulf of Mexico
NJ1301	Mid-Atlantic
NY1302	Mid-Atlantic
SC1302	South Atlantic
TX1002C	Gulf of Mexico
TX1104	Gulf of Mexico
CA1303	West Coast
FL1301	Gulf of Mexico
FL1302	Gulf of Mexico
LA1301	Gulf of Mexico
LA1302	Gulf of Mexico
MA1102	Northeast
NC1001	South Atlantic
SC0801	South Atlantic
VA1301	Mid-Atlantic
WA1001	West Coast

2014 Imagery

AK1403	Alaska
FL1419	South Atlantic
FL1420	South Atlantic
MS1401	Gulf of Mexico
SC1408	South Atlantic
AL0902	Gulf of Mexico
AL0903	Gulf of Mexico
CA1212	West Coast
CA1213	West Coast
FL1303	Gulf of Mexico
FL1401	Gulf Coast
FL1402	Gulf Coast
FL1403	South Atlantic
FL1417	South Atlantic
LA1304	Gulf of Mexico
LA1401	Gulf Coast
MD1401	Mid-Atlantic
ME1301	Northeast
NC0901	South Atlantic
NJ1302	Mid-Atlantic
NJ1303	Mid-Atlantic
SC1401	South Atlantic
SC1405	South Atlantic
SC1406	South Atlantic
SC1407	South Atlantic
TX1402	Gulf Coast
WA1206	West Coast

Imagery In Acquisition

AK1109	Alaska
CA1401	West Coast
CA1402	West Coast
FL1305	Gulf of Mexico
FL1414	Gulf Coast
FL1414	Gulf Coast
FL1415	Gulf Coast
FL1416	South Atlantic
MA1101	Northeast
OR1201	West Coast
OR1210	West Coast
SC1104	South Atlantic
TX1403	Gulf Coast
TX1404	Gulf Coast
TX1405	Gulf Coast
TX1406	Gulf Coast
WA1002	West Coast
WA1401	West Coast
WA1402	West Coast
WA1403	West Coast

TopoBathy Lidar

NJ1301	2013
NJ1302	2013
NJ1303	2013
CT1401	2014
VA1401	2014
FL1418	2014

ArcGIS Online Maps

RSD Shoreline Mapping Status & 5-Year Acquisition

- Estimated release dates for projects in compilation
- Released Shoreline
- Projects in Acquisition
- 5 Year Acquisition Plan

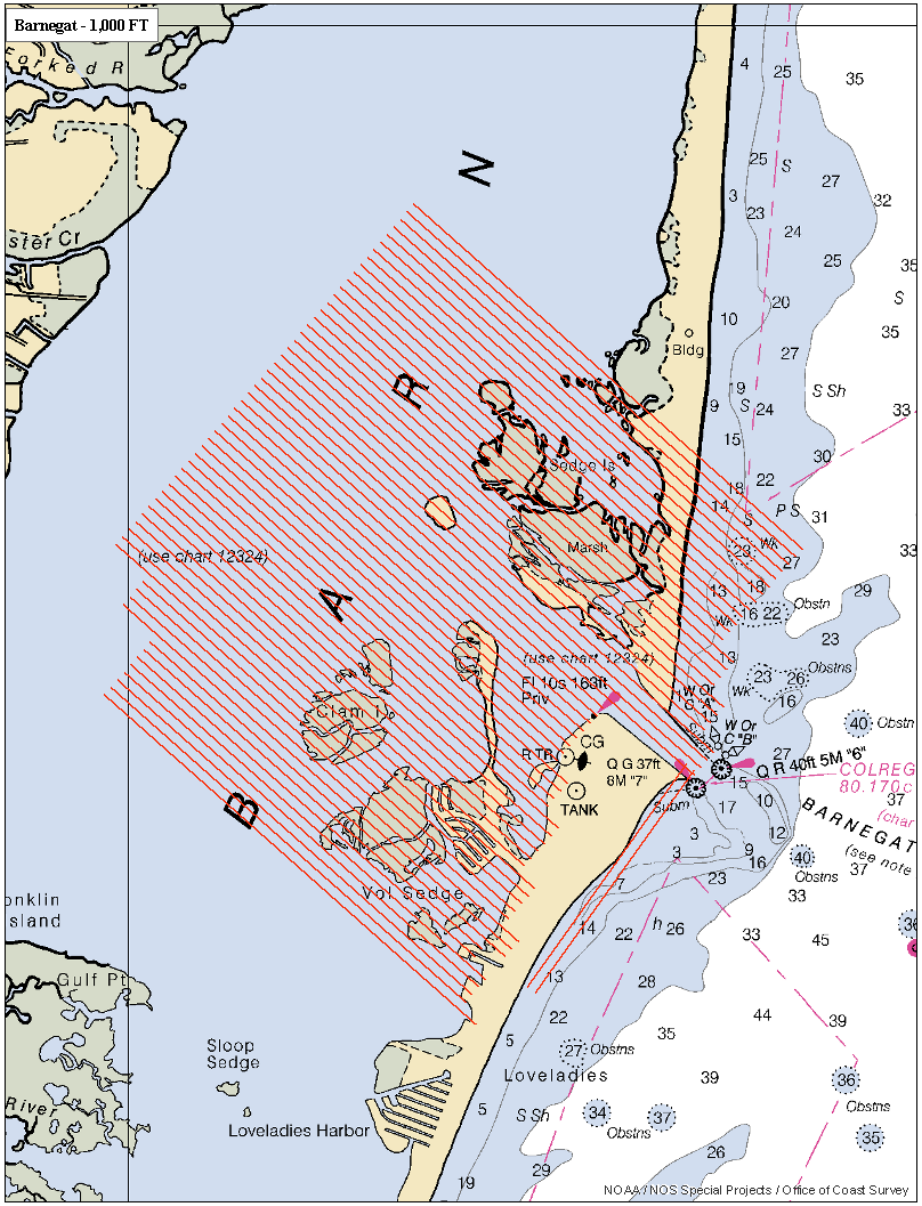
http://noaa.maps.arcgis.com/home/webmap/viewer.html?webmap=042df23b4ea14f1cadb9e2c3cf40b68f

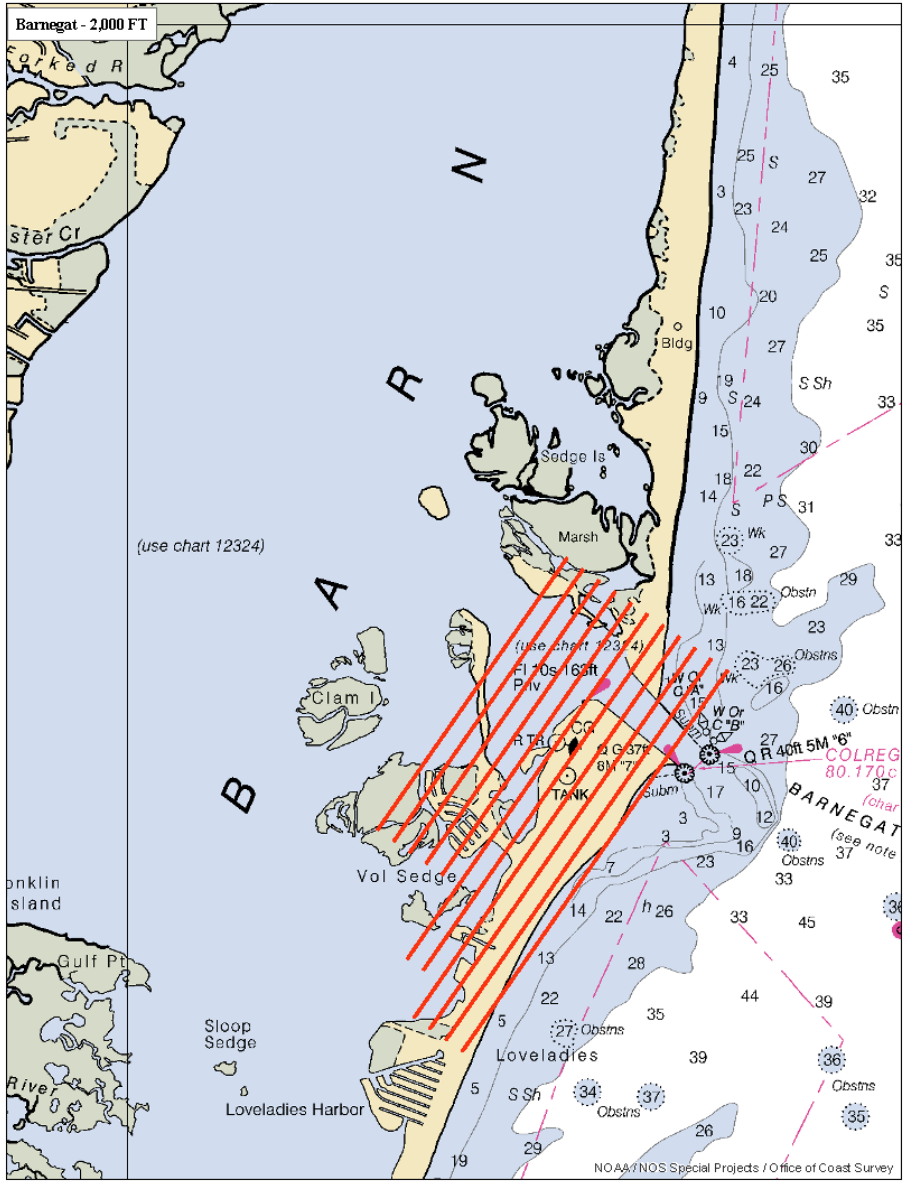
RSD Shoreline Mapping Acquisition & Compilation Status

- Estimated release dates for projects in compilation
- Released Shoreline
- Projects in Acquisition
- Special Projects

http://noaa.maps.arcgis.com/home/webmap/viewer.html?webmap=10b99e21ef714e9988c3ff0bdef394bf

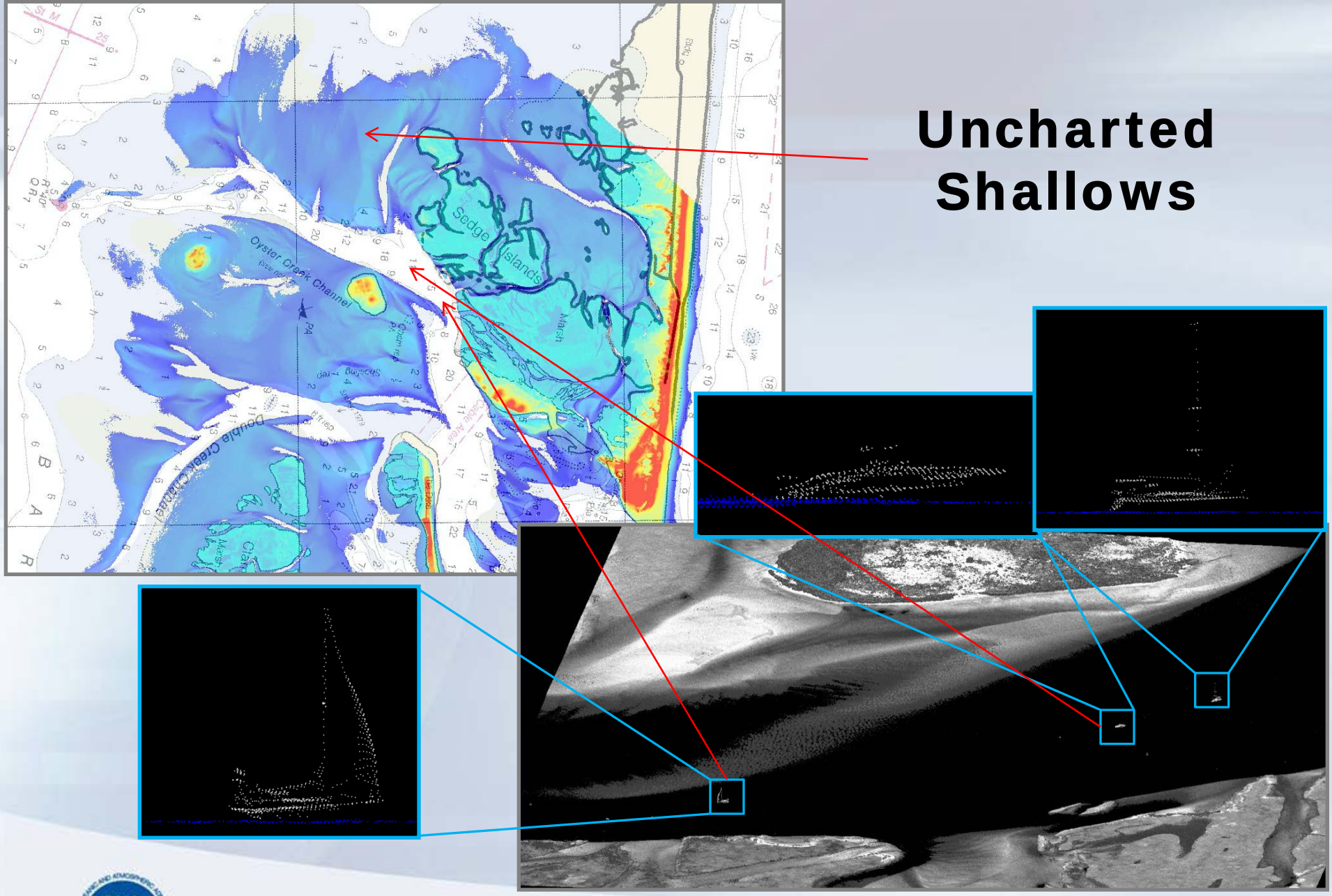
NGS.RSD_noaa





National Oceanic and Atmospheric Administration

Uncharted Shallows



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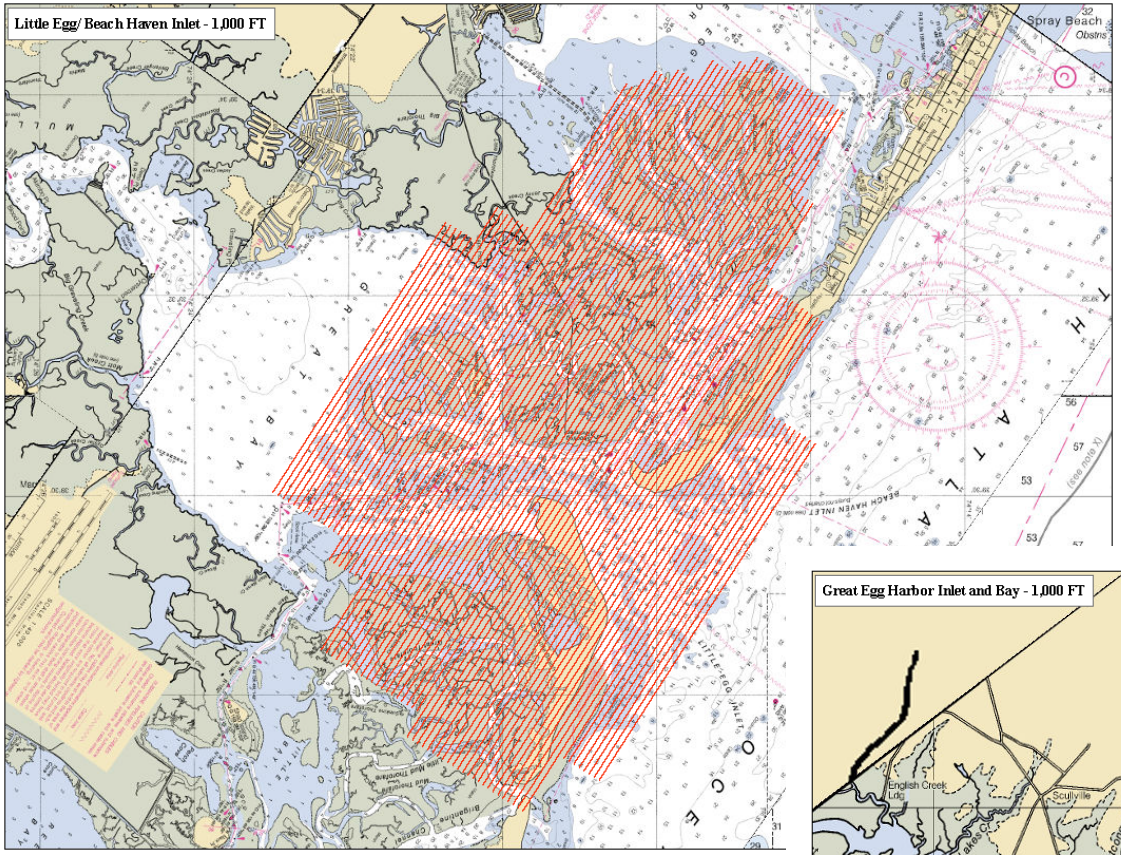

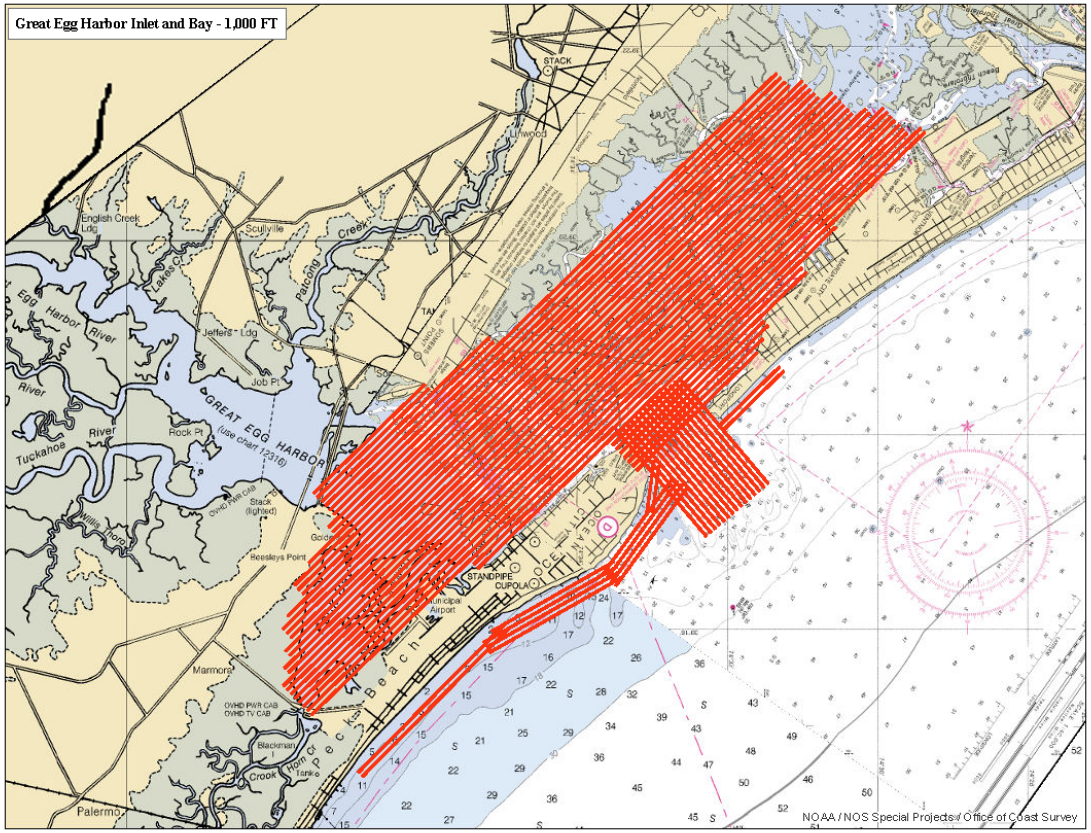

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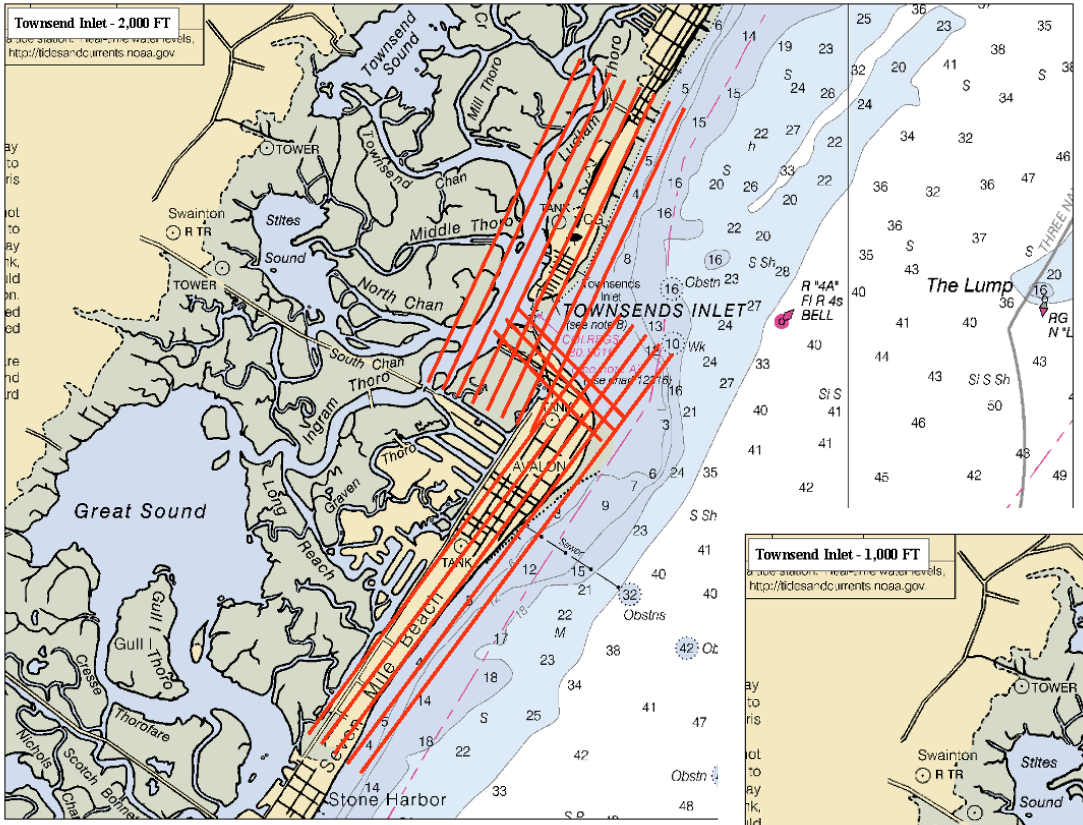

