



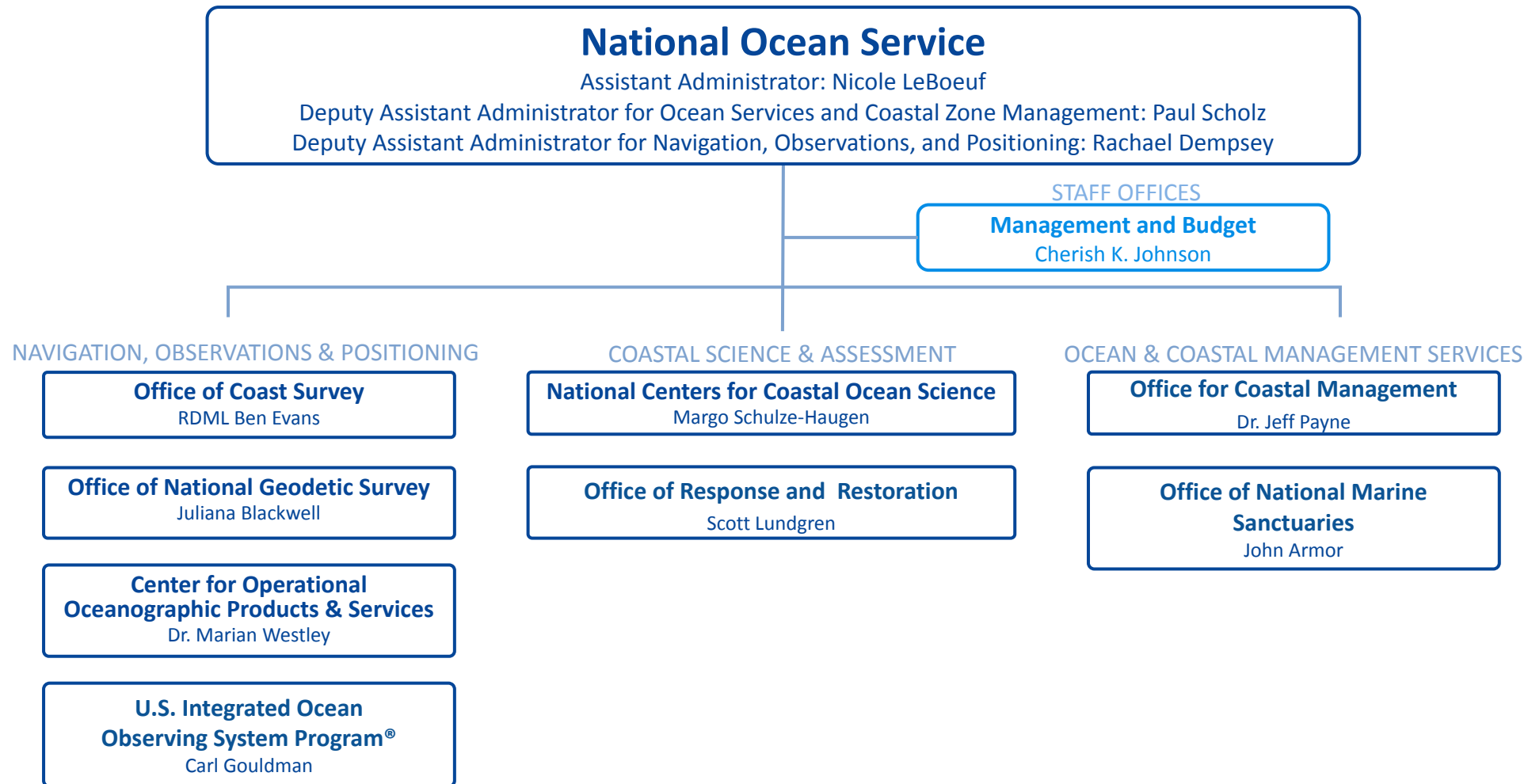
Marine Navigation and Port Recovery

Kyle Ward - 20 May 2024



Office of Coast Survey

National Oceanic and Atmospheric Administration

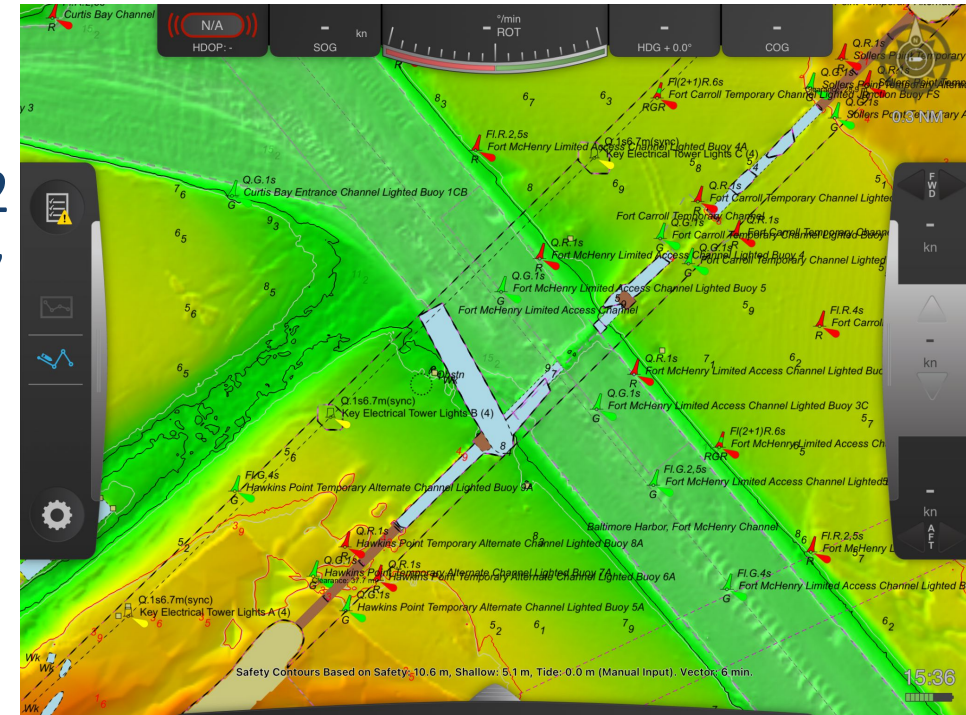


- Some Significant Storms

- Hurricane Katrina – New Orleans - 2005
- Hurricane Sandy – New York New Jersey - 2012
- Hurricane Maria – Puerto Rico and USVI - 2017
- Hurricane Harvey – Houston Galveston - 2017

- Other Responses

- TWA Flight 800 – Long Island Sound - 1996
- JFK Jr. Plane Crash – Martha’s Vineyard - 1999
- Egypt Air Flight 990 – New England - 1999
- Deep Water Horizon – Gulf of Mexico – 2010
- Francis Scott Key Bridge – Baltimore Harbor - Ongoing