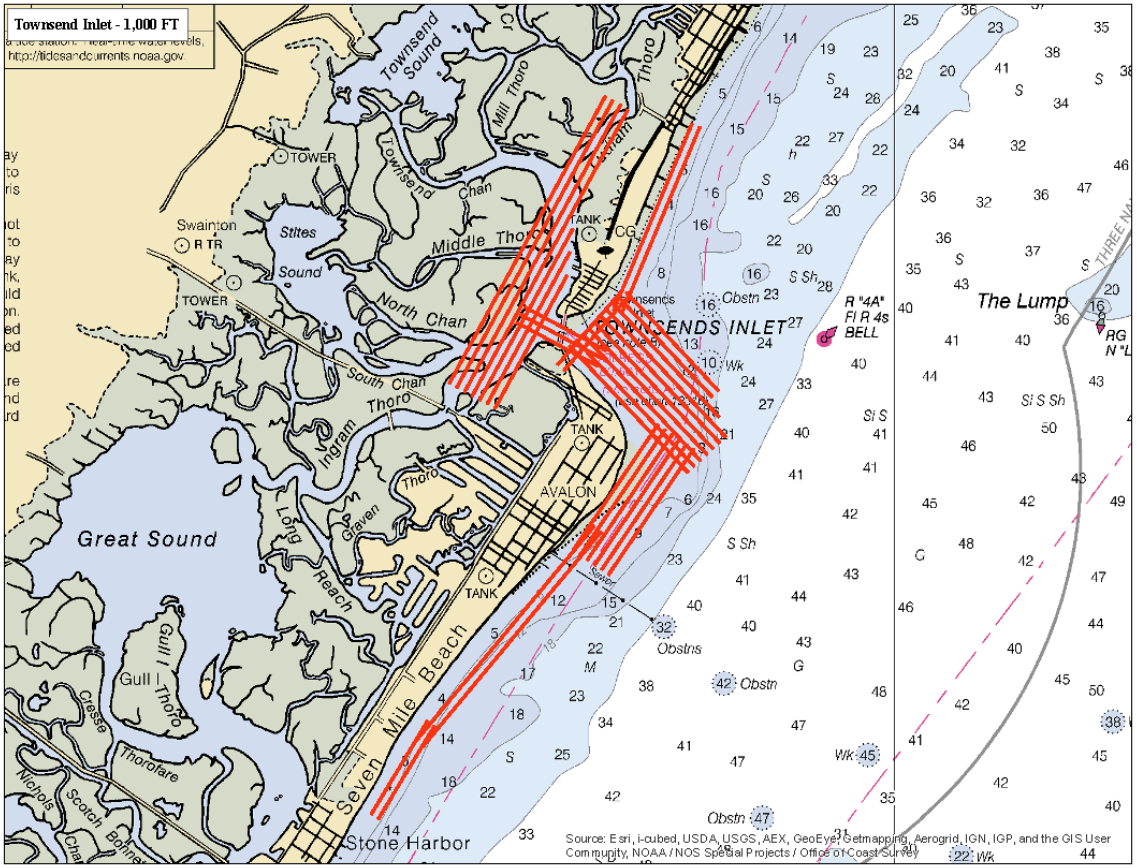

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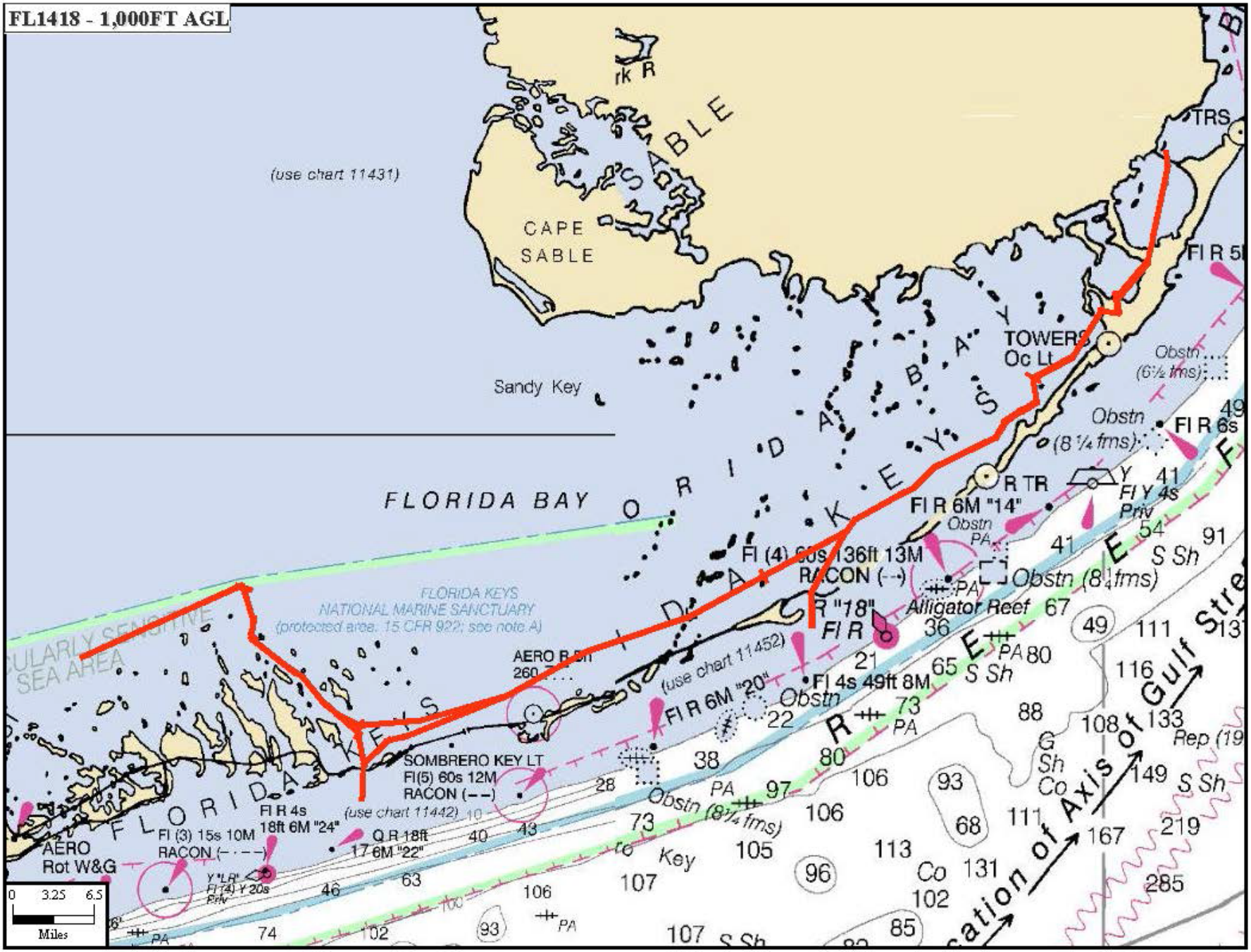
FL1418 - 1,000FT AGL
(use chart 11431)
CAPE SABLE
SABLE
Sandy Key
FLORIDA BAY
FLORIDA KEYS
FLORIDA KEYS NATIONAL MARINE SANCTUARY
(protected area, 15 CFR 922; see note A)
SEA AREA
TOWERS Oc Lt
TRS
Fl R 5
Obstn (6½ fms)
Obstn (8¼ fms)
Fl R 6s
R TR
Fl Y 4s Priv
Fl R 6M "14"
Obstn PA
Fl (4) 60s 136ft 13M RACON (--)
R "18" Fl R
Alligator Reef
Obstn (8¼ fms)
S Sh
(use chart 11452)
Fl R 6M "20"
Fl 4s 49ft 8M
Obstn
AERO R Sh 260
SOMBRERO KEY LT
Fl(5) 60s 12M RACON (--)
(use chart 11442)
Fl R 4s 18ft 6M "24"
Q R 18ft 17 6M "22"
Fl (3) 15s 10M RACON (-·--)
AERO Rot W&G
Y "LR" Fl (4) Y 20s Priv
Obstn (8¼ fms)
Key
Co
Rep (19
Location of Axis of Gulf Stre
0 3.25 6.5
Miles

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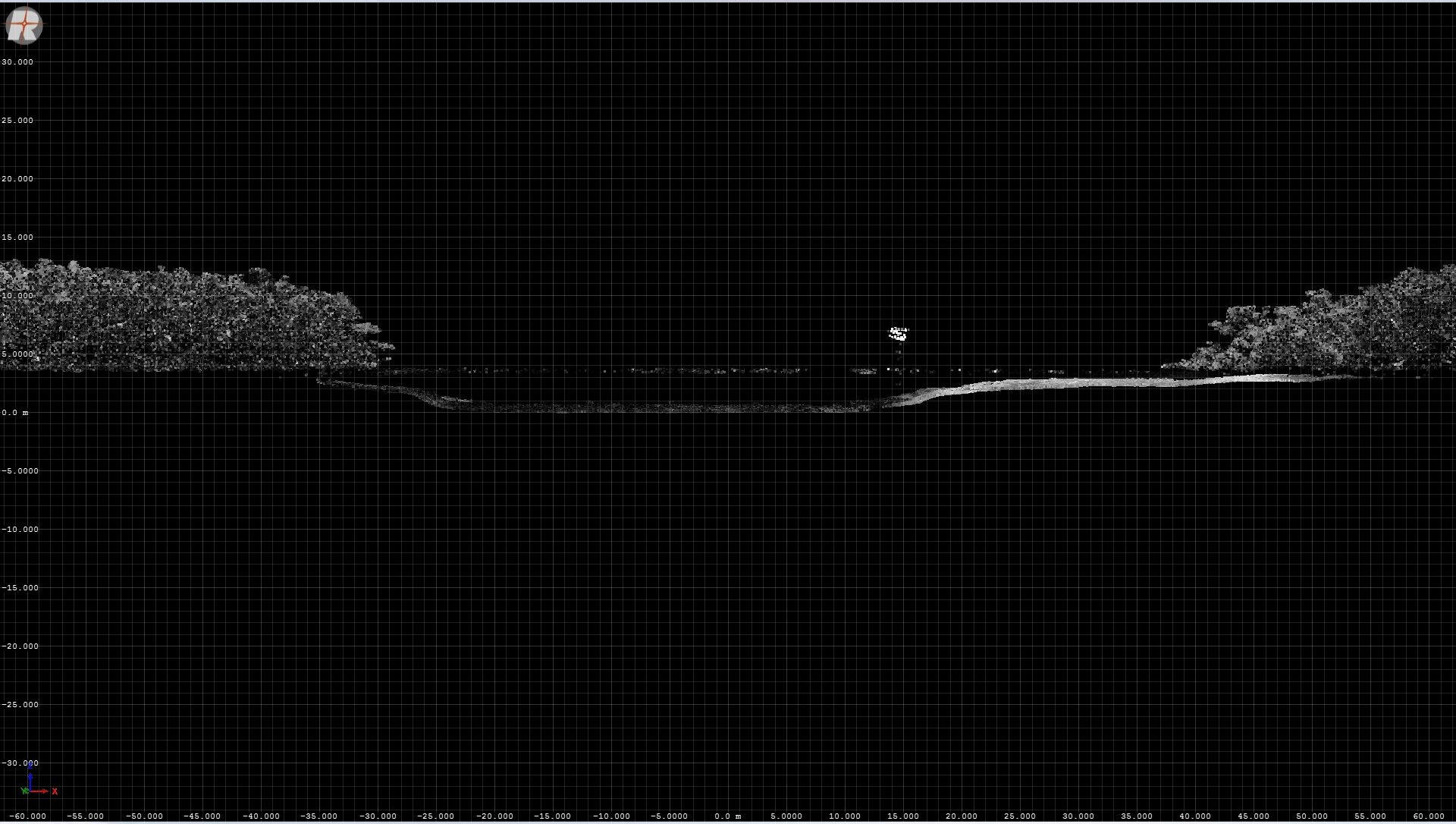
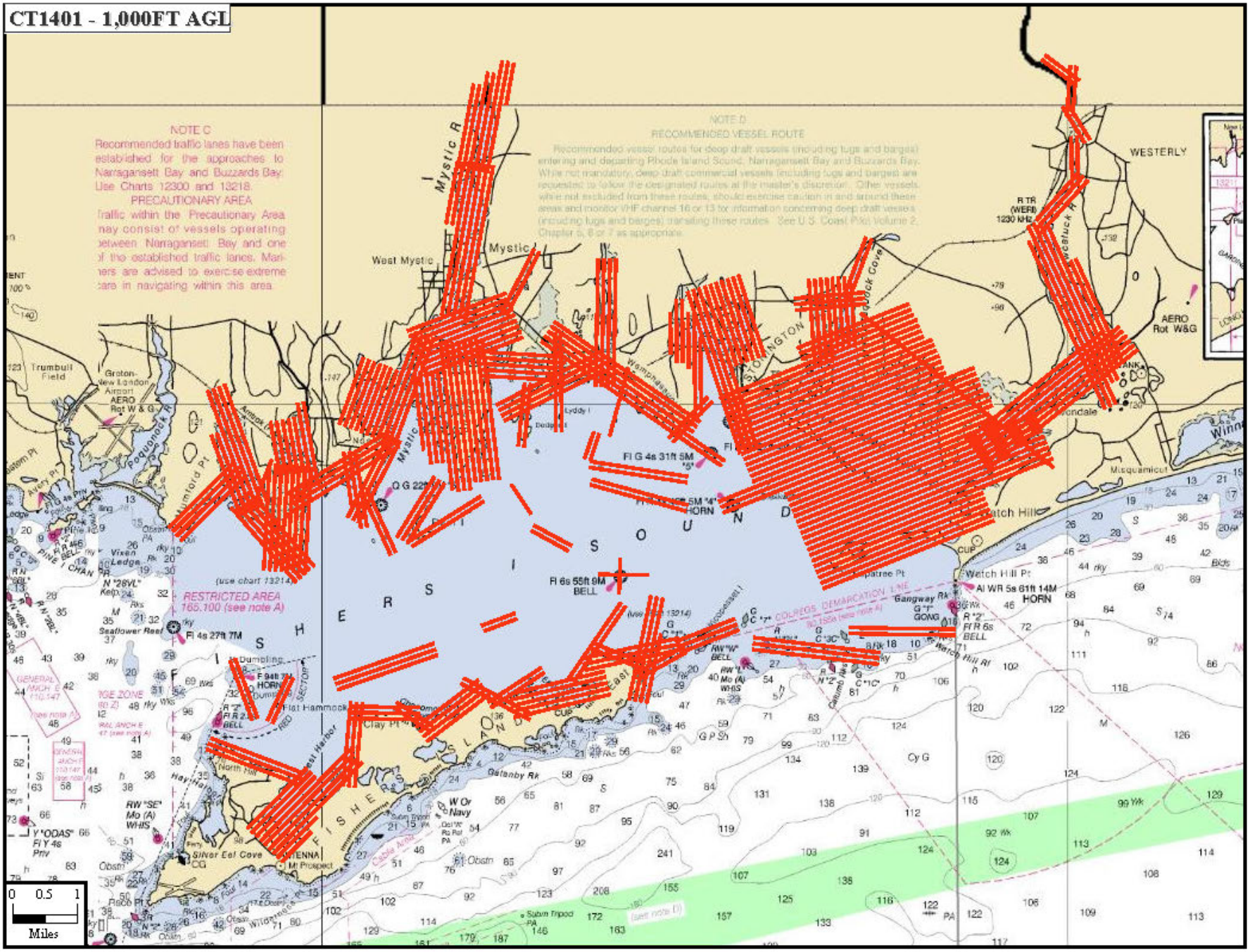
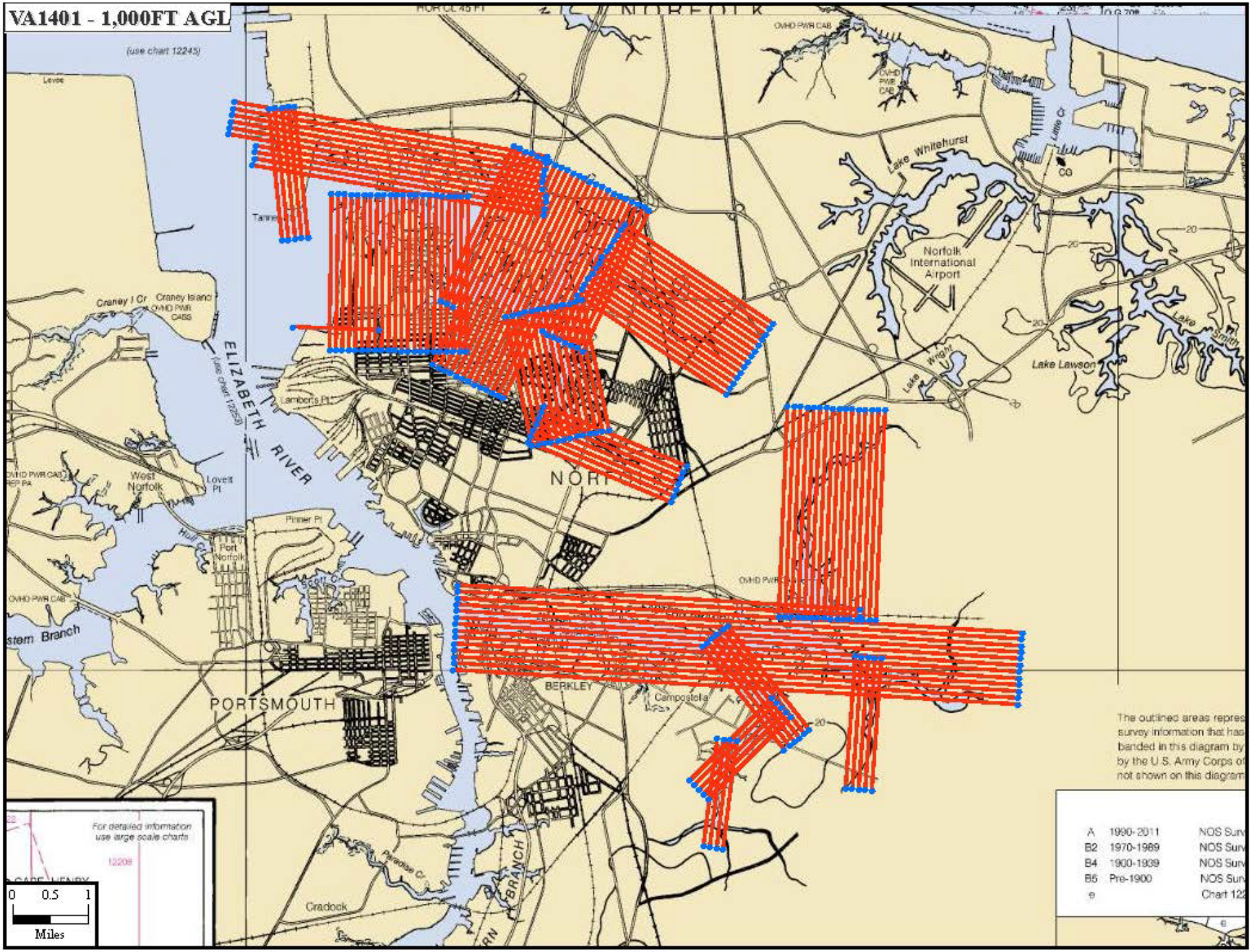


National Oceanic and Atmospheric Administration

CT1401 - 1,000FT AGL



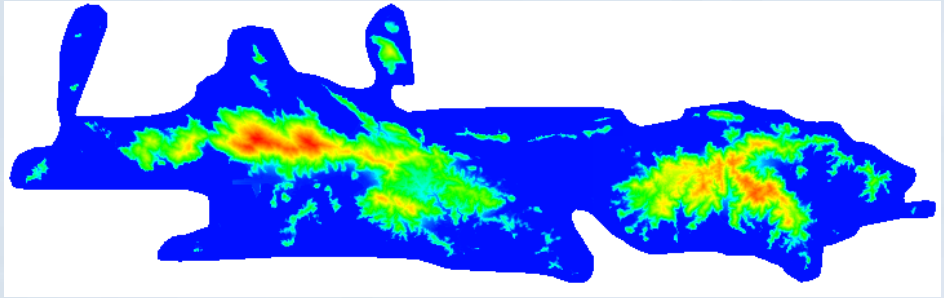

VA1401 - 1,000FT AGL
(use chart 12245)
Levee
Tanner
Craney I Cr
Craney Island
OVHD PWR CABS
ELIZABETH RIVER
(use chart 12253)
Lambert's Pt
West Norfolk
Lovett Pt
Hull Cr
Pinner Pt
Port Norfolk
Scott Cr
OVHD PWR CAB
stern Branch
PORTSMOUTH
NORT
BERKLEY
Campostella
Paradise Cr
Cradock
BRANCH
Lake Whitehurst
Little Cr
CG
Norfolk International Airport
Lake Wright
Lake Smith
Lake Lawson
20
The outlined areas repres
survey information that has
banded in this diagram by
by the U.S. Army Corps of
not shown on this diagram
A 1990-2011 NOS Surv
B2 1970-1989 NOS Surv
B4 1900-1939 NOS Surv
B5 Pre-1900 NOS Sur
Chart 122
For detailed information
use large scale charts
12208
0 0.5 1
Miles

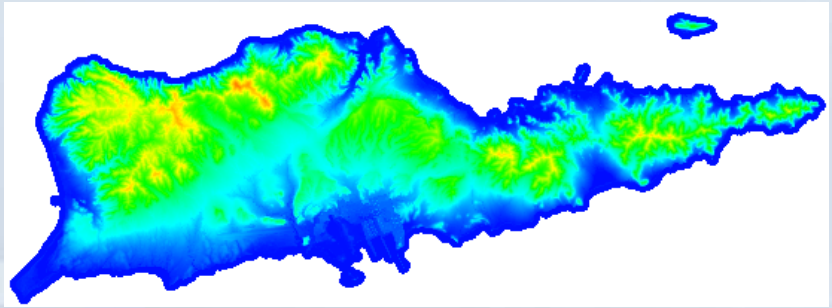
FY13/14 Collections - CSC

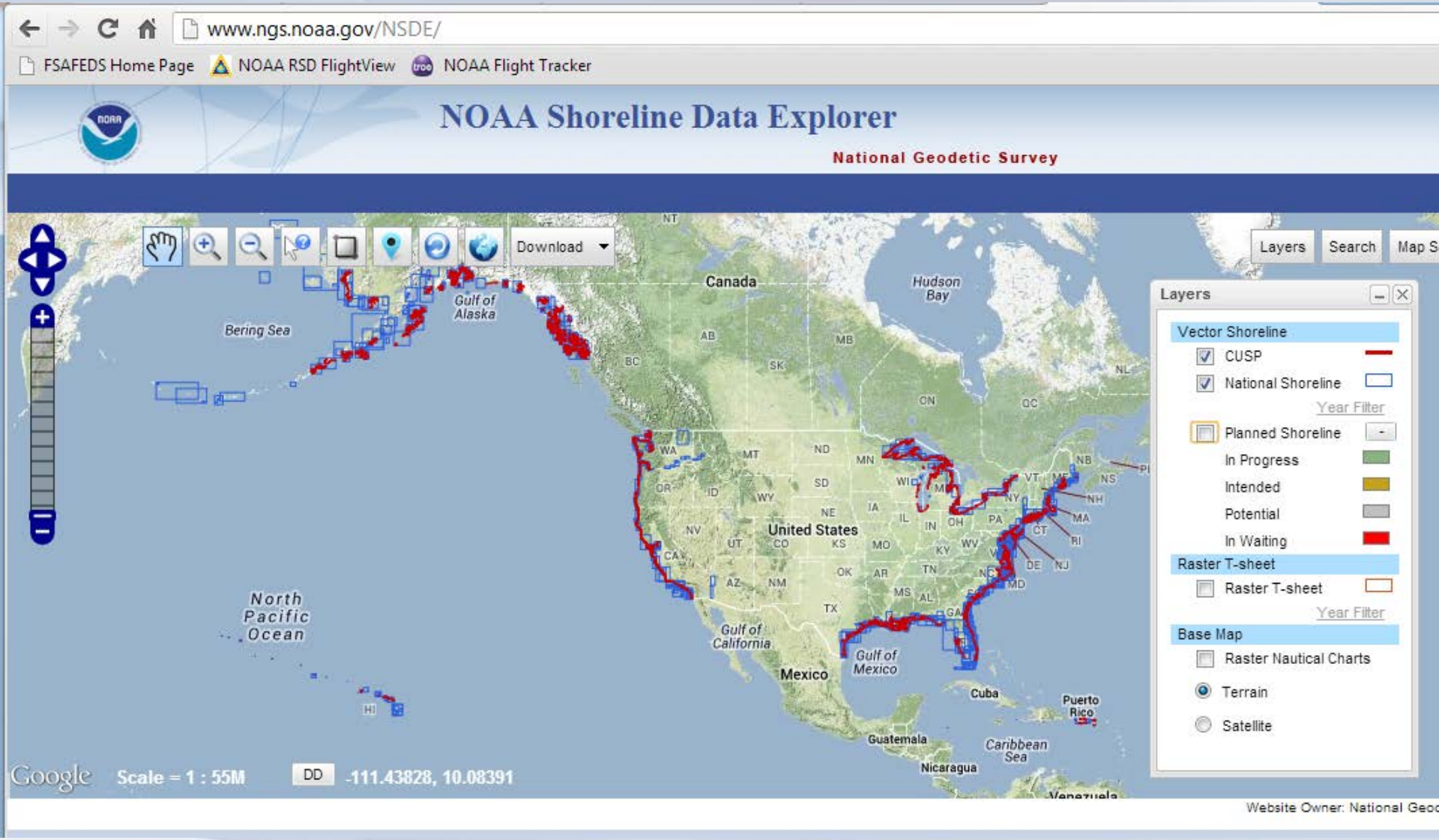
Oahu

- Joint with USGS, NCRS
- Cloudy mountains

USVI – Independent QA was critical







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

National Oceanic and Atmospheric Administration

http://www.csc.noaa.gov/digitalcoast/dataregis | Data Registry | Digital Coast

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DIGITAL COAST
NOAA COASTAL SERVICES CENTER

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1064 layers

Narrow your results

- Theme
- State/Territory
- Offshore Region
- Service Type

12NM Territorial Sea

NOAA Office of Coast Survey

Each coastal State may claim a territorial sea that extends seaward up to 12 nautical miles from its baselines. The coastal State exercises sovereignty over its territorial sea, the air space above it, and the seabed and subsoil beneath it.