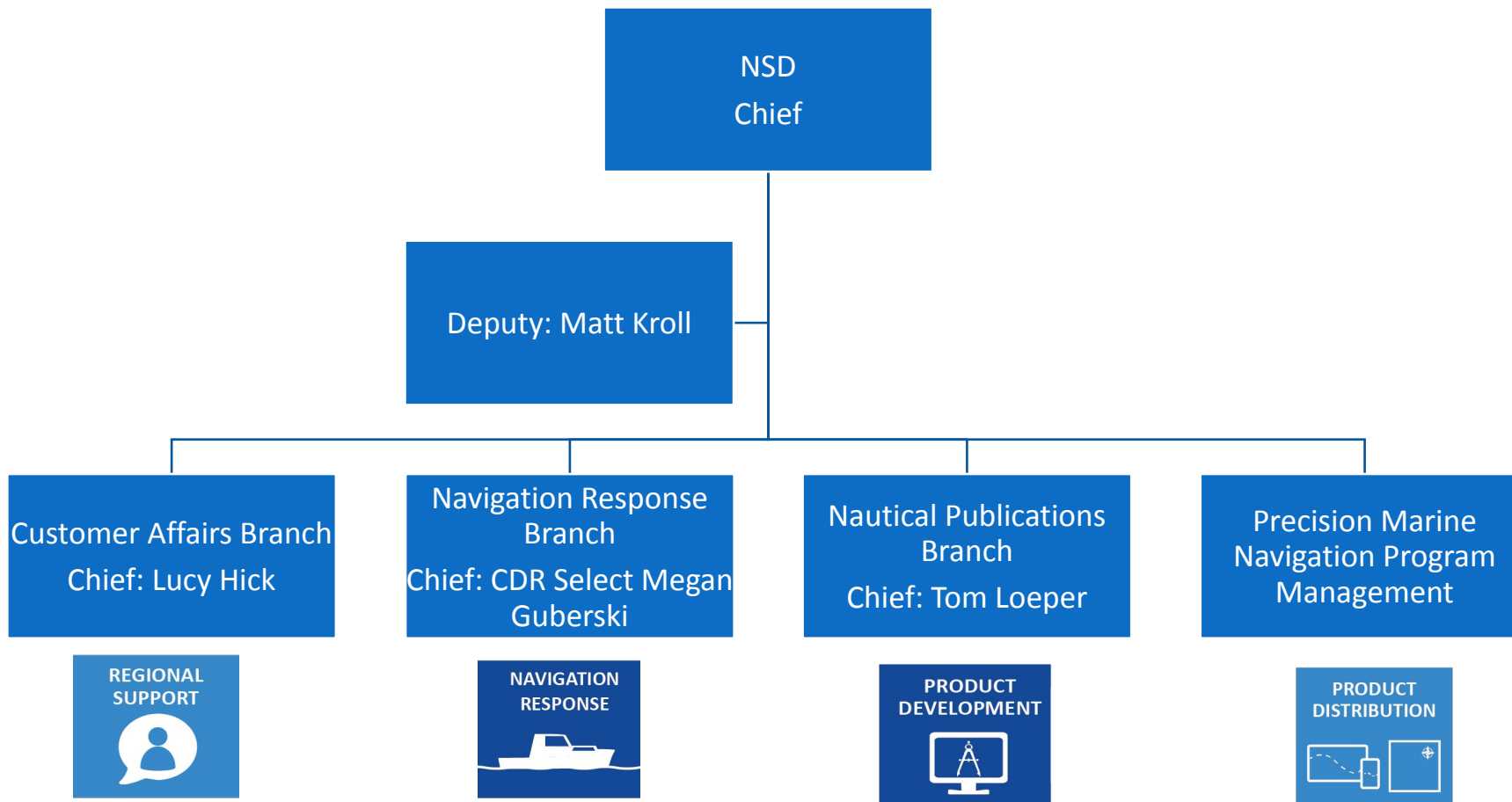
Hurricane Response in 2020

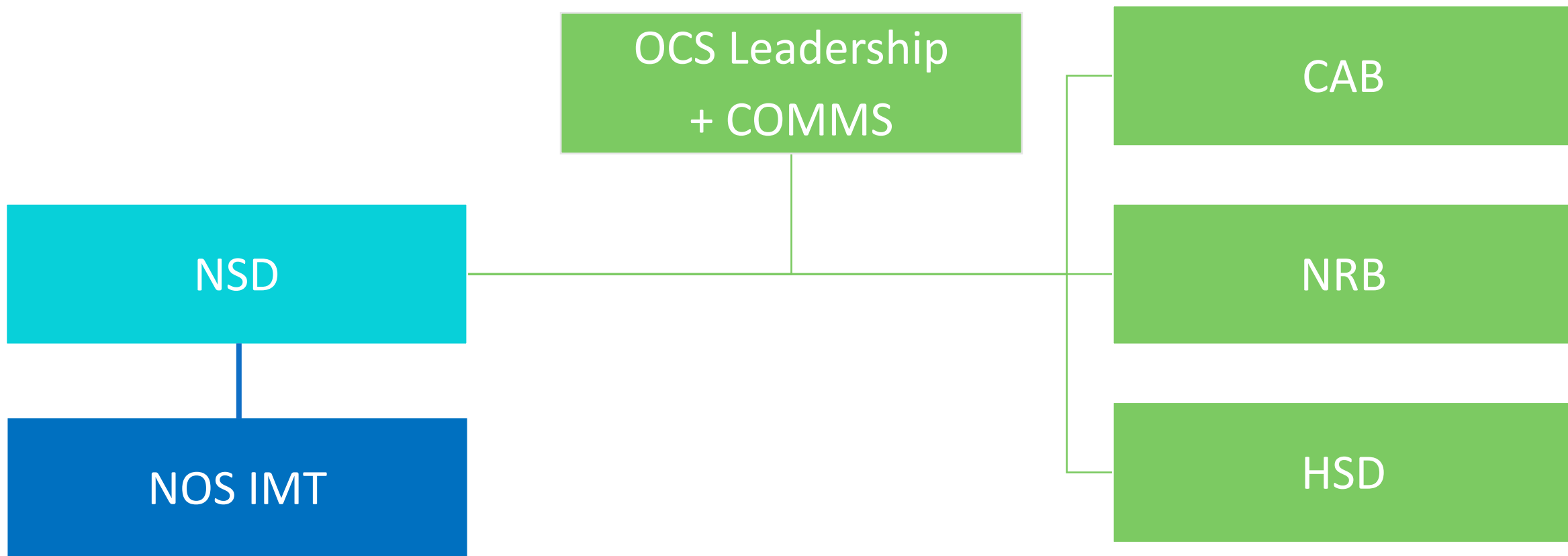
- Responded to four Storms
 - Hurricane Laura – Galveston and Lake Charles
 - Hurricane Sally – Pensacola
 - Hurricane Delta – Lake Charles
 - Hurricane Zeta – Gulfport

Challenges and Lessons Learned

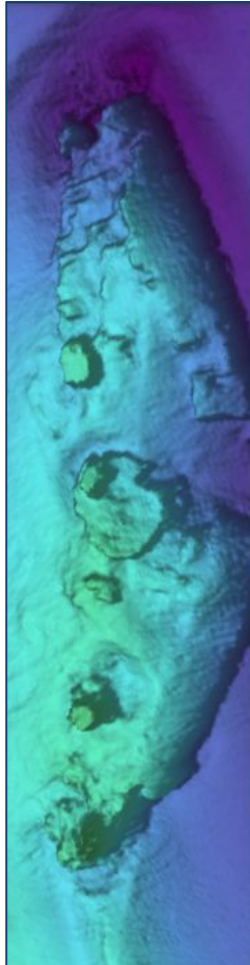
- Implemented Disaster Response Blanket Travel Authorizations to cover the entire season
 - NOAA has expanded it to FY22
- Implemented COVID-19 testing and increased safety protocols
 - PPE, Social Distancing
 - Test 72 hours prior to landfall
 - Test after response
 - Offered SIP travel to teams
- RV Rentals due to lack of local lodging
- Additional Processing teams to reduce crew fatigue

NSD Organization





COTP Guide




Office of Coast Survey
Navigation Services Division

A Captain of the Port guide to NOAA
emergency hydrographic survey

Version 1.1

May 2021



Office of Coast Survey
National Oceanic and Atmospheric Administration

Mobile Integrated Survey Team (MIST)

Coast Survey maintains two mobile integrated survey team kits for deployment on vessels of opportunity, such as a USCG trailer-able aids to navigation boat. The MIST is a modular system that can be used to collect seafloor imagery and depth soundings. The system includes a mounting pole designed to fit a wide range of vessels. The MIST system fits in the back of a pickup truck and can be shipped overnight.



Figure 4: MIST installed on a trailer-able aids to navigation boat.



Figure 5: Portside view of installed MIST.