Data featured in MarineCadastre.gov

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1944 Guam Historical 8 Bit Imagery

NOAA | Guam Government

This dataset consists of scanned aerial photos provided by the Guam Government, and is part of a larger effort to scan historical aerial photos for Hawaii, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands (CNMI).

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1945 CNMI Saipan High Res Land Cover

NOAA Coastal Services Center

The Coastal Change Analysis Program (C-CAP) produces nationally standardized land cover data from remotely sensed imagery. C-CAP products provide inventories of coastal intertidal areas, wetlands, and adjacent uplands. High-resolution C-CAP provides data relevant for addressing site-specific management decisions.

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Hurricane Planning and Response

Data, tools, and additional resources you need to get ready for the next big storm

Connect to Other Data Resources on state, federal and regional websites

100%

National Oceanic and Atmospheric Administration

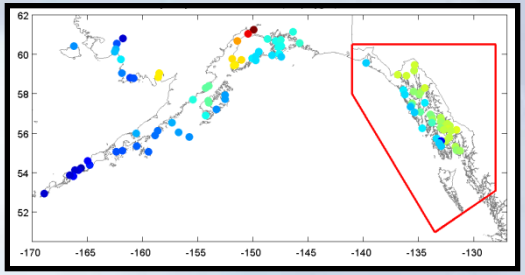
VDatum Status

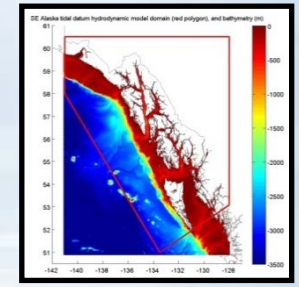
National Oceanic and Atmospheric Administration

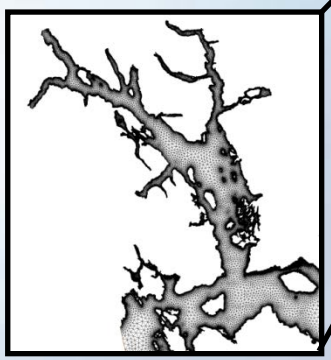
http://vdatum.noaa.gov/

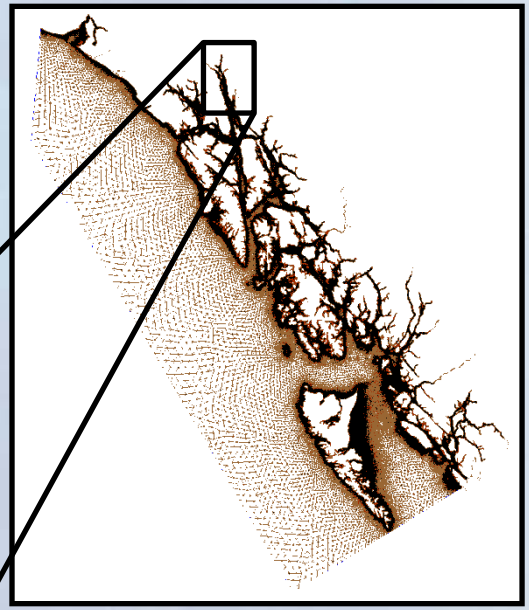
Exploratory Alaska Tidal Modeling

Southeast Alaska

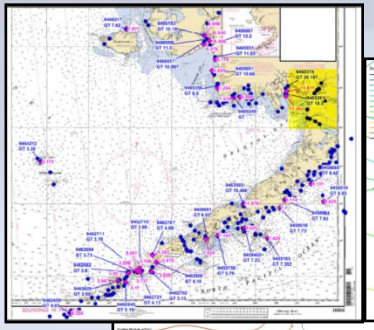


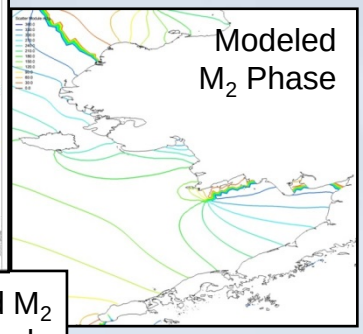


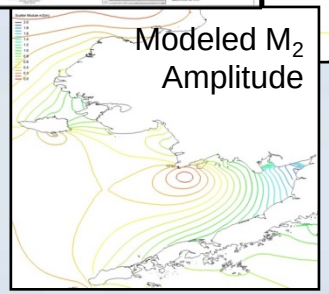


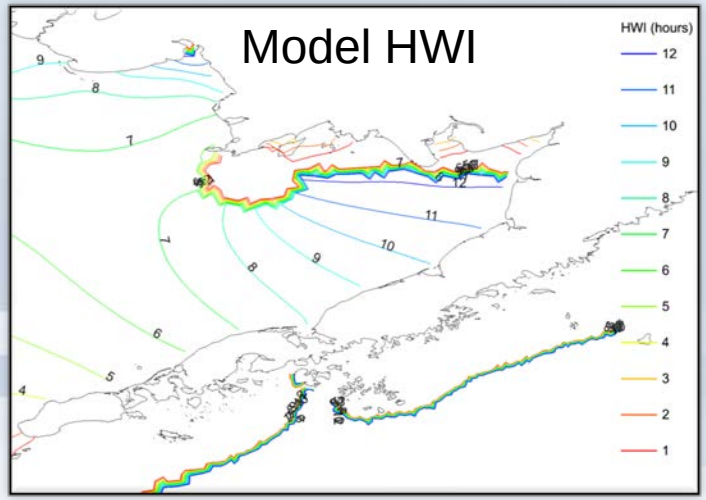


Western Alaska





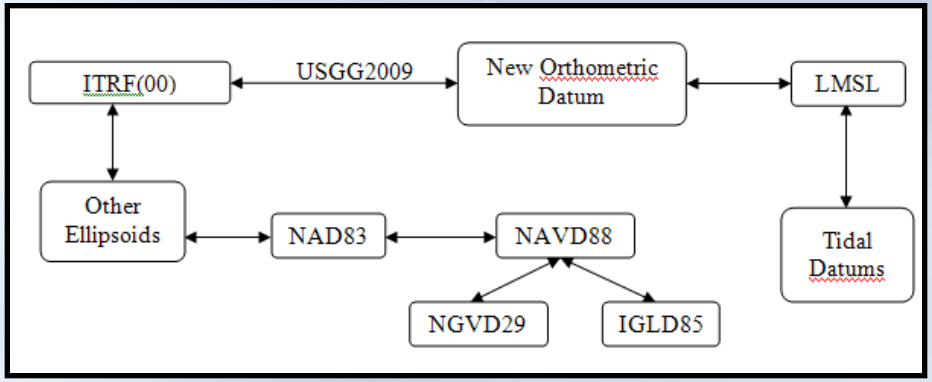


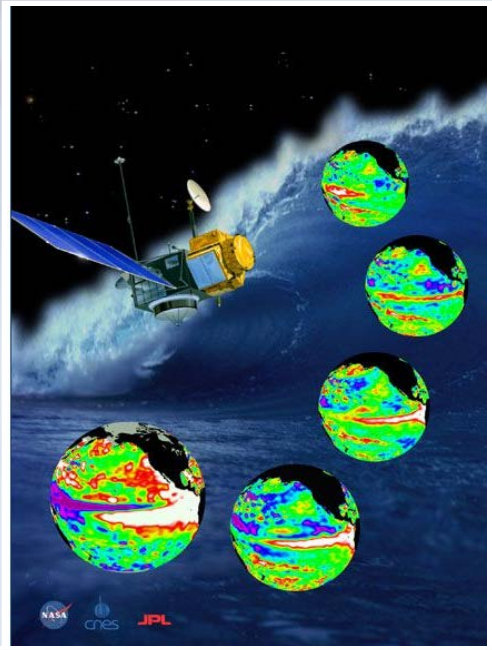


National Oceanic and Atmospheric Administration

Future Enhancements: Next Generation TSS Development

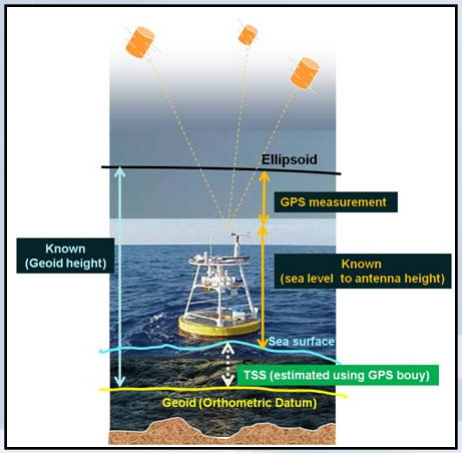
New Proposed Transformation Roadmap based on a purely Gravimetric GEOID

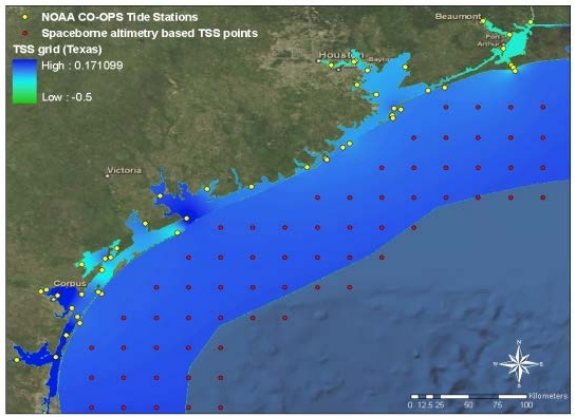




A Must: GPS Campaign on benchmarks to determine new relationships

Wish List: GPS tide buoys to be utilized for data input, validation, and calibration inshore and offshore

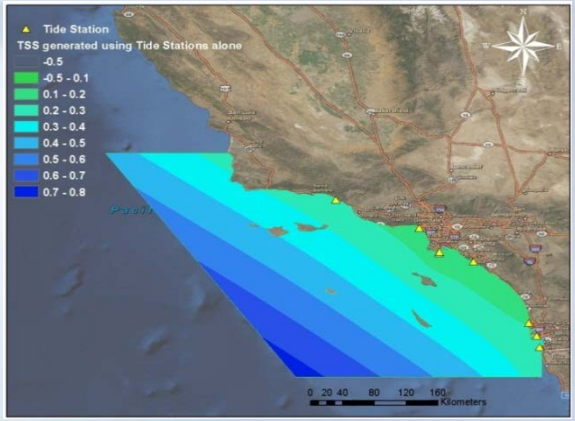




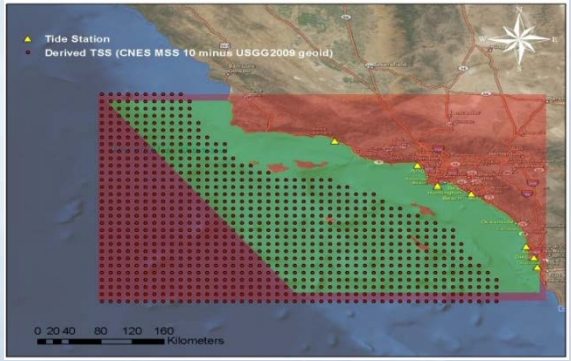
Utilization of Satellite Altimetry/Derived Products to better understand offshore Sea Surface Topography

National Oceanic and Atmospheric Administration

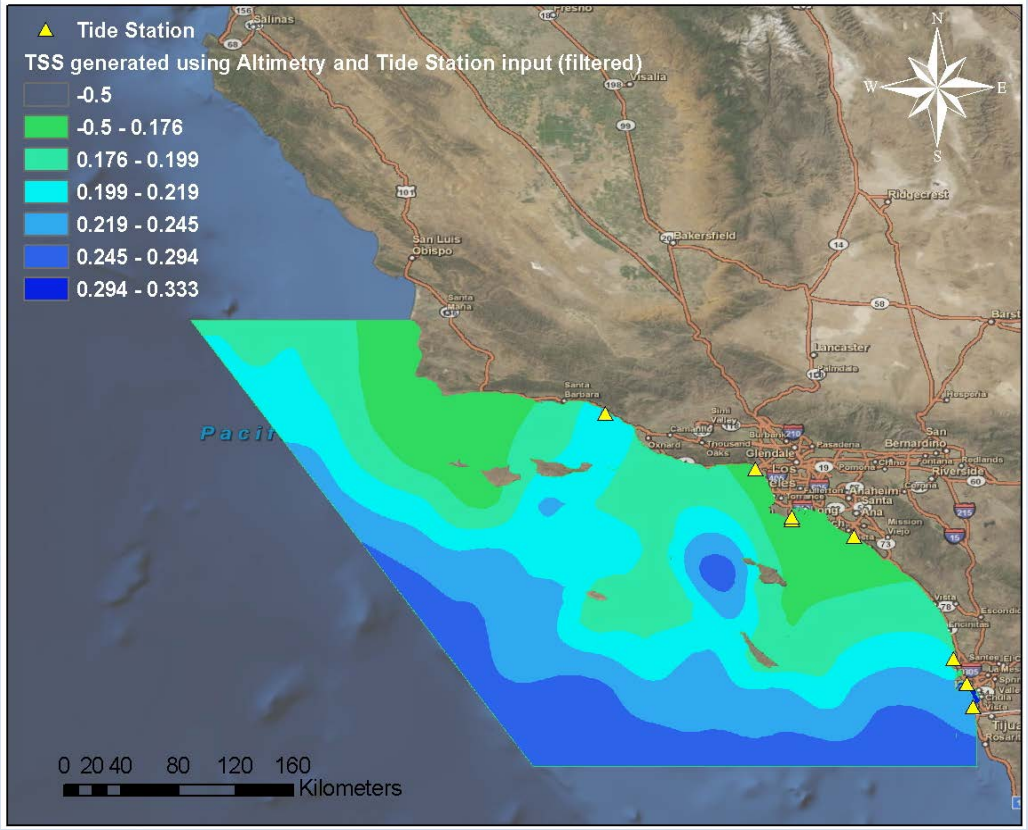
Future Enhancements: Next Generation TSS Development



TSS generated with only the 8 tide stations



TSS points derived at the location of tide stations (yellow triangle) and CNES MSS points (red dots). These TSS points are the input for TSS grid (0.001 degree spacing) creation.



Refined TSS grid created using the derived TSS points at CNES MSS points (Gaussian filtered), and newly determined geodetic relationships at tide stations

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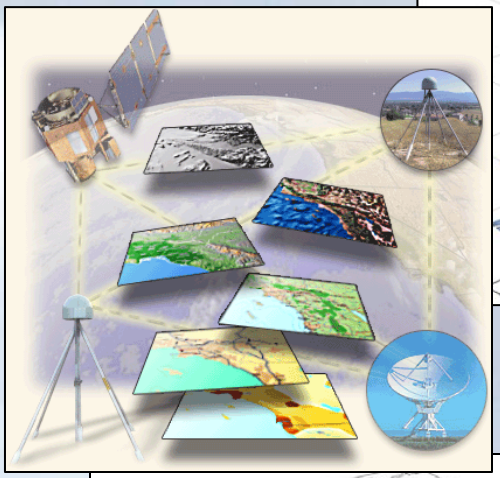
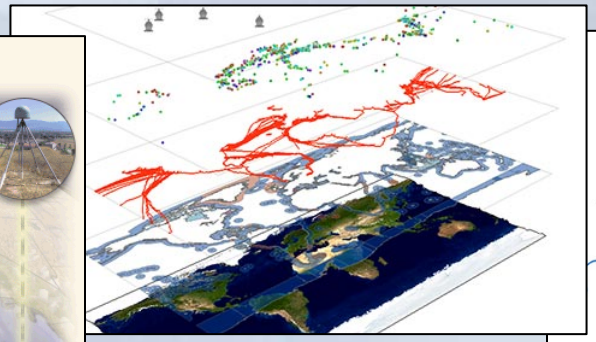
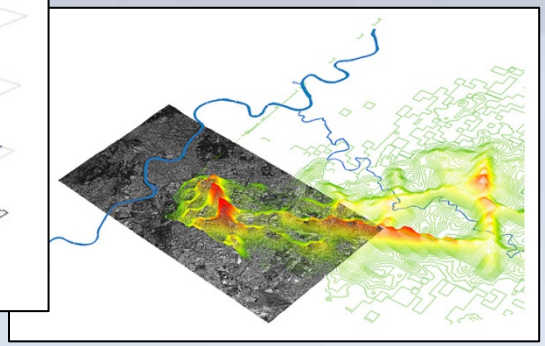
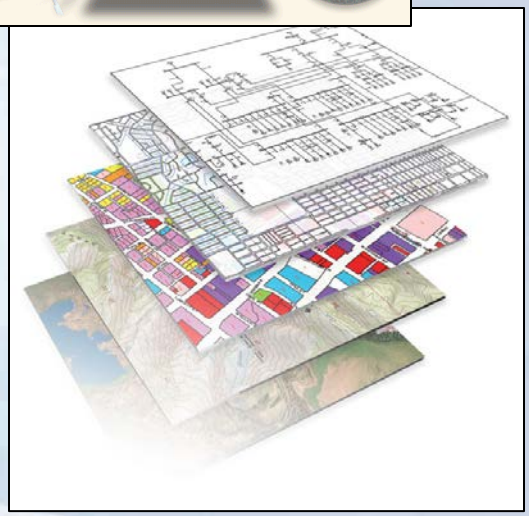
Future Enhancements: VDatum GIS Format Support