3. FIELD UNIT SPECIFICATIONS AND REQUIREMENTS

Navigation Response Team vessel specifications

- Length: 33 feet
- Beam: 8.5 feet
- Draft: 2 feet
- Air Draft: 10 feet
- Fuel: 160 gallons gasoline
- Crew: 3-4
- Power: 35 amps

Requirements

- Berthing: 3-4 if hotels are not available
- Adequate ramp
- Gasoline, if no public supply available
- Room to store trailer and two vehicles
- Food, if response extends a significant amount of time

Bay Hydro II vessel specifications

- Length: 57 feet
- Beam: 24 feet
- Draft: 6 feet
- Air Draft: 28 feet
- Fuel: 1200 gallons diesel (2-inch fill port)
- Crew: 3-4
- Power: 50 amp, 250 volts

Requirements

- Berthing: 3-4 if hotels are not available
- Diesel, if no public supply available
- Food, if response extends a significant amount of time

Mobile Integrated Survey Team specifications

- 1300-pounds of equipment in 22 Pelican cases
- 1 REMUS 100 ~125 pounds
- 3 small Autonomous Survey Vessels ~150 pounds each

Requirements

- Vessel of opportunity – preferably a trailer-able aids to navigation boat
- 110-volt power or gasoline supply for generator
- Berthing: 3-4 depending if hotels are not available
- Food, if response extends a significant amount of time
- Partial canopy on vessel of opportunity to protect electronics from weather

The Public







Coast Survey

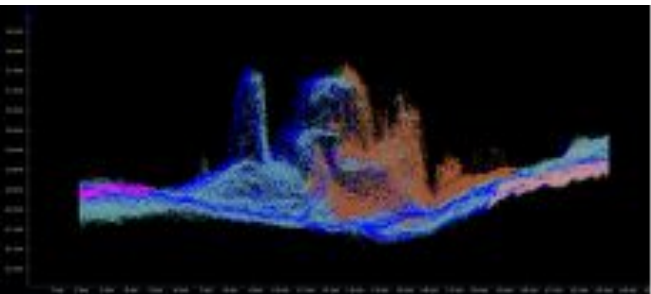
Survey Operations



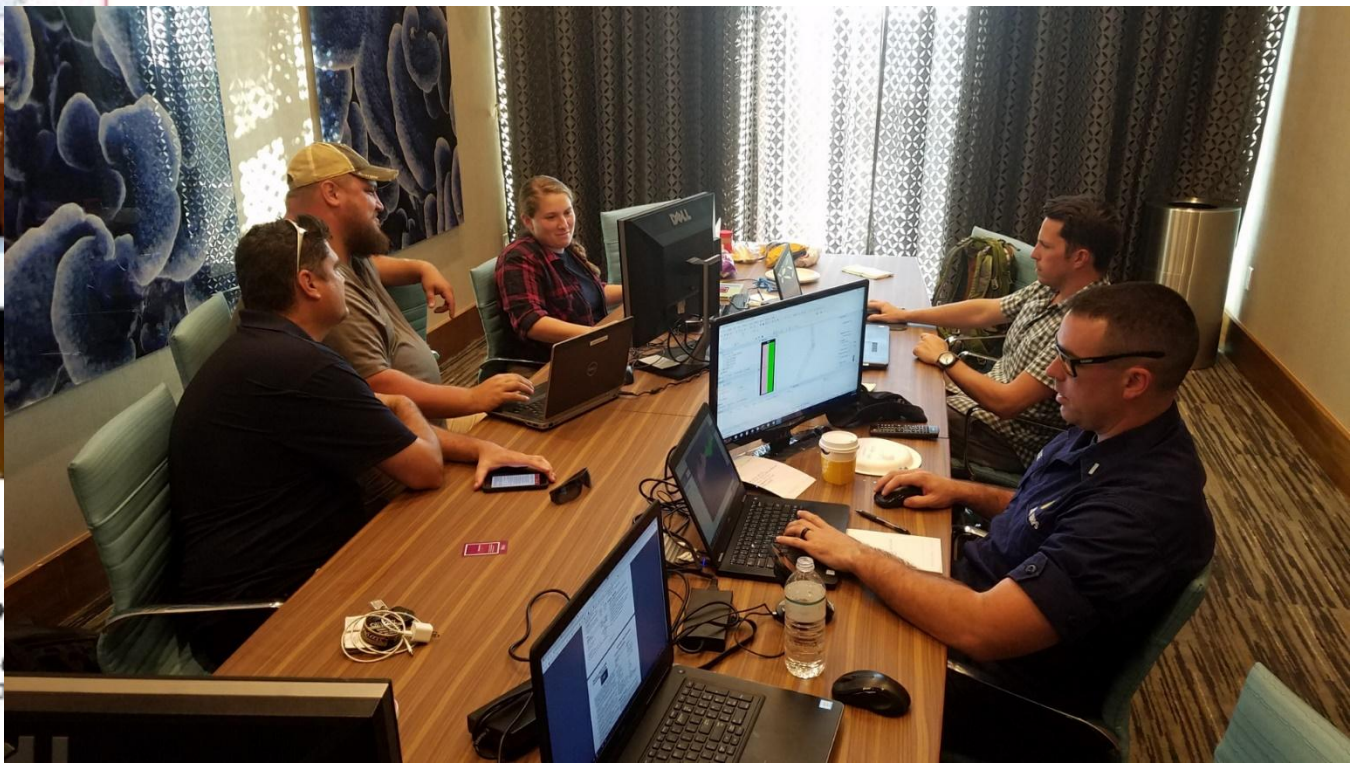
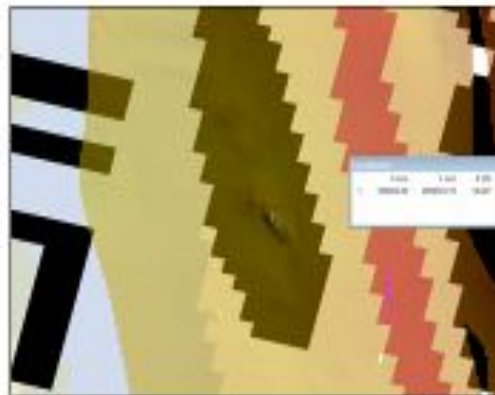
Office of Coast Survey