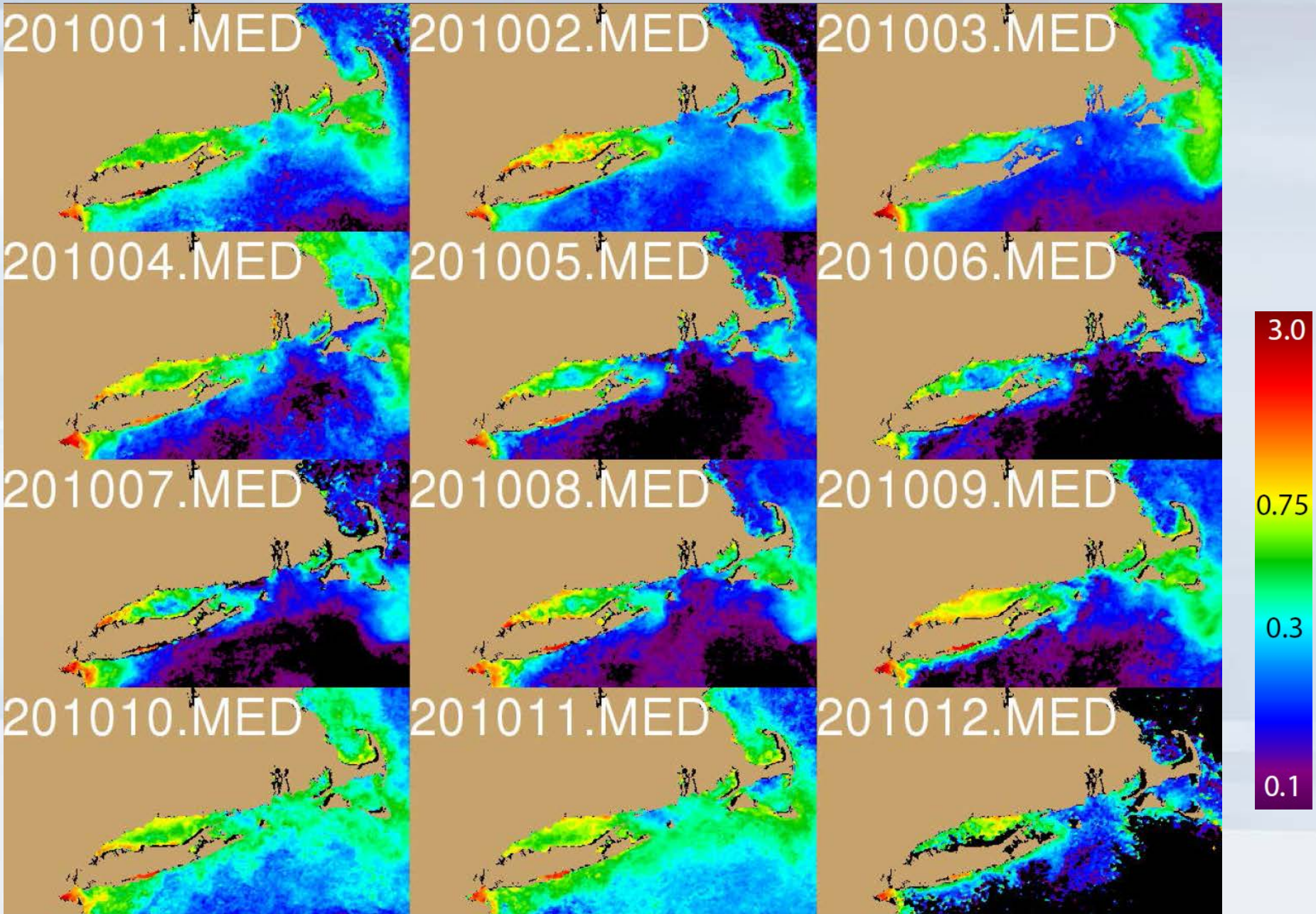




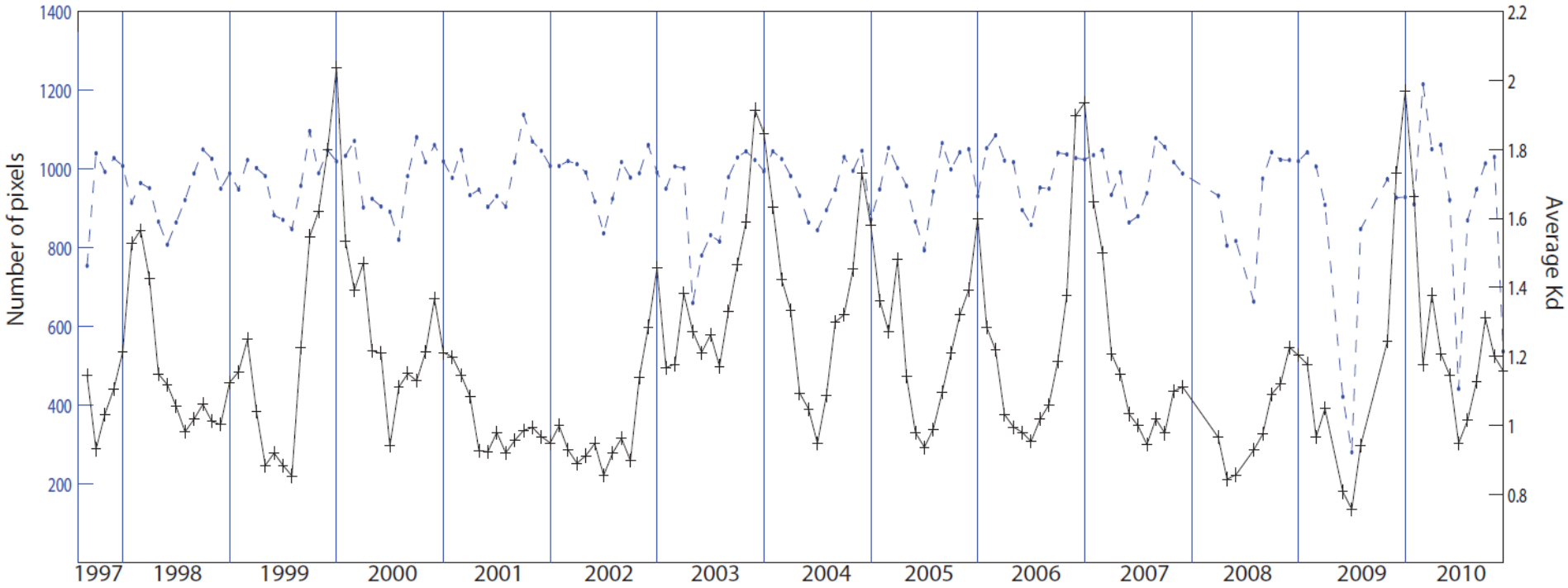
- **Current Formats:** single point, ASCII input file, and ESRI ASCII Grid, LAS files.
- **Proposed Formats and Tools:**

Format	Data Model	Tool	Source
Shapefile	Vector	Reader and Writer	In-house
ESRI ASCII Grid	*Raster*	*Reader and Writer*	*In-house*
KML	Vector	Reader and Writer	In-house
TIFF	Raster	Reader and Writer	Explore Third-party tools

NOAA NCCOS Kd Climatology Product: 2010 Monthly Averages for North East



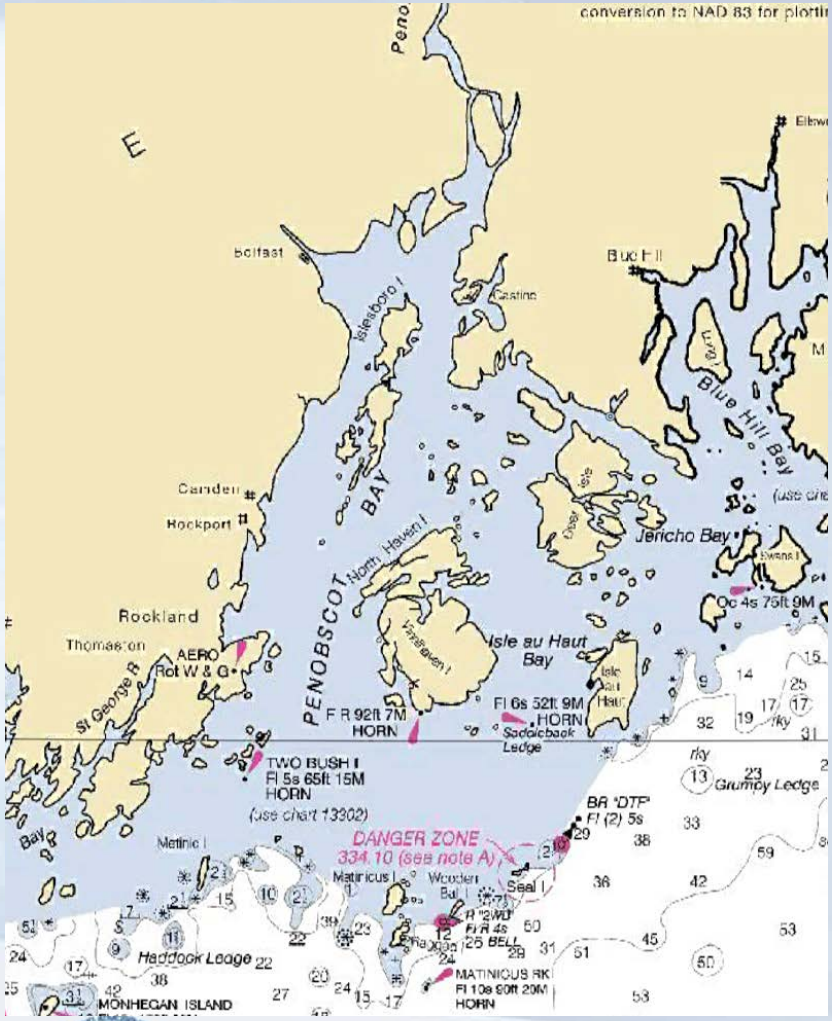
Graph of NOAA NCCOS Kd Climatology

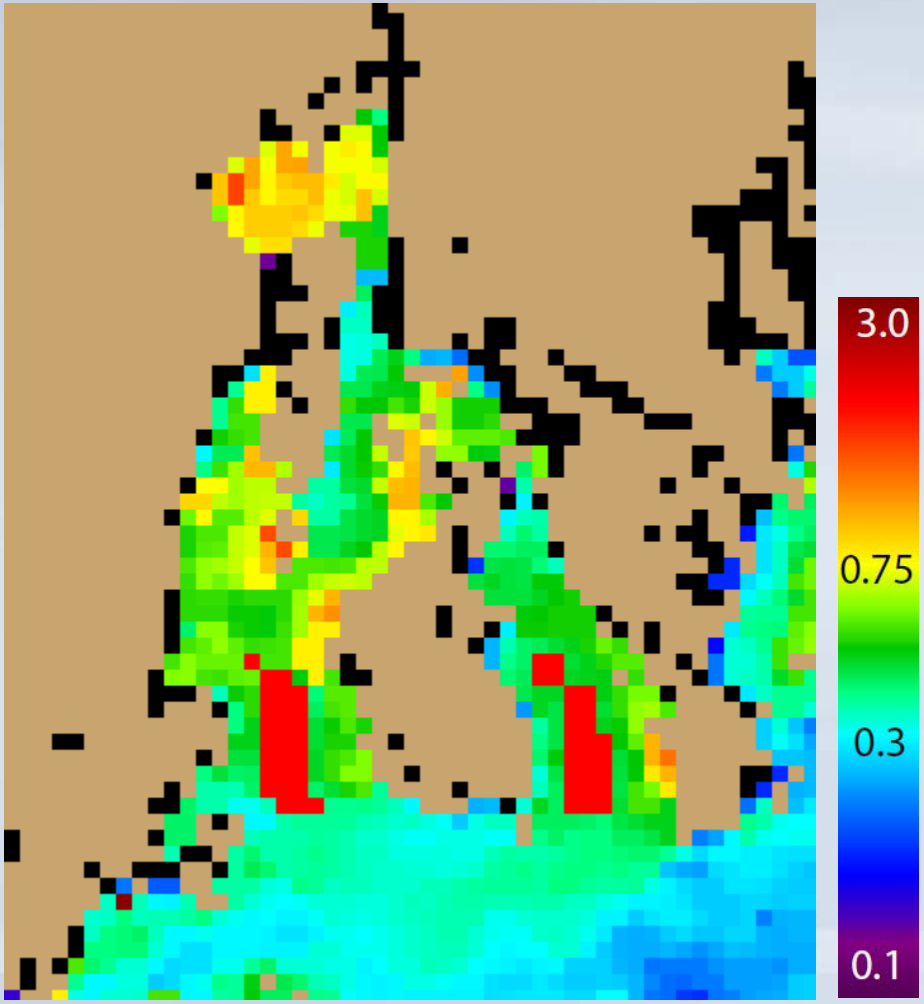


Illustrates seasonal trends, as well as year-to-year variability in water clarity for AOI

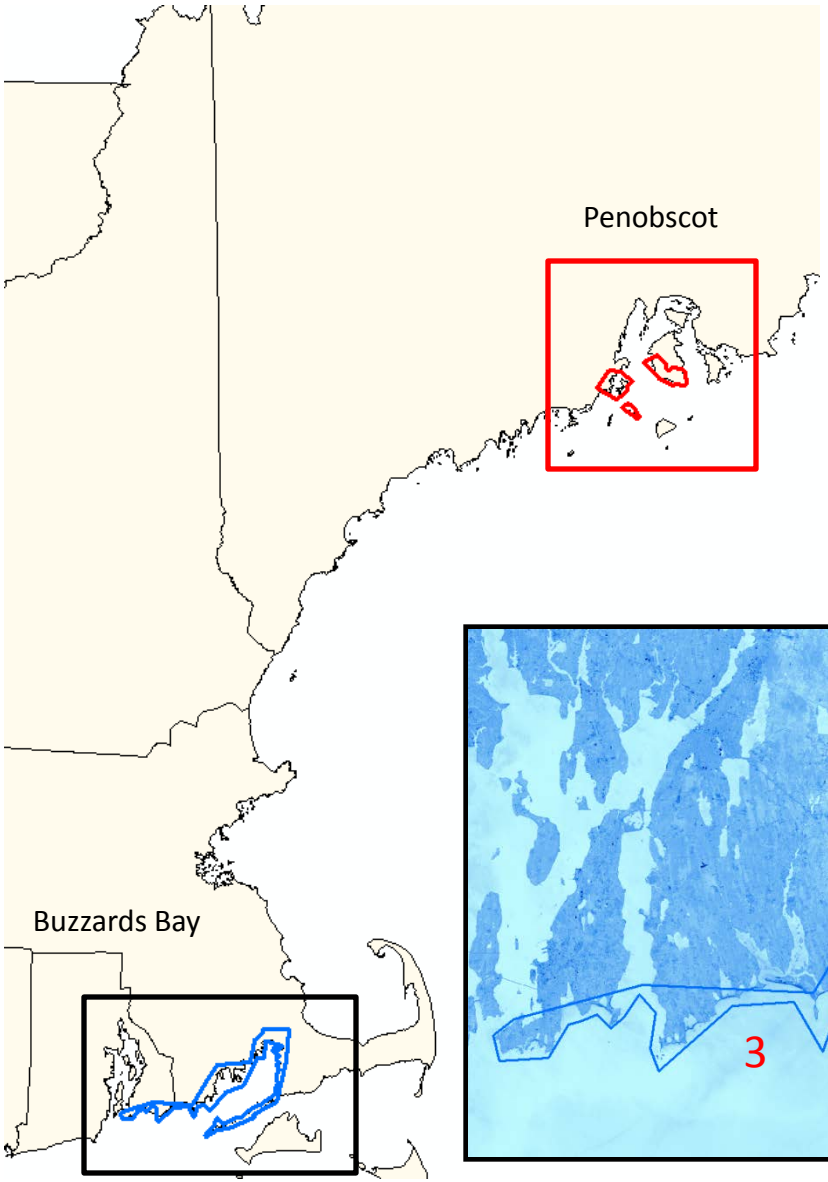
National Oceanic and Atmospheric Administration

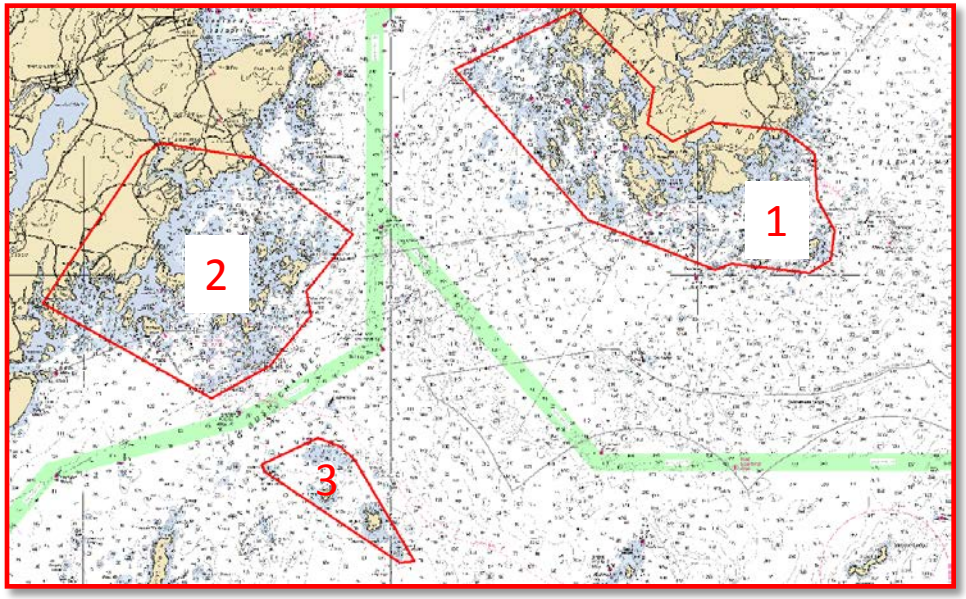
Penobscot Bay: Kd analysis from NOAA NCCOS





National Oceanic and Atmospheric Administration





Penobscot Initial Water Clarity Analysis

1. Top- left half no data – rest ok Mar - May
2. Ok Mar-Apr
3. relatively good Mar-May

Buzzards Bay Initial Water Clarity Analysis

1. Top portion no data
2. Upper bays no data - rest ok Mar-May
3. Most left portion ok Mar – May
   Lower portion ok Mar

* Example of Landsat 8 data but still looking at…

SDB: Technical overview

- **Approaches:**
  - Inversion methods (e.g., Lyzenga 1978, 2006; Philpot 1989)
  - Ratio approaches (e.g., Dierssen et al. 2003; Stumpf et al. 2003)
  - Look-up tables (LUT) (e.g., Louchard et al. 2001)

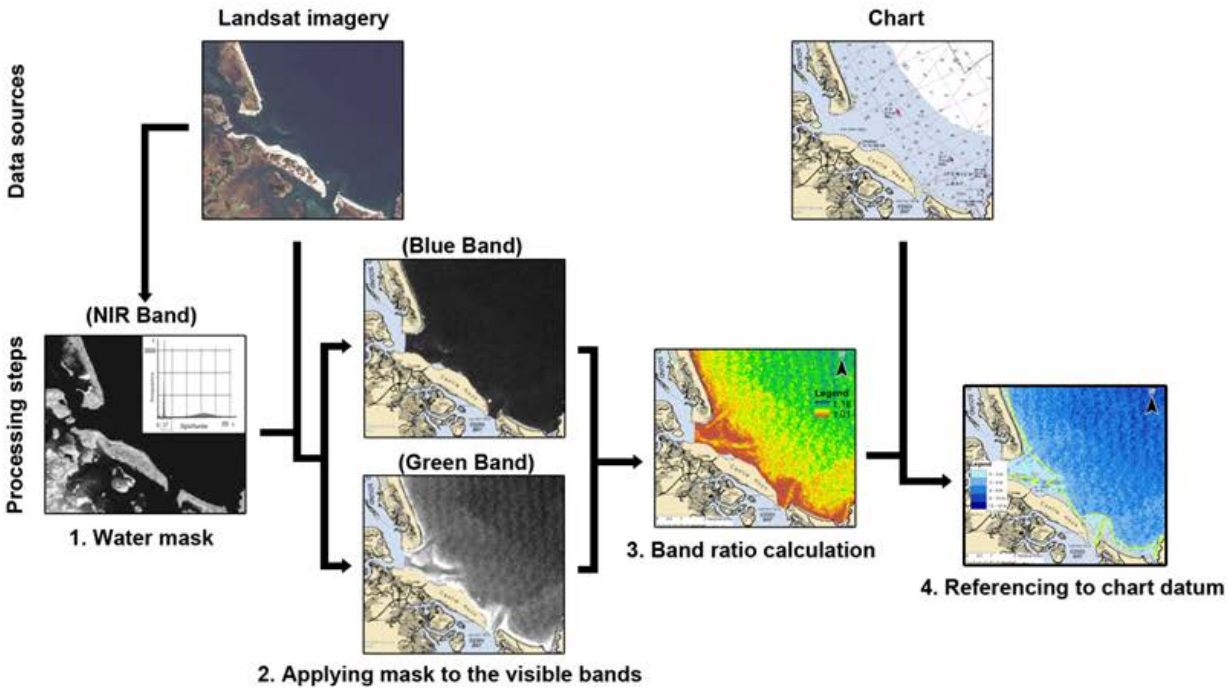
Stumpf et al. 2003

$$Z = m_0 \cdot \frac{\ln\left(L_{obs}(\lambda_i)\right)}{\ln\left(L_{obs}(\lambda_j)\right)} - m_1$$