National Oceanic and Atmospheric Administration

On the Fly Reporting and Night Processing



Length: 24ft
 Width: 7ft
 Contact Height: 4ft
 Least Depth: 17ft
 Coordinates: 25-56-14.450089N, 080-07-53.472089W



Non-Dangerous wreck discovered on edge of ICW. Least depth of 17 feet poses no threat to navigation.



NATIONAL OCEANIC AND
 ATMOSPHERIC ADMINISTRATION
 NATIONAL OCEAN SERVICE

Project:	F00778	Sounding Units:	Feet
Survey:	S-H912-NRT2-19	Sounding Datum:	MLLW
State:	FL	Horizontal Datum:	NAD 83 UTM 17 N
Locality:	MIA to FTL	Chart Number:	11467
Sublocality:	Dumbfounding Bay		
Survey Scale:	1:10,000		

2017 Atlantic Hurricane Season

Office of Coast Survey

1 NOAA's Office of Coast Survey Response Efforts

The 2017 Atlantic hurricane season was powerful, with the strongest storms occurring consecutively from late August to early October. The sequential magnitude of four hurricanes in particular—Harvey, Irma, Maria, and Nate—made response efforts challenging for NOAA's Office of Coast Survey.

In the wake of a disaster, Coast Survey is the federal leader in emergency hydrographic response. Before and after a storm event or other disaster, Coast Survey's regional navigation managers and navigation response teams (NRT) work with other NOAA offices, port authorities, maritime industries, the U.S. Coast Guard (USCG),

2 Hurricane Harvey

3 Hurricane Irma

4 Hurricane Maria

5 Hurricane Nate



Mobile Survey Team on Vessel of Opportunity

Mobile Survey Team
Hurricane Irma Response
Key West, FL
Platform: USCG TANB.