$L_{obs}(\lambda_i)$, $L_{obs}(\lambda_j)$-radiance values

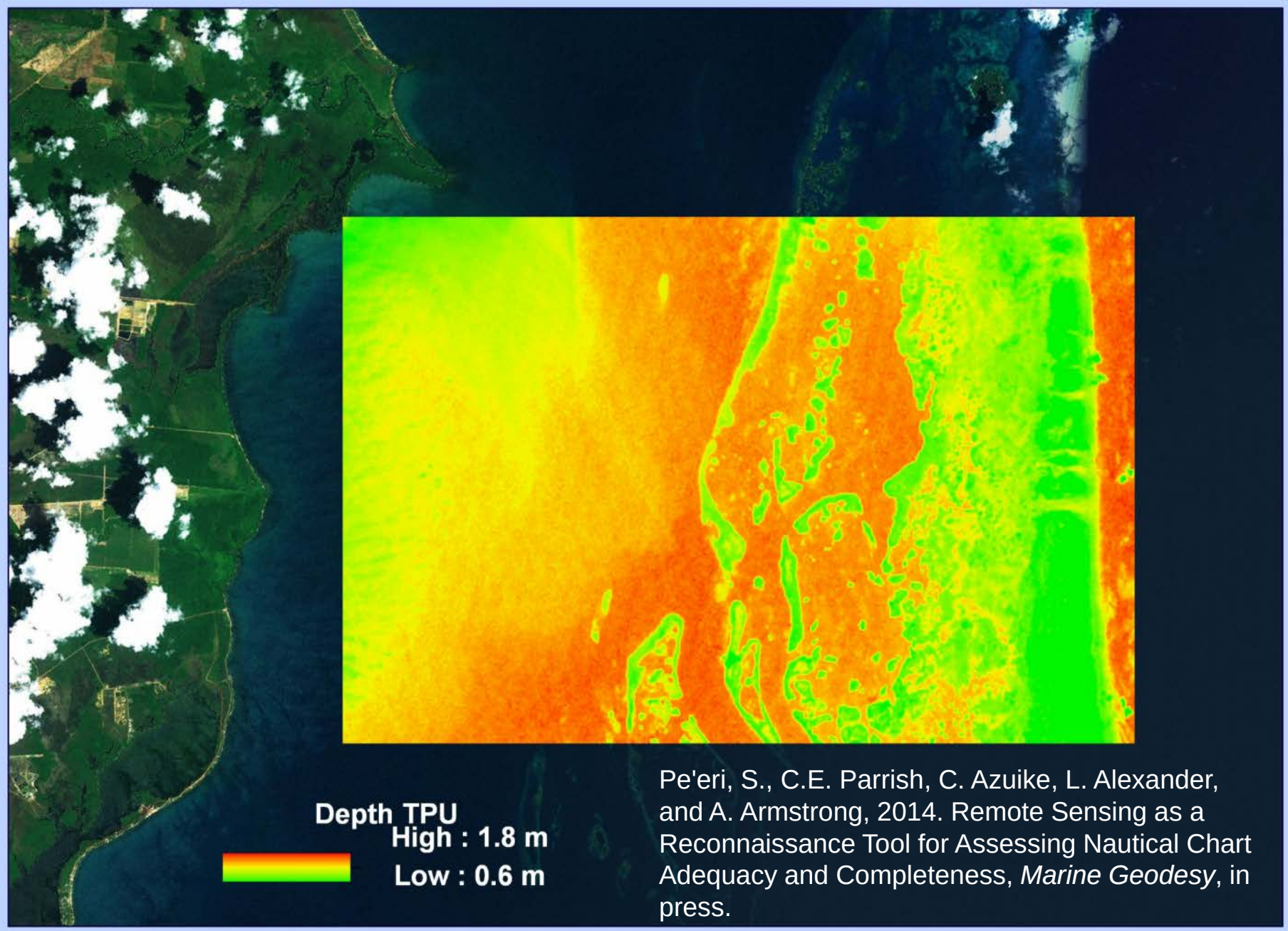
m_o- gain

m_1- offset



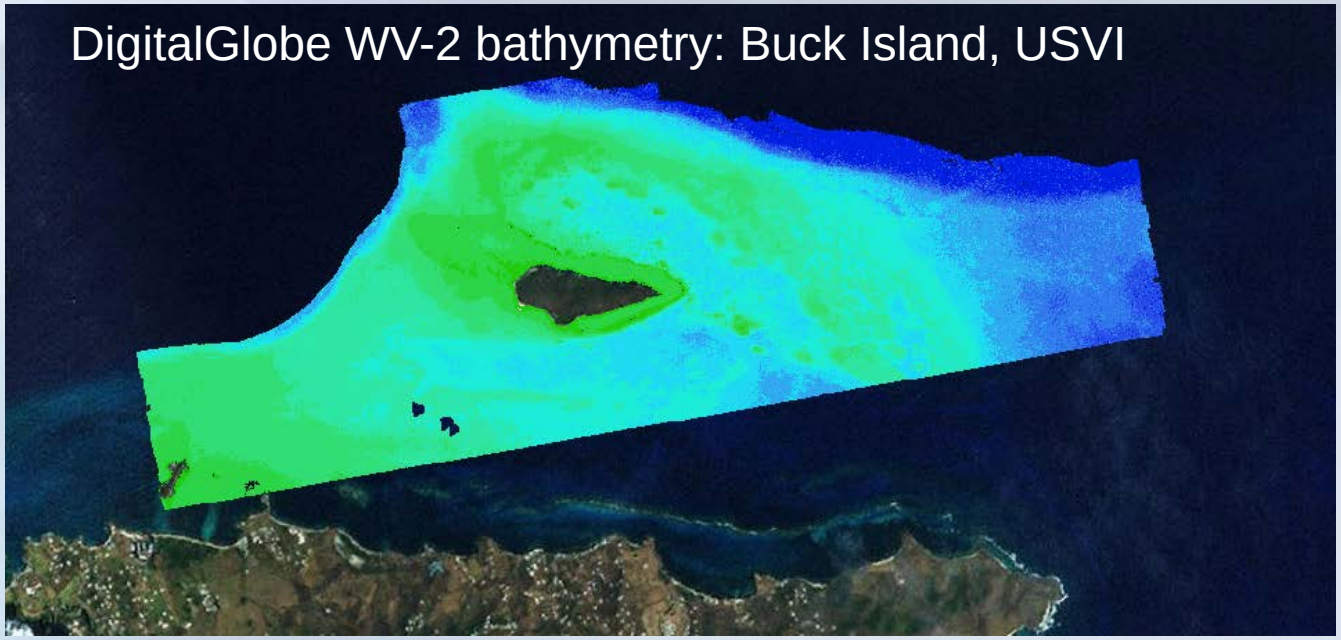
Slide credit: Shachak Pe'eri

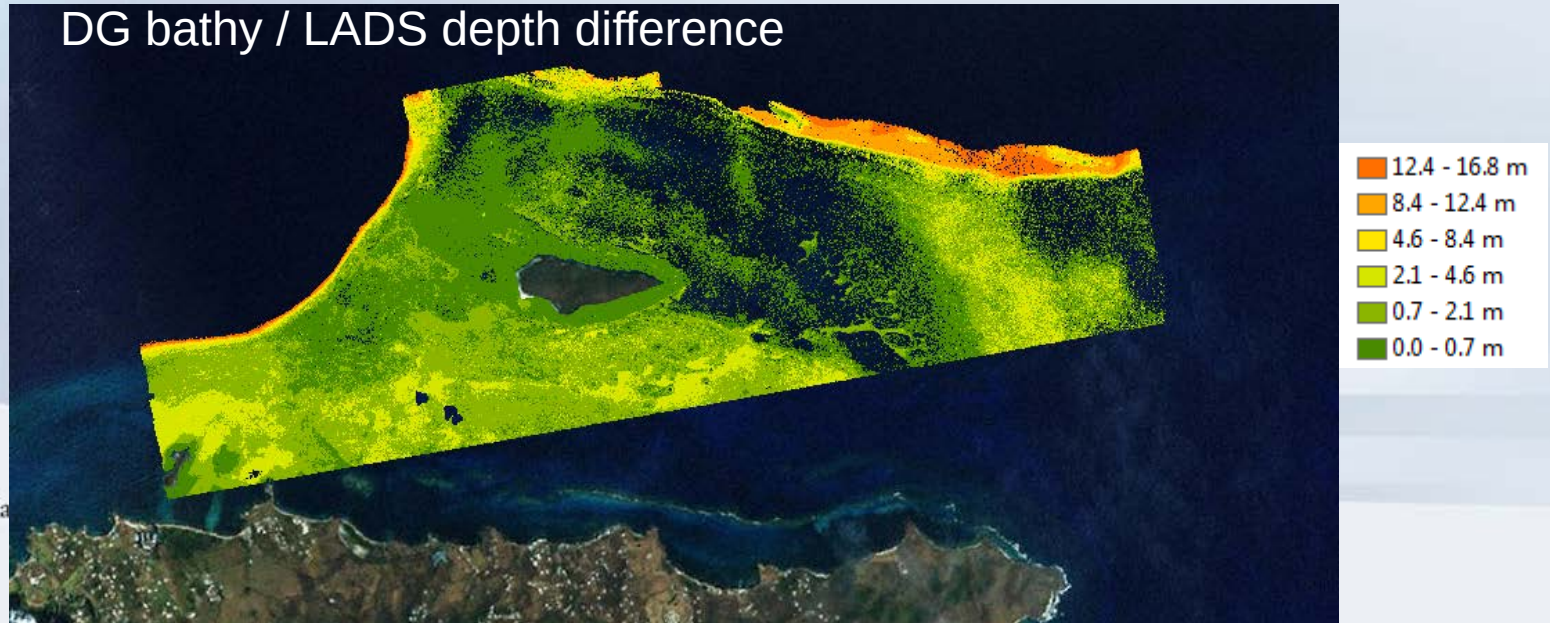
Uncertainty Surface for Belize Satellite-Derived Bathymetry



Pe'eri, S., C.E. Parrish, C. Azuike, L. Alexander, and A. Armstrong, 2014. Remote Sensing as a Reconnaissance Tool for Assessing Nautical Chart Adequacy and Completeness, *Marine Geodesy*, in press.

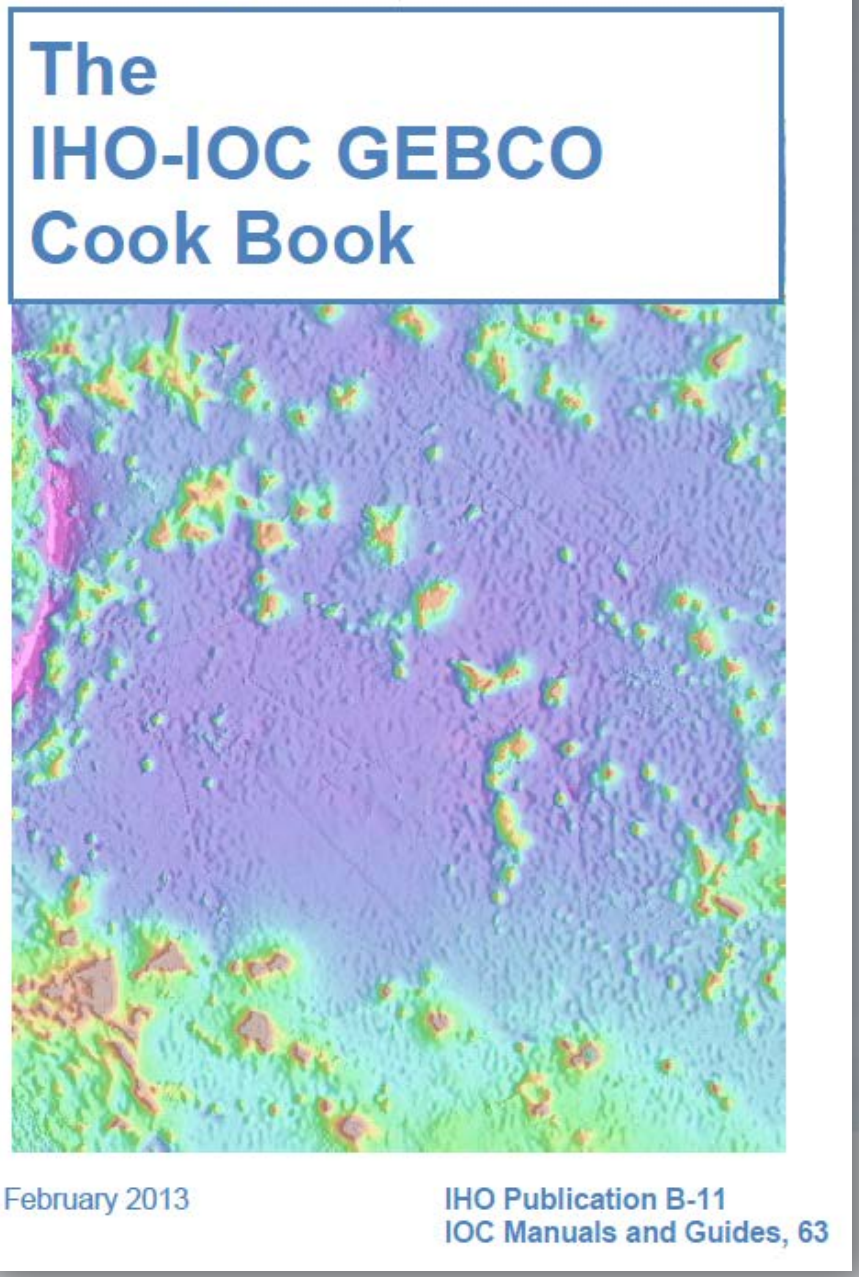
Evaluation of DigitalGlobe bathymetry from WV-2





Contributed procedures to GEBCO Cook Book

http://ibis.grdl.noaa.gov/SAT/GEBCO_Cookbook/index.php



Chapter 11.0 LANDSAT 7 Satellite-Derived Bathymetry

Contributed by S. Pe'eri, B. Madore and L. Alexander, Center for Coastal and Ocean Mapping, USA, C. Parrish and A. Armstrong, National Oceanic and Atmospheric Administration, USA, and C. Azuike, Nigerian Navy Hydrographic Office Lagos, Nigeria

Since the 1970's, satellite remote sensing has become increasingly recognized as a useful reconnaissance tool to map near-shore bathymetry, characterize a coastal area and to monitor seafloor changes that may have occurred since the last hydrographic survey was conducted. Satellites allow for the capturing of images over broad expanses of the Earth. The following procedure provides the user with an inexpensive and quick approach to derive bathymetry from satellite imagery. The data sources used in the procedure below are publicly-available imagery collected by LANDSAT 7 satellite using the Enhanced Thematic Mapper Plus (ETM+) instrument and chart soundings.

The key steps in the procedure include:

1. **Pre-processing** – Satellite imagery is downloaded based on the geographic location and environmental conditions (e.g., cloud coverage and sun glint) had to be used.
2. **Water separation** – Dry land and most of the clouds are removed.
3. **Spatial filtering** – 'Speckle noise' in the Landsat imagery is removed using spatial filtering.
4. **Applying the bathymetry algorithm** – The Stumpf et al. (2003) algorithm using the blue and green bands.
5. **Identifying the extinction depth** – The optic depth limit for inferring bathymetry (also known as, the extinction depth) is calculated.
6. **Vertical referencing** – A statistical analysis between the algorithm values to the chart soundings references the Digital Elevation Model (DEM) to the chart datum.

For more details on satellite-derived bathymetry and hydrographic applications, please refer to Pe'eri et al. (2013).

Pe'eri, S., C. Parrish, C. Azuike, L. Alexander and A. Armstrong, 2013. Satellite Remote Sensing as Reconnaissance Tool for Assessing Nautical Chart Adequacy and Completeness, *Marine Geodesy* (submitted).

Stumpf, R., K. Holderied and M. Sinclair, 2003, Determination of water depth with high-resolution satellite imagery over variable bottom types, *Limnology and Oceanography*, **48,** 547-556.

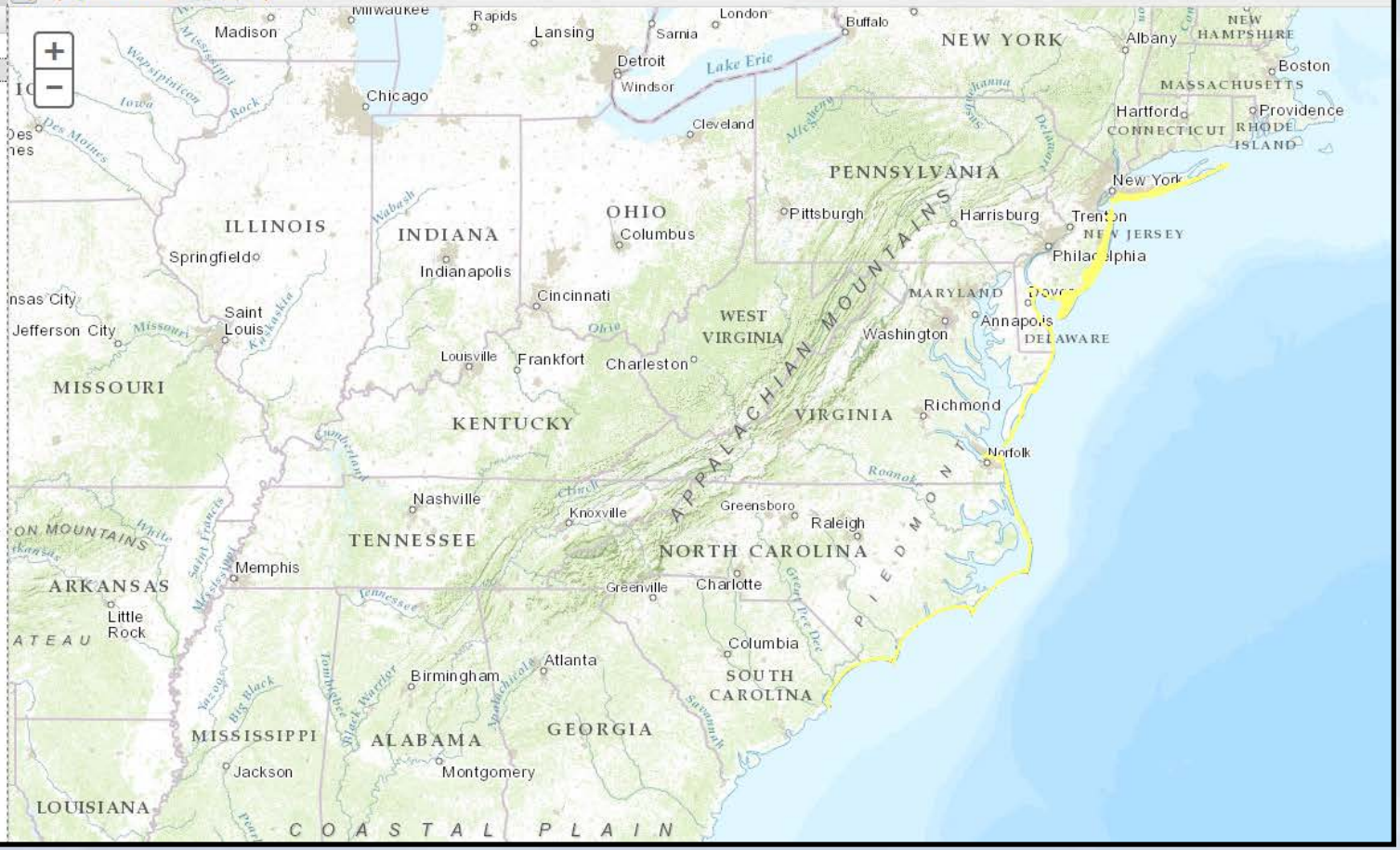
Supplemental Sandy LiDAR and Imagery Acquisition for NOAA and USGS

In support of: NOAA Coastal Geospatial and Services Contract, NOAA Shoreline Mapping Program, USGS Geospatial Products and Services Contract

Dewberry

Table of Content

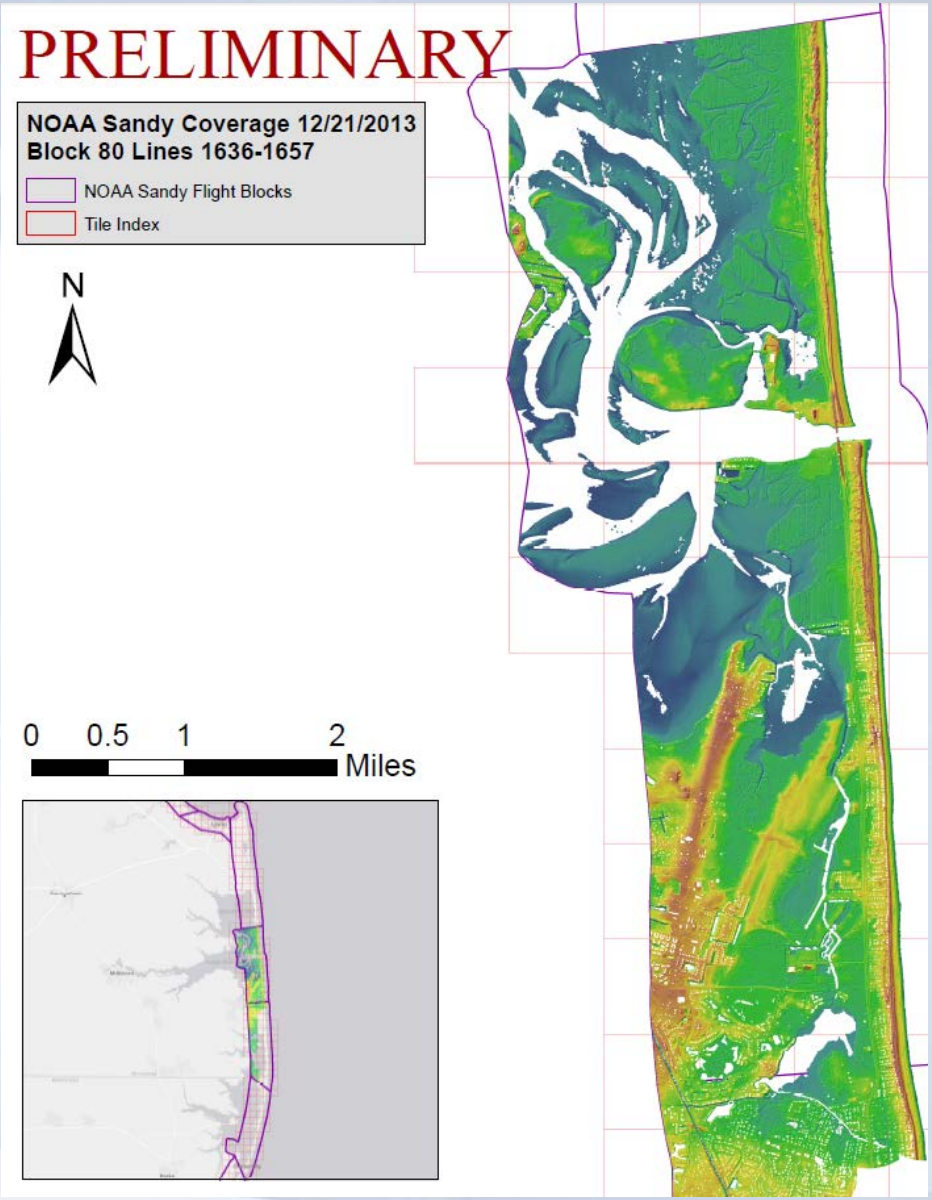
Layers	Description
	NOAA Topobathy LiDAR
	Flight Plans
	PSI Planned Flight Lines 300m
	PSI Planned Flight Lines 600m
	AME Planned Flight Lines 300m
	AME Planned Flight Lines 600m
	WSI Planned Flight Lines 300m
	WSI Planned Flight Lines 600m
	Flight lines flown
	Flight lines flown (Daily)
	Flight Blocks
	Quicklook DEM
	Water Clarity
	NOAA Tide Stations
	NOAA Imagery
	USGS Topo LiDAR
	Dewberry
	Quantum Spatial
	Woolpert
	General
	FAA Temporary Flight Restrictio...
	NOAA Weather Warnings, Wat... Advisories, and Statements
	NOAA METAR current wind spe... and direction
	NOAA Nautical Charts

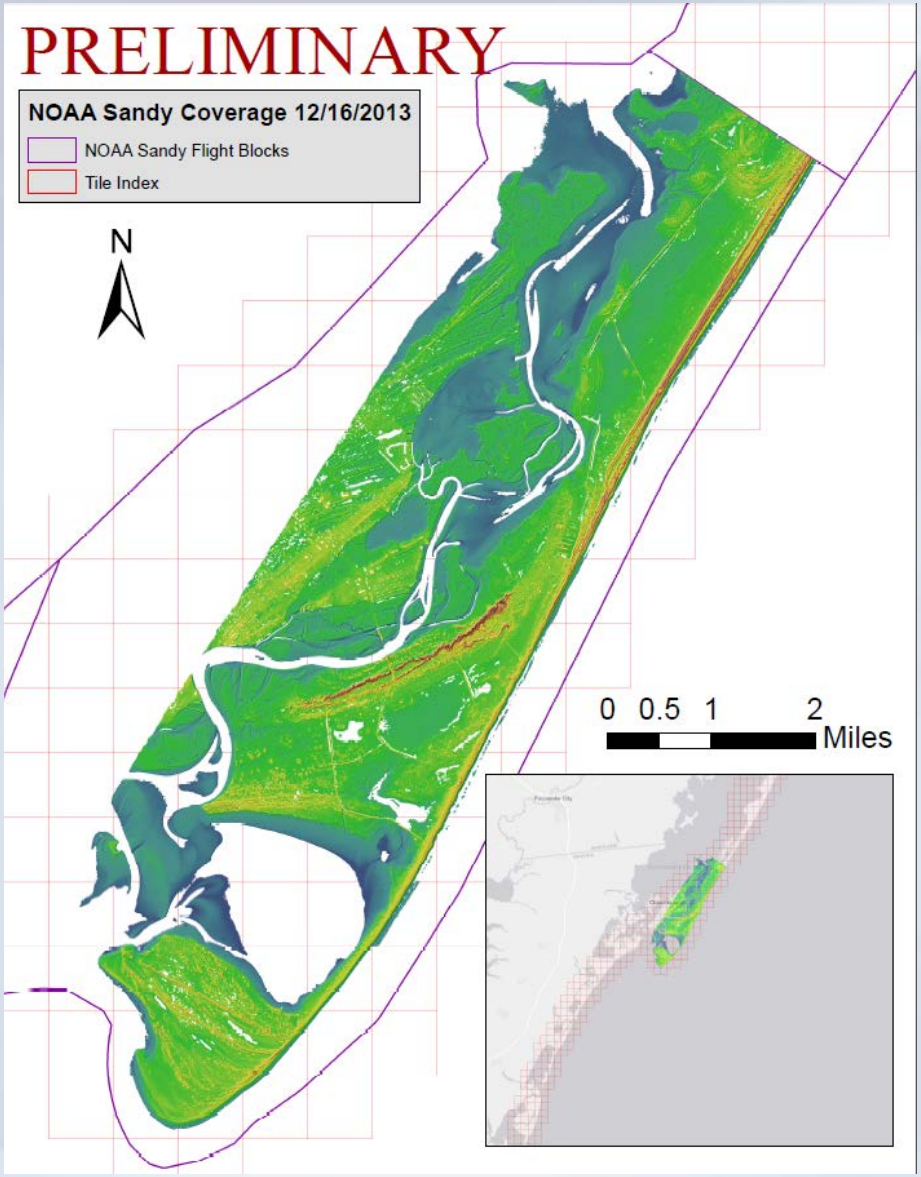


National Oceanic and Atmospheric Administration

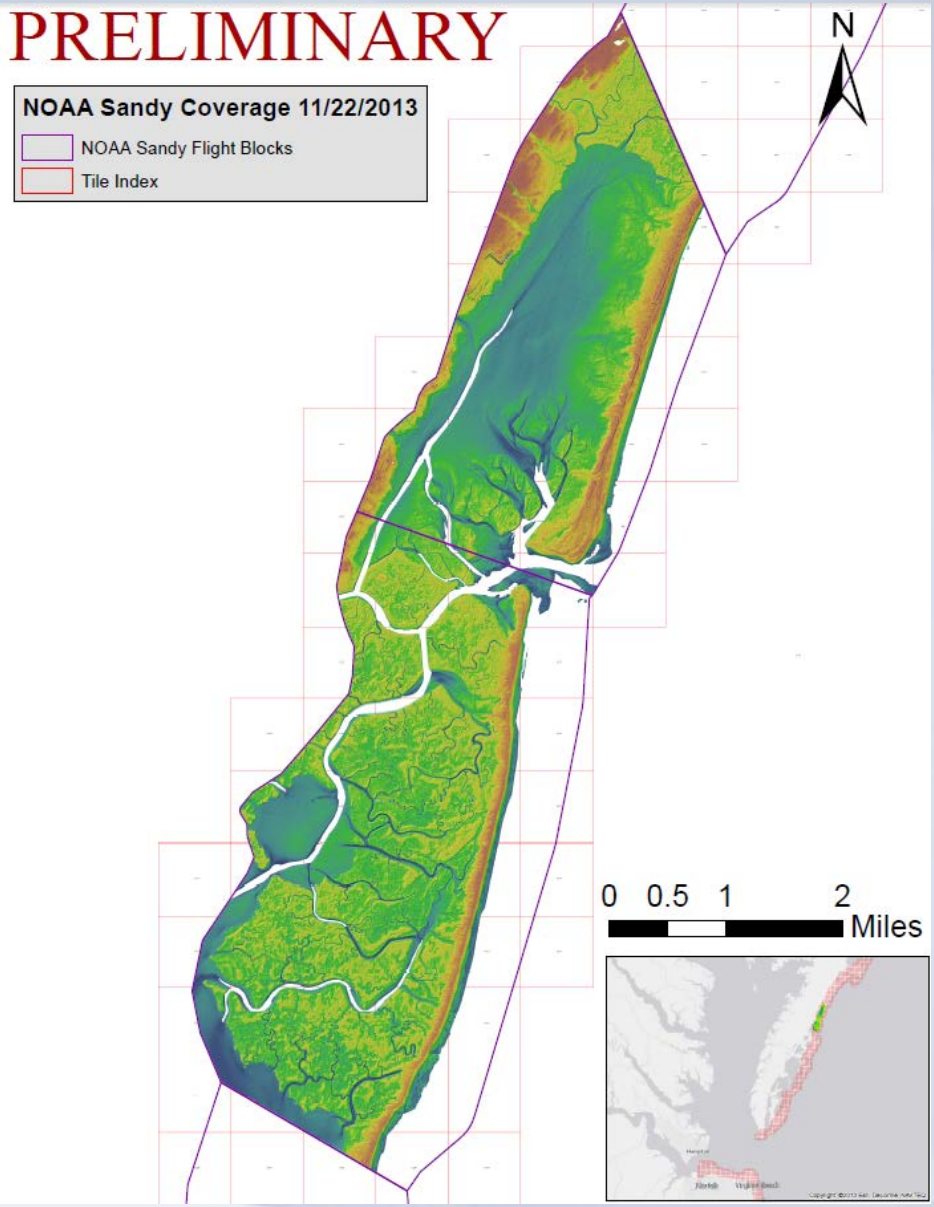
Situation Report All Blocks

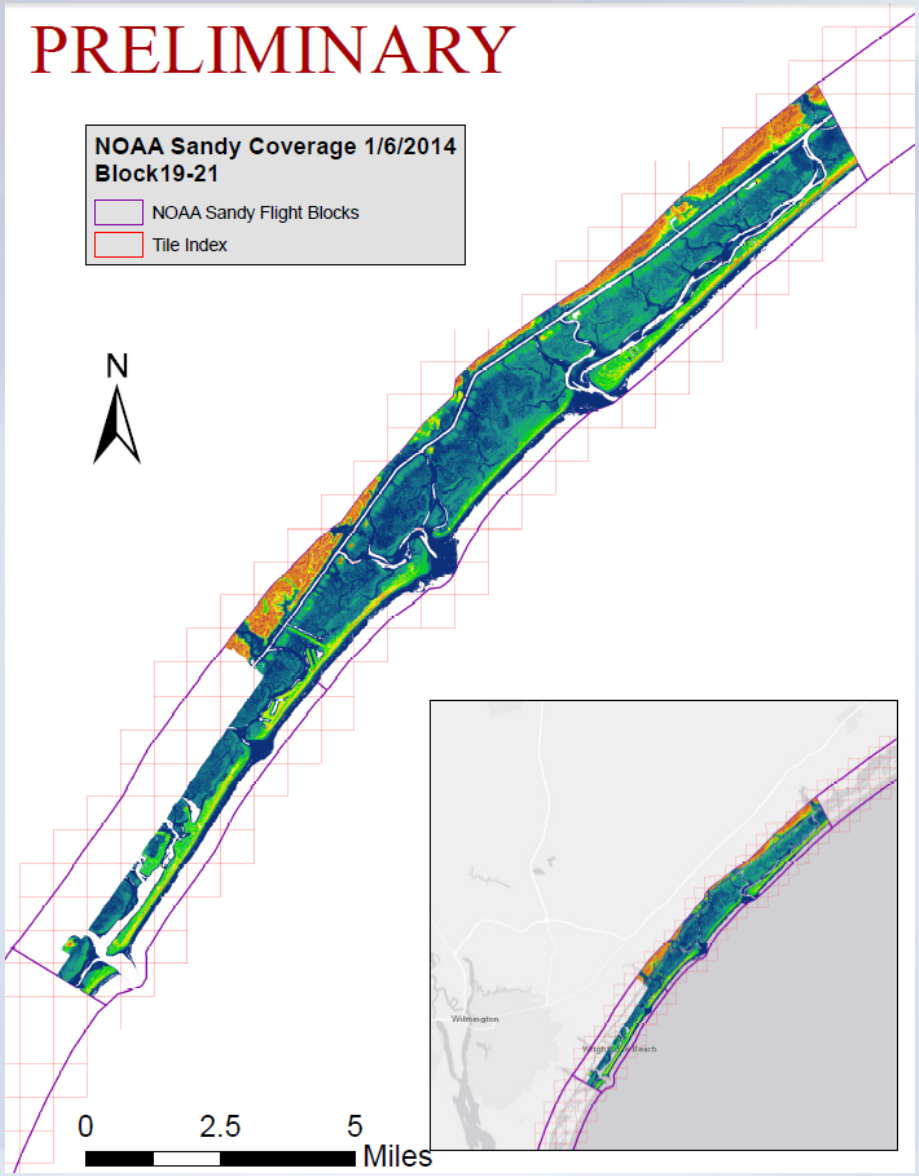
	Number of Flightlines Flown (600m)	Percent of Flightlines Flown (600m)	Miles Coverage (600m)	Percent Miles Coverage (600m)	Standby Days Requested	Standby Approved
	3644	**102.07%**	**23,261.63**	**95.07%**	**107**	**90**
Collected (not verifie		**0.00%**				
Accepted		**0.00%**				
Rejected (Total)		**0.00%**				
Refly at High Tide						
Refly at Low Tide						
Updated 6/2//2014						
Total Miles (600m)	24,469.00					
Total Flightlines (600n	3570					



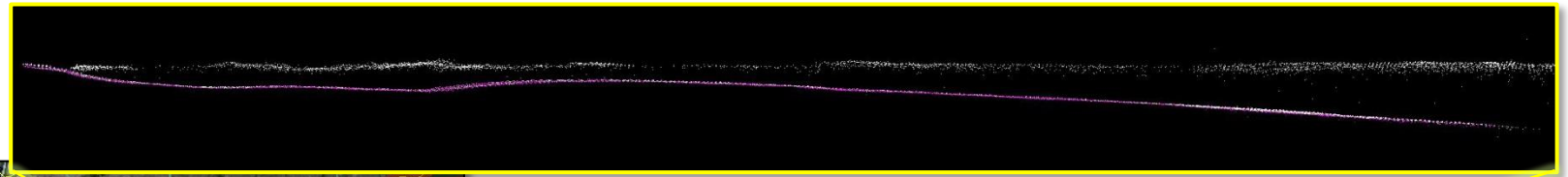


National Oceanic and Atmospheric Administration

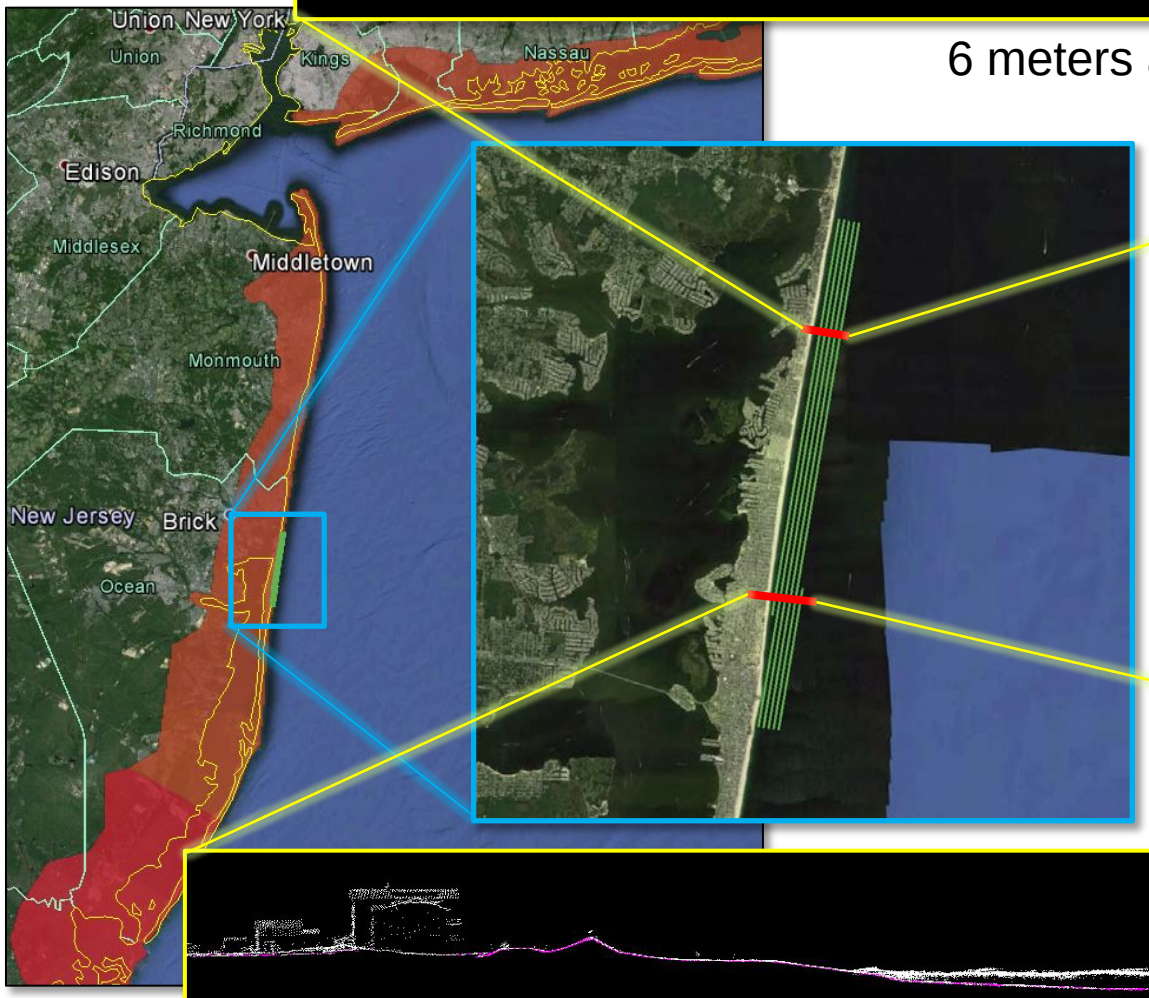




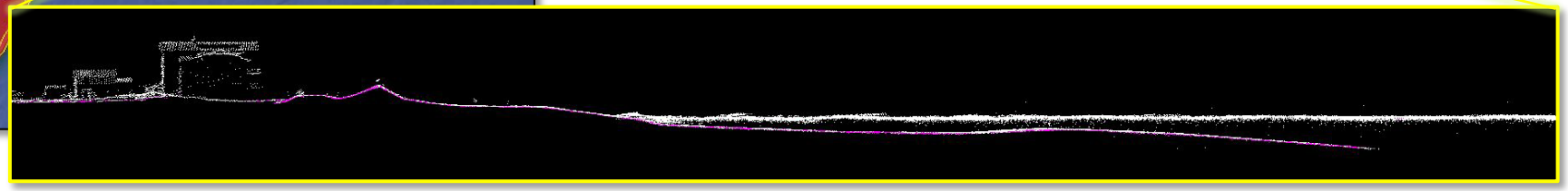
National Oceanic and Atmospheric Administration

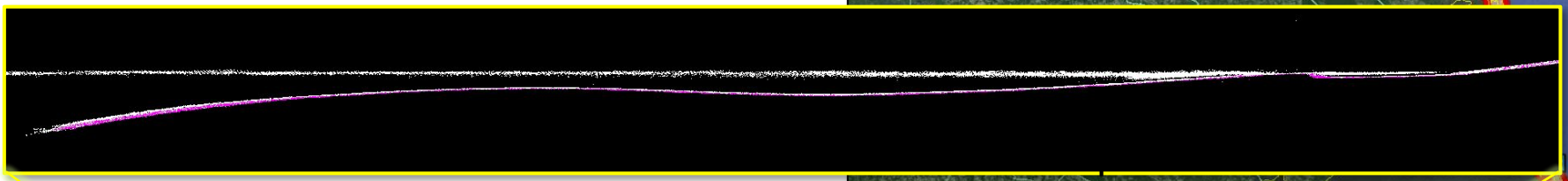


6 meters at deepest extent

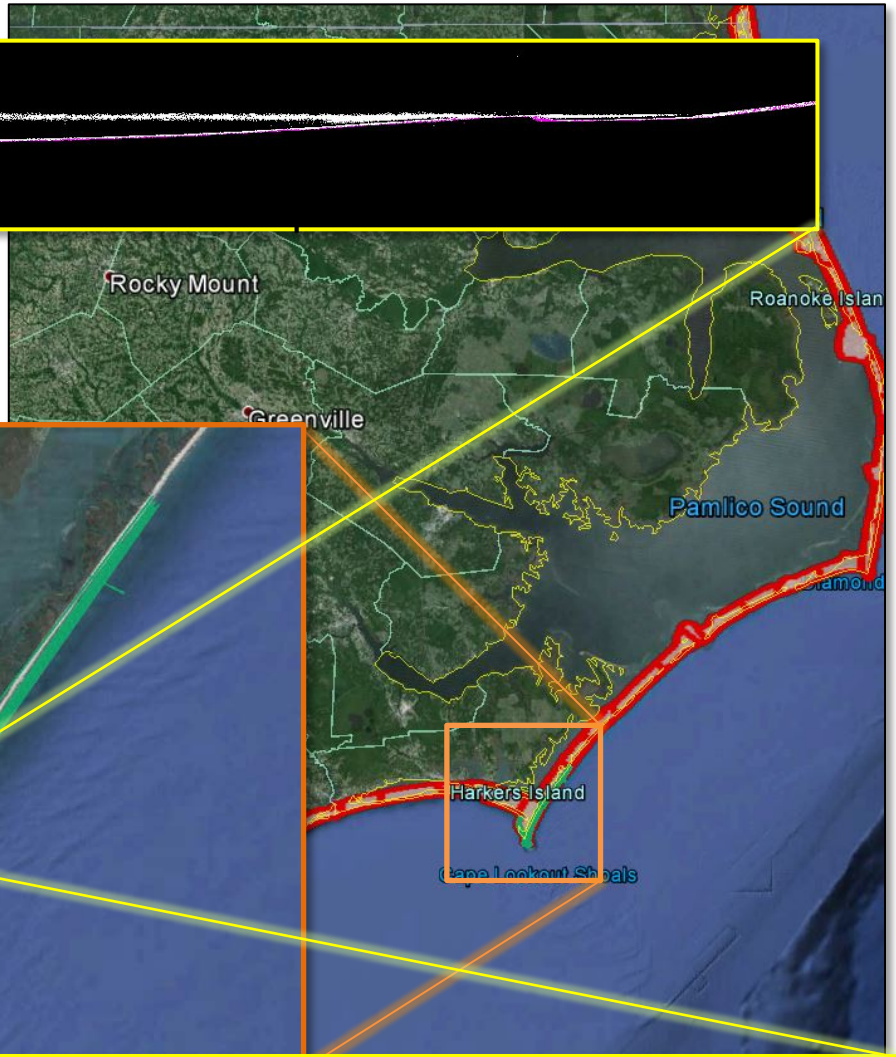


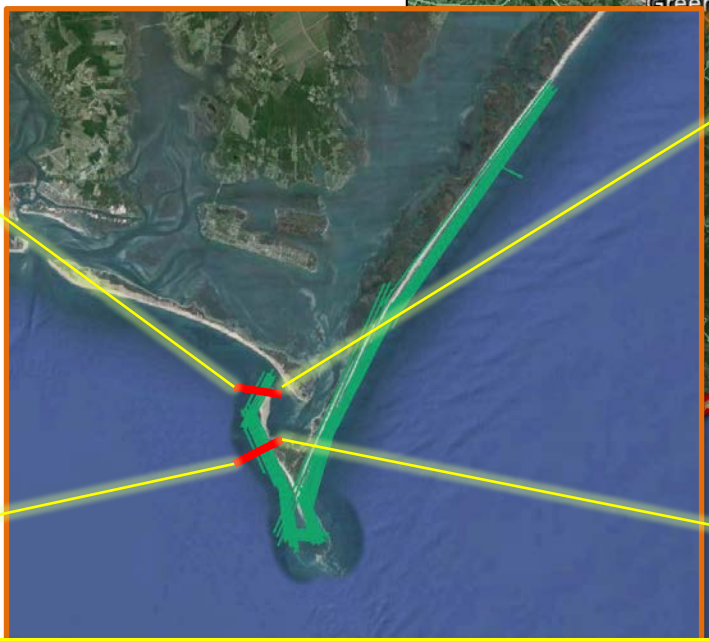
6.5 meters at deepest extent



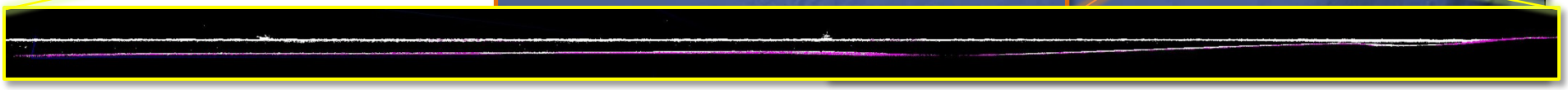


7 meters at deepest extent





11 meters at deepest extent, bathy extending nearly 800 meters offshore

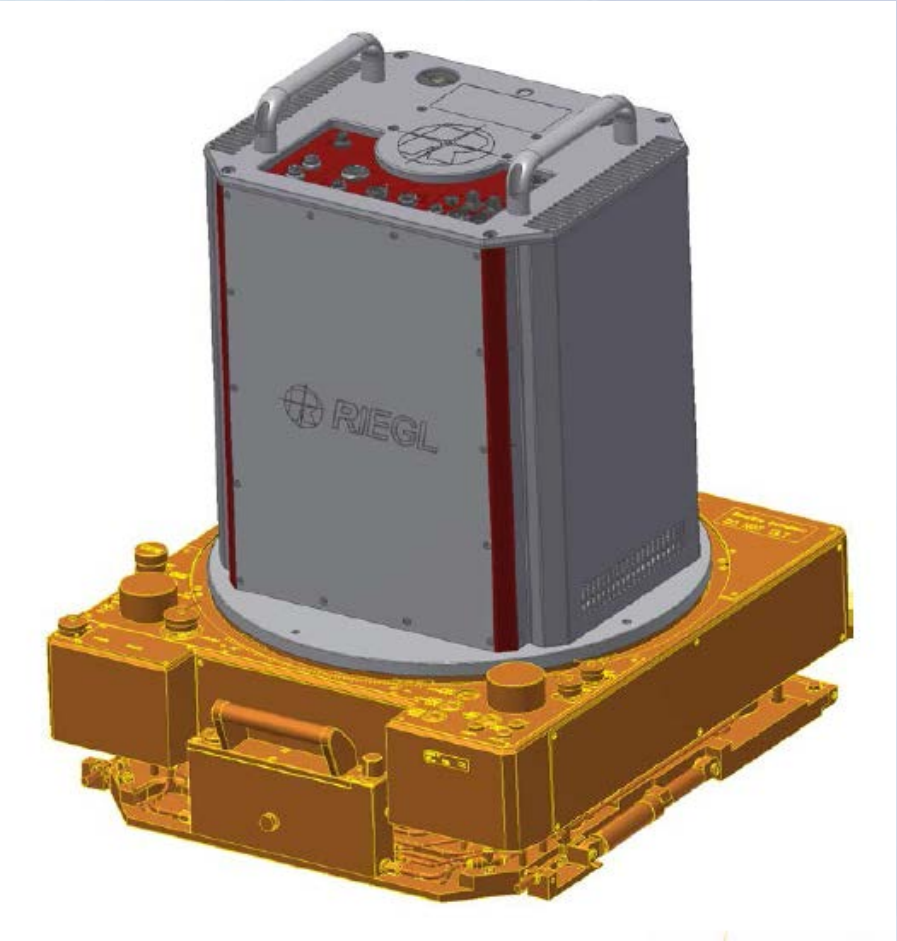


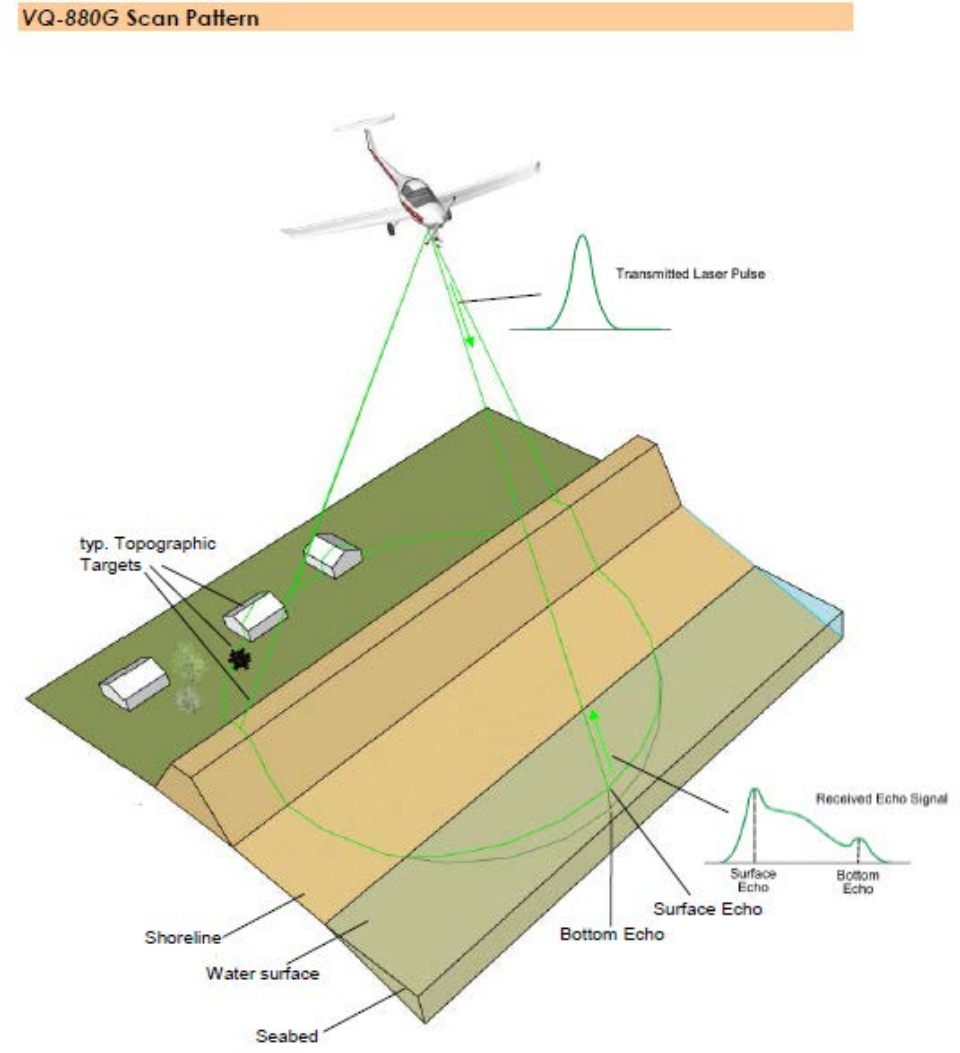
Current Delivery Schedule

ID	Project Name	Days	Start	End	1-Sep	1-Oct	1-Nov	1-Dec	1-Jan	1-Feb	1-Mar	1-Apr	1-May	1-Jun	1-Jul	1-Aug	1-Sep	1-Oct	1-Nov	1-Dec	1-Jan	1-Feb
1.0	**NGS Topobathy lidar**	**600**	**16-Aug**	**8-Apr**																		
1.1	Signed Task Order from NOAA	1	16-Aug	17-Aug																		
1.1.1	Kickoff Meeting	35	16-Aug	20-Sep																		
1.2	**ACQUISITION**																					
1.2.1	Mobilization	120	21-Nov	21-Mar																		
1.2.2	Block 1 Acquisition	60	21-Nov	20-Jan																		
1.2.3	Block 2 Acquisition	60	20-Jan	21-Mar																		
1.2.4	Block 3 Acquisition	60	21-Mar	20-May																		
1.2.5	Block 4 Acquisition	60	5-Apr	4-Jun																		
1.2.6	Checkpoint Survey	60	1-Apr	31-May																		
1.3	**PROCESSING**																					
1.3.1	Pilot area delivery	48	1-Feb	21-Mar																		
1.3.2	Pilot area shoreline delineation (NOAA)	21	22-Mar	12-Apr																		
1.3.3	Pilot area shoreline attribution - FINAL pilot area delivery	30	13-Apr	13-May																		
1.3.1	All Calibrated (unrefracted) Data Delivered to Dewberry	150	1-Feb	1-Jul																		
1.3.2	Block 1 processing (except shoreline attribution)	120	15-Feb	15-Jun																		
1.3.3	Block 2 processing (except shoreline attribution)	120	15-Mar	13-Jul																		
1.3.4	Block 3 processing (except shoreline attribution)	120	1-Jun	29-Sep																		
1.3.5	Block 4 processing (except shoreline attribution)	120	28-Jun	26-Oct																		
1.3.6	Shoreline delineation by NOAA for Block 1	45	15-Jun	30-Jul																		
1.3.7	Shoreline attribution for Block 1	30	1-Jul	31-Jul																		
1.3.8	Shoreline delineation by NOAA for Block 2	45	13-Jul	27-Aug																		
1.3.9	Shoreline attribution for Block 2	30	27-Aug	26-Sep																		
1.3.10	Shoreline delineation by NOAA for Block 3	45	29-Sep	13-Nov																		
1.3.11	Shoreline attribution for Block 3	30	14-Nov	14-Dec																		
1.3.12	Shoreline delineation by NOAA for Block 4	45	27-Oct	11-Dec																		
1.3.13	Shoreline attribution for Block 4	30	12-Dec	11-Jan																		

National Oceanic and Atmospheric Administration

Upgrade to VQ-880G





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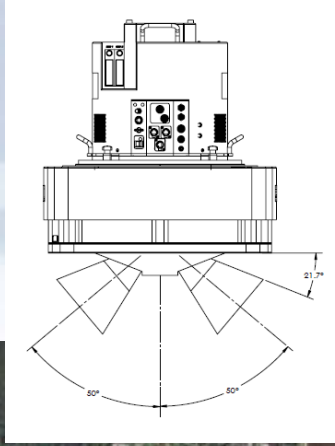
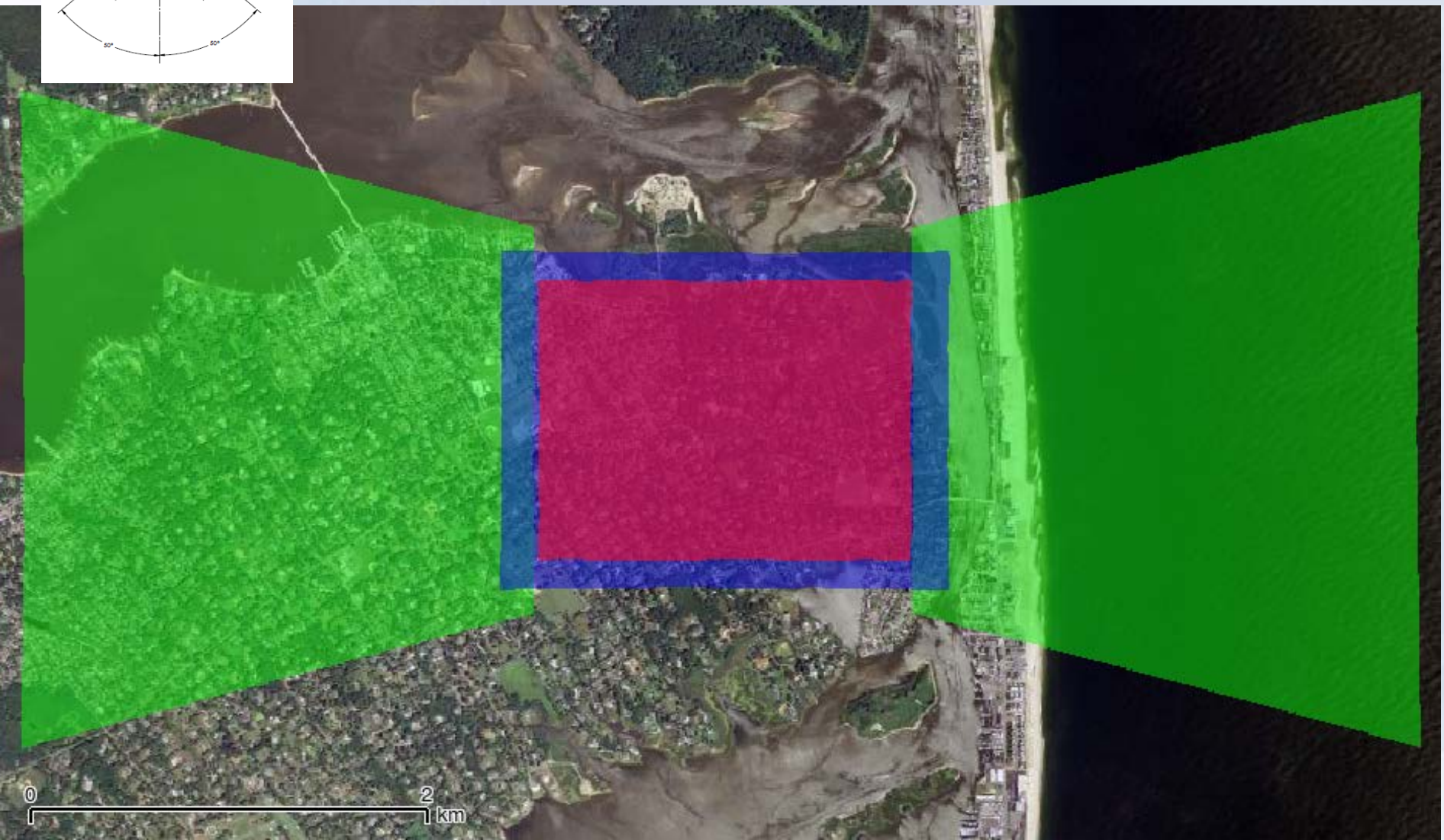
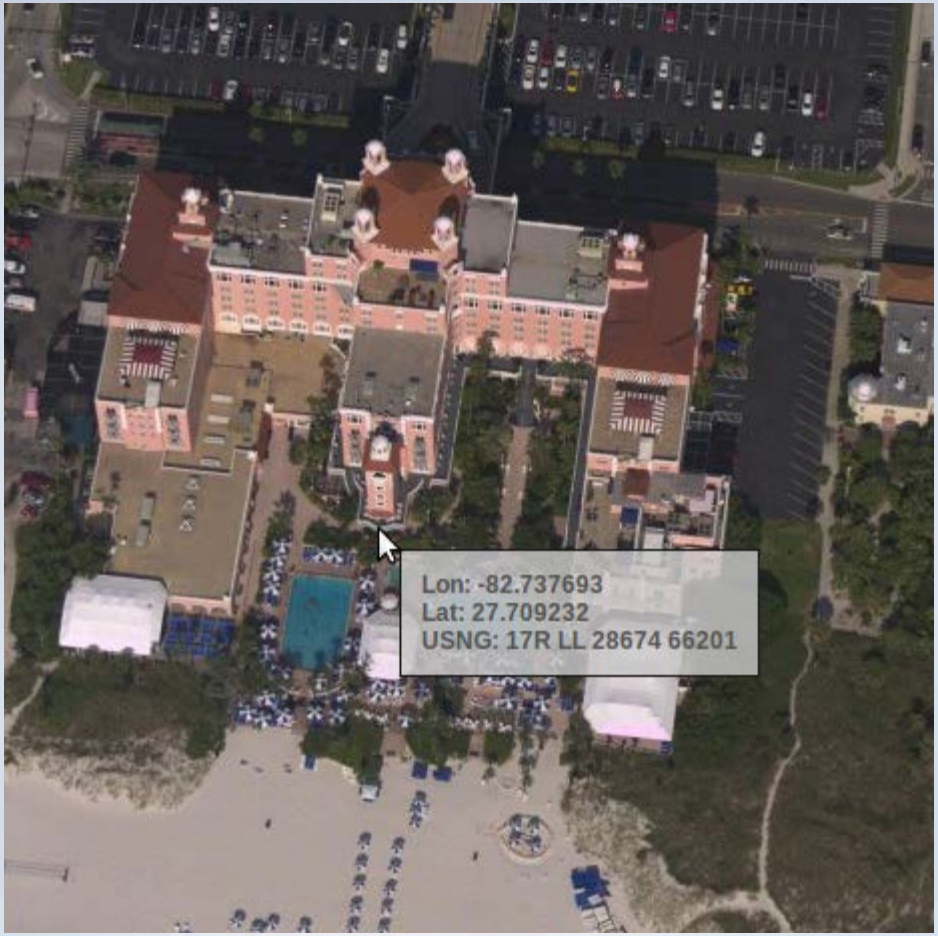


DSS (cameras) Upgrade



ER Mission Profile(s) for Oblique Imagery

- 1500ft-3500ft (450-1067 m) AGL
- 60 mm lens
- Average GSD ~0.05 m - ~0.15m
- Individual Images with embedded GCP's
- Small, fast *and* geo-referenced
  - JPEG compression
  - Pyramids
  - GeoTiff
- Enhanced flexibility
- Multiple perspectives
- Drag and drop in ESRI
- In browser coordinate display
  - Lat/Lon and USNG



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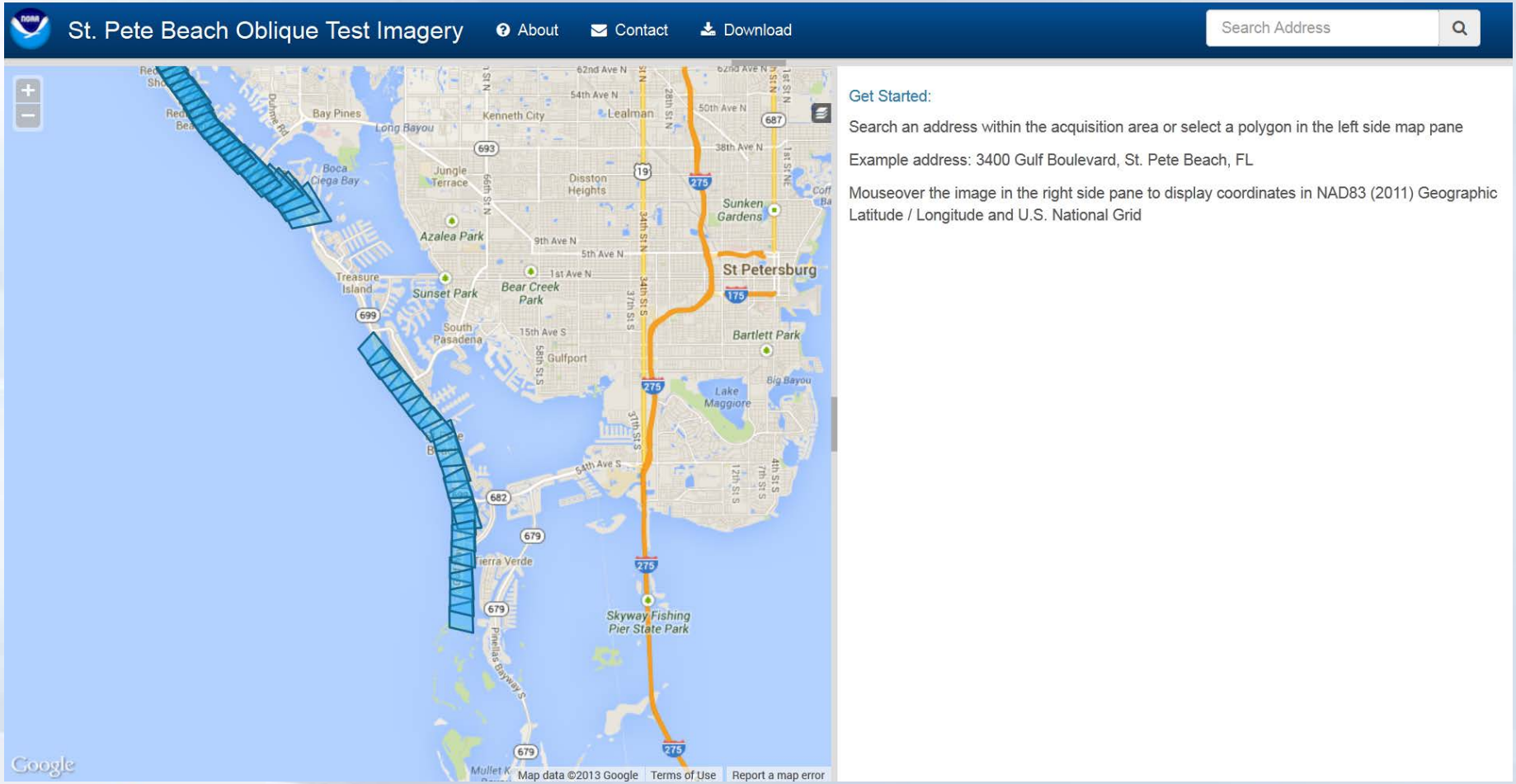
In Browser Image Selection



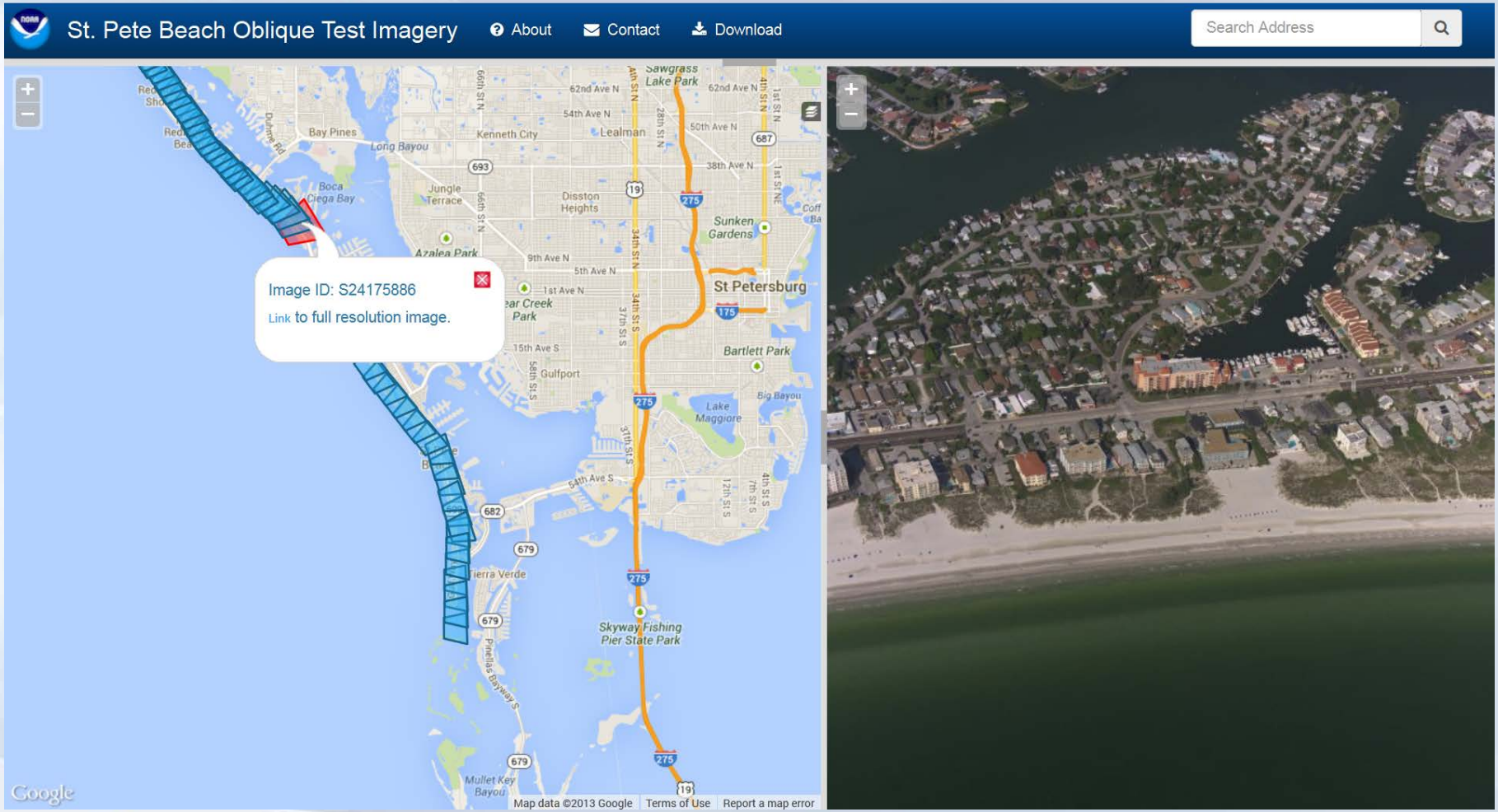
National Oceanic and Atmospheric Administration

http://storms.ngs.noaa.gov/storms/obliquedemo/

http://storms.ngs.noaa.gov/storms/hx14Test/oblique

http://storms.ngs.noaa.gov/storms/hx14Test

In Browser Image Selection



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http://storms.ngs.noaa.gov/storms/obliquedemo/

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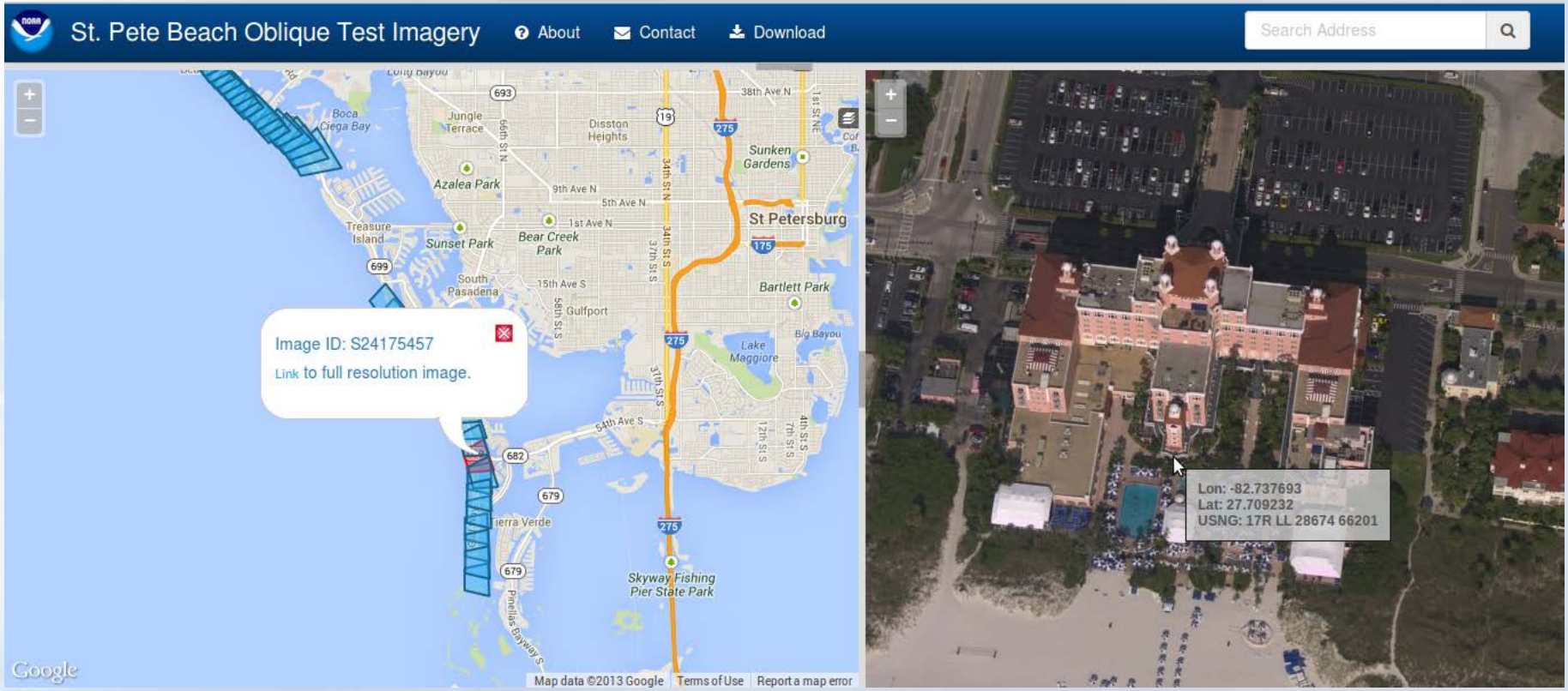

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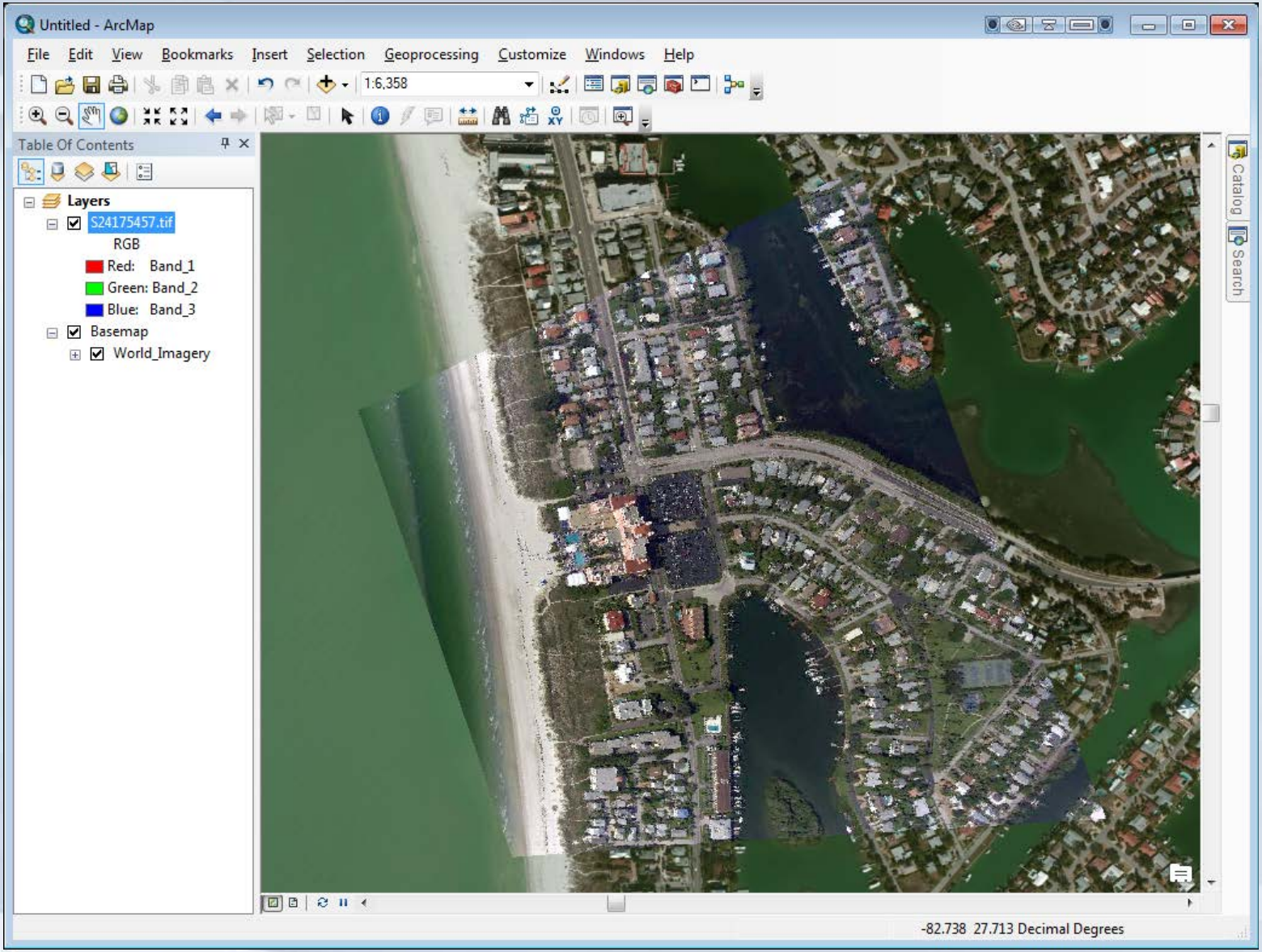
http://storms.ngs.noaa.gov/storms/obliquedemo/

http://storms.ngs.noaa.gov/storms/hx14Test/oblique

http://storms.ngs.noaa.gov/storms/hx14Test

ESRI ArcMap



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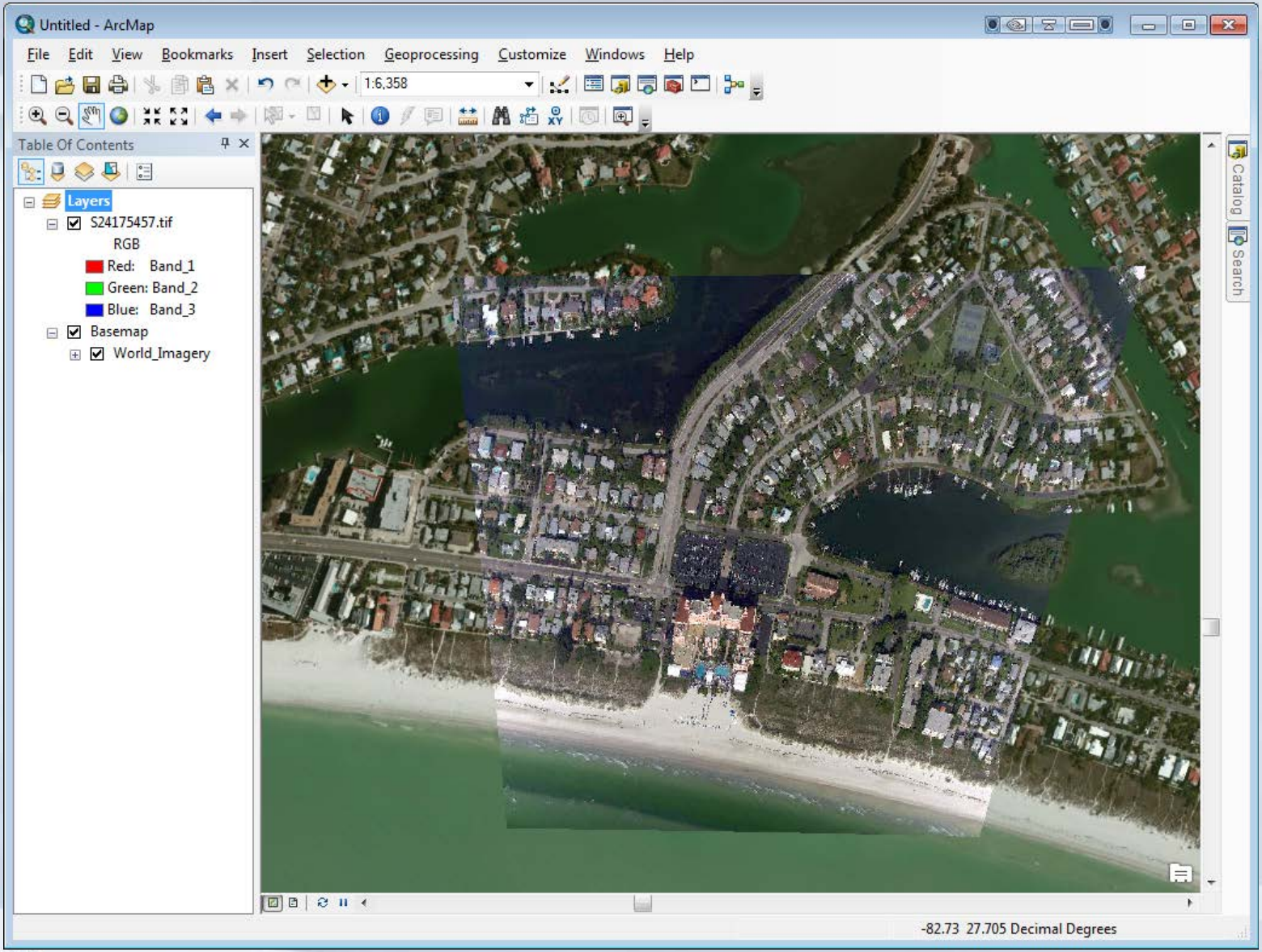
ESRI ArcMap



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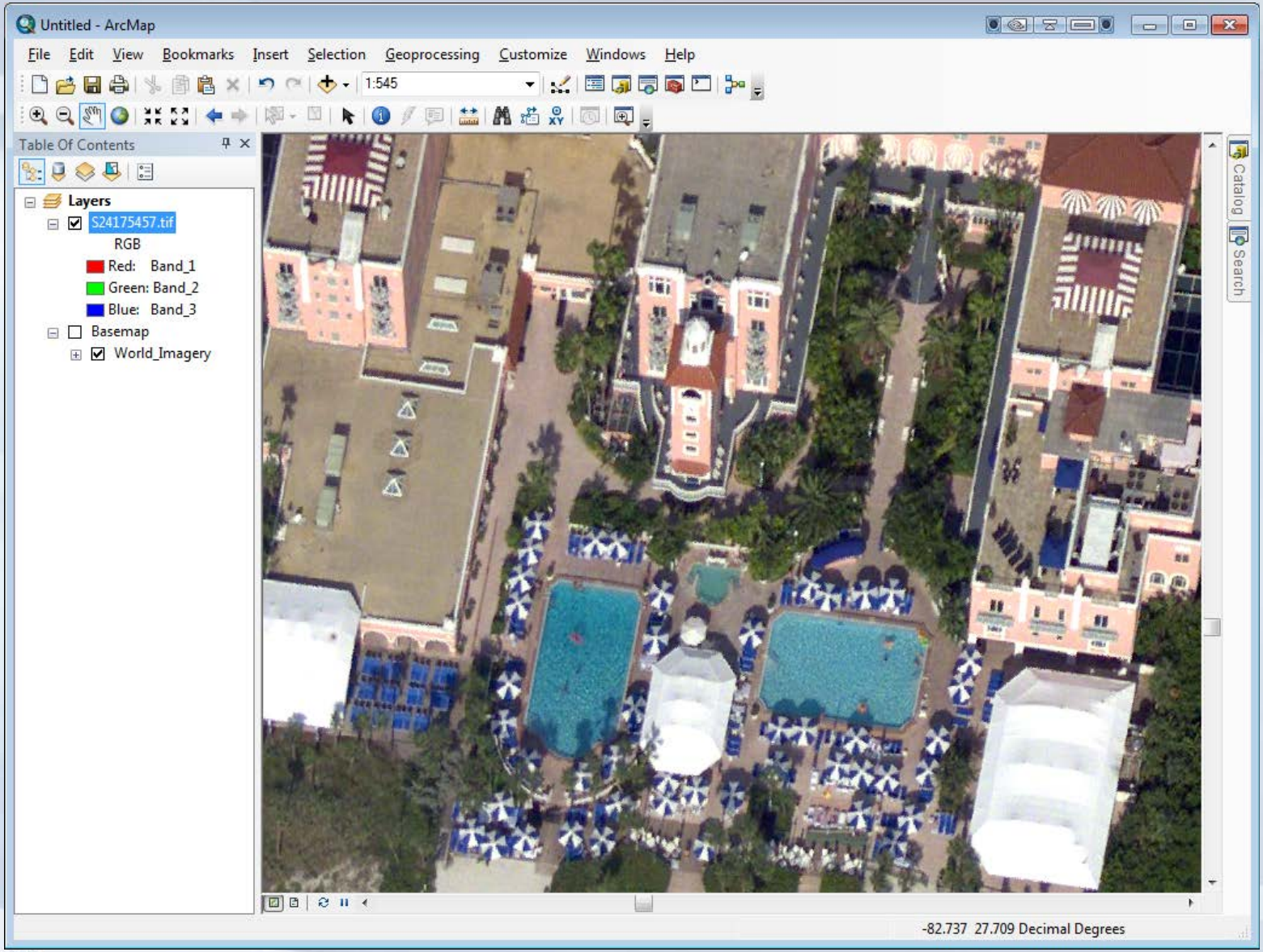
ESRI ArcMap



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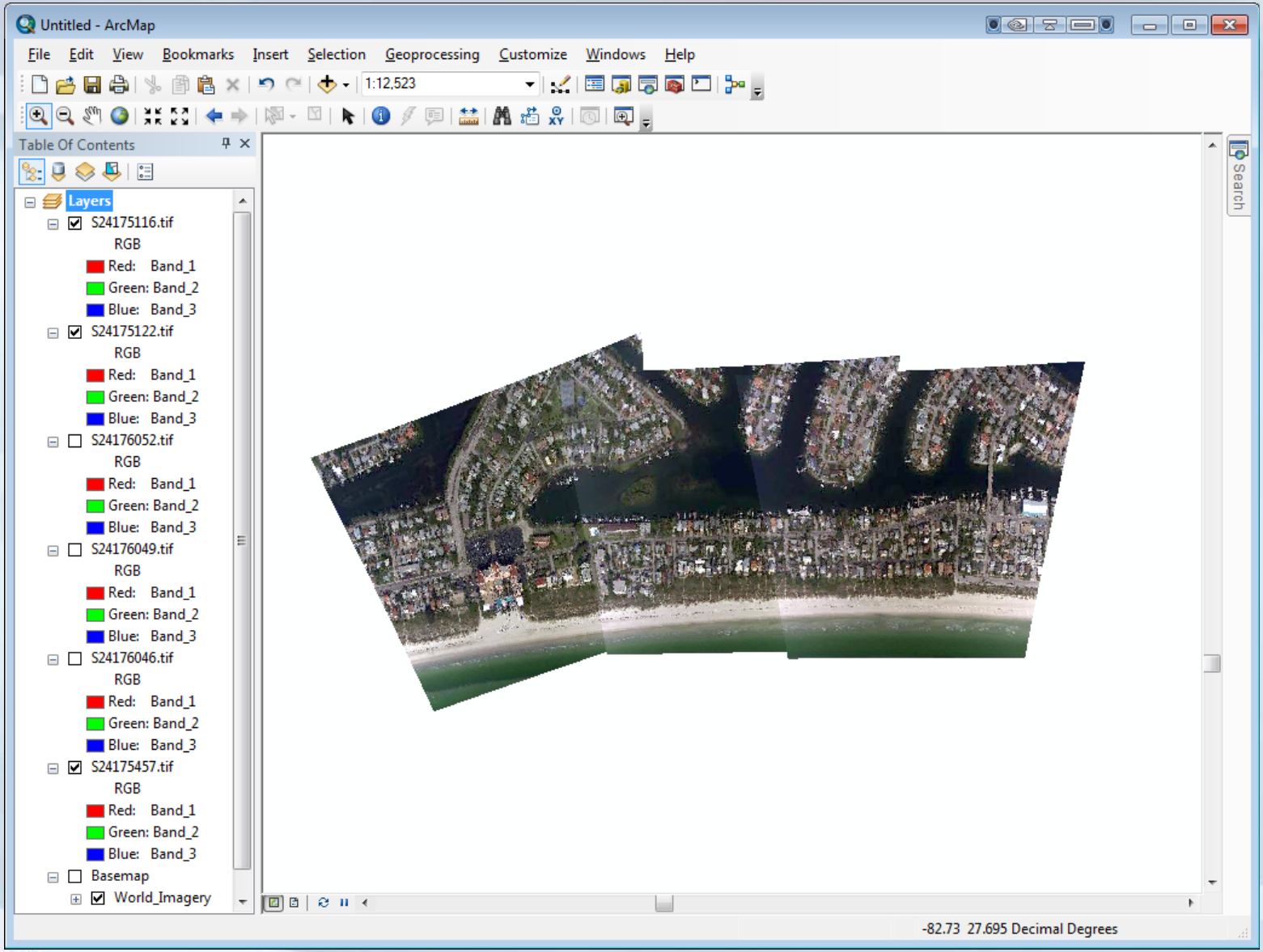
ESRI ArcMap



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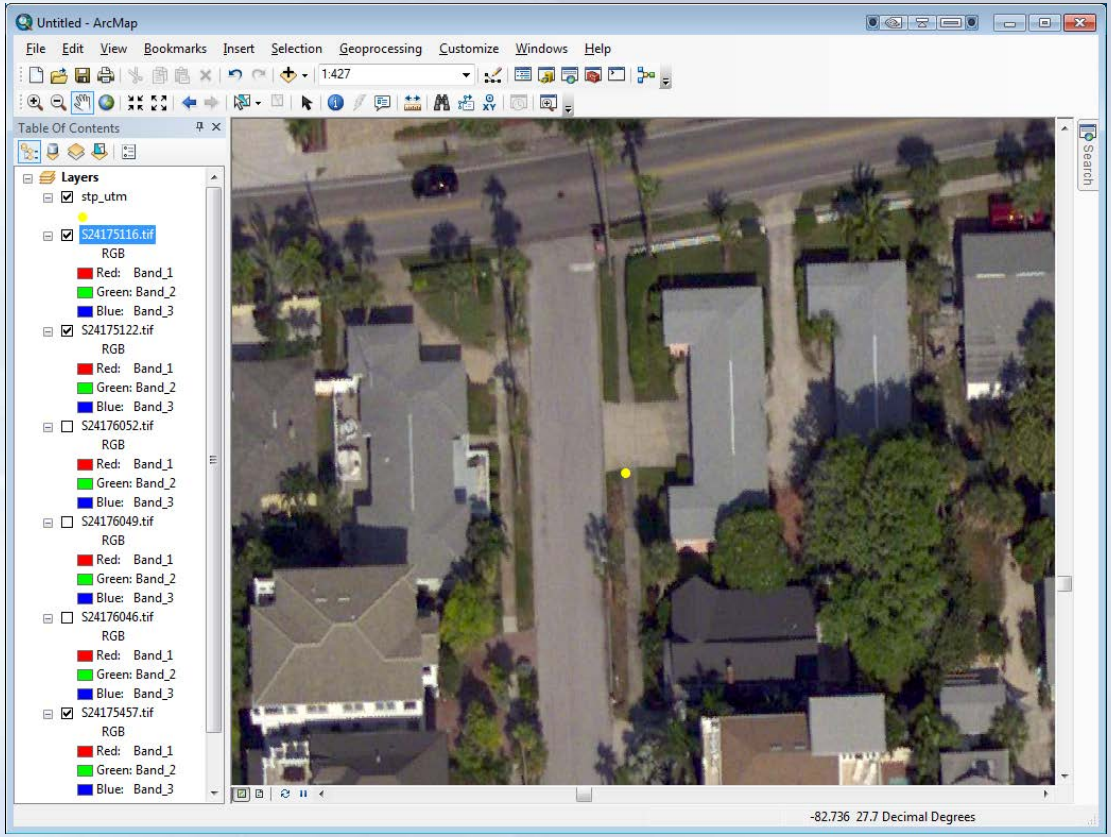
ESRI ArcMap Accuracy Check



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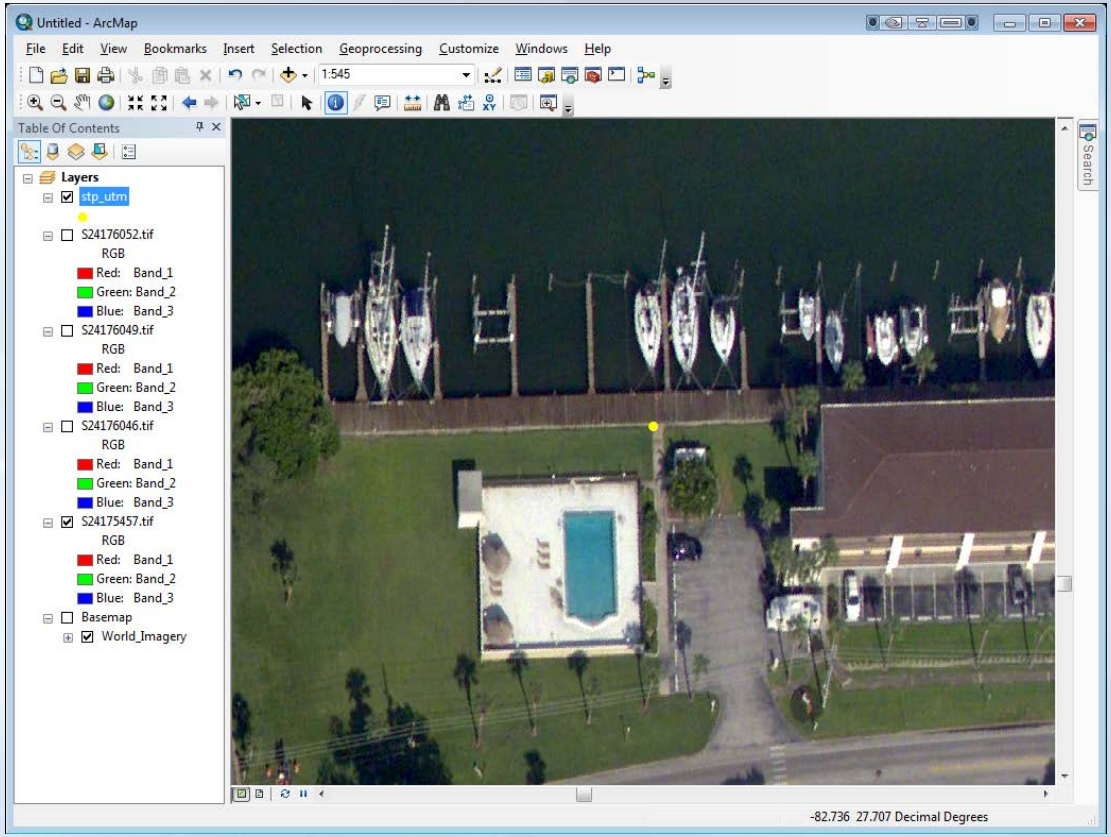
ESRI ArcMap Accuracy Check



National Oceanic and Atmospheric Administration

FY15 President Budget

Navigation, Observations and Positioning: Shoreline TopoBathy LIDAR Data: NOAA requests an increase of $4,000,000 to build upon its coastal LIDAR survey efforts. Working with interagency partners, NOAA will expand the national dataset to enhance navigation safety, coastal storm preparedness, and stewardship of ecological resources.

***Supported in both the House and Senate FY15 mark ups!!**

In Closing:

- **NOAA continues pursuing and advancing topobathy lidar technology as well as complimentary technologies**
  - **Shoreline and shallow bathymetry for nautical charts and IOCM multi use**
- **Sandy supplemental work will broaden the capability of the private sector to collect this data as well as feed new and unknown applications**
- **FY15 President's Budget plus up, if passed, will further support the overall mission of NOAA and JALBTCX to realize the National Coastal Mapping Strategy**