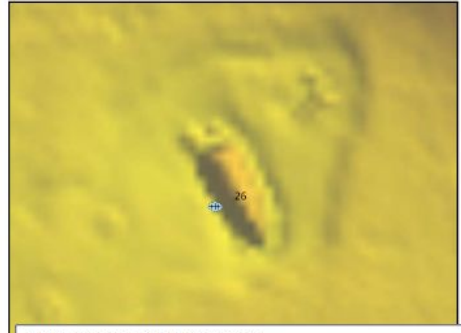
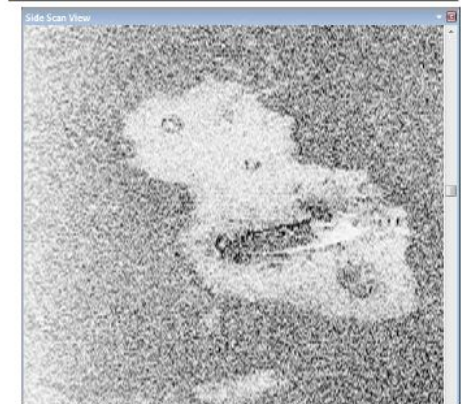




NOAA Ship Thomas Jefferson (S-222)
 Supplemental Contact Information
 NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
 NATIONAL OCEAN SERVICE - OFFICE OF COAST SURVEY

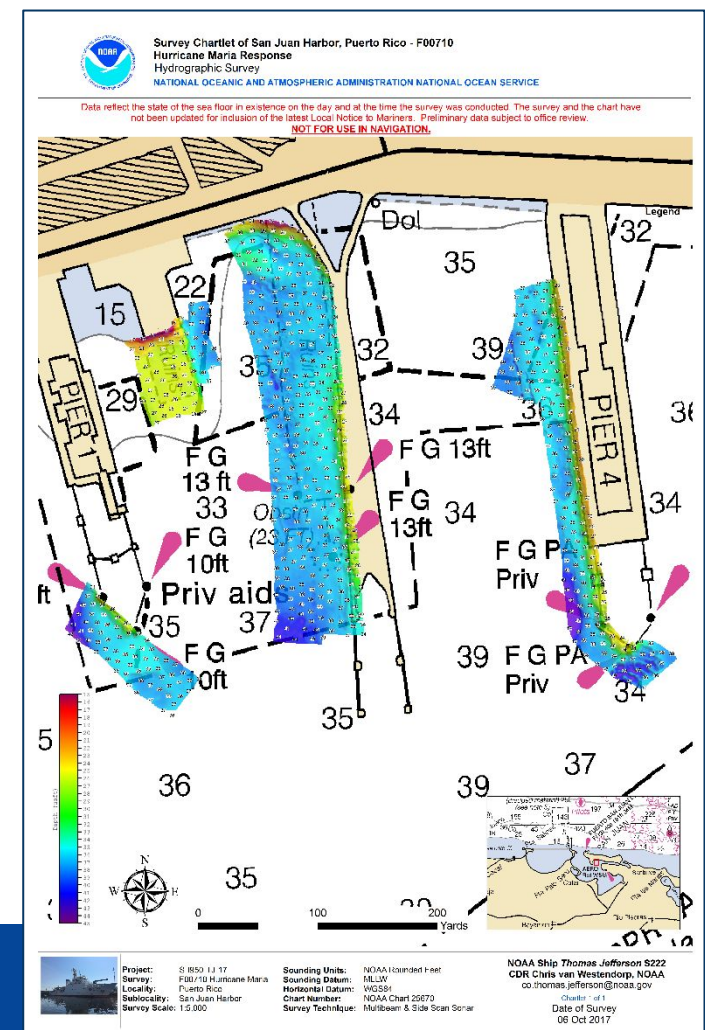
Contact:
 Commanding Officer / Chief of Party
 CDR Chris van Westendorp, NOAA
 co.thomas.jefferson@noaa.gov



Date:	4 October 2017	Comments:	Uncharted wreck near Cay Bay inside designated "A" anchorage.	Additional media / information:
Latitude:	18.336648 N	 MBES coverage of uncharted wreck		 SSS image of wreck.
Longitude:	64.93101 W			
MBES least depth:	26 ft			
SSS contact height:	3.5 ft			
Contact dimensions:	22 x 9 ft			

PRELIMINARY PRODUCT - FOR USCG & NOAA DECISIONAL USE ONLY - NOT FOR USE IN NAVIGATION

Example of a contact report and digital terrain models delivered to the USCG and other stakeholders a day after acquisition.



Office of Coast Survey
 National Oceanic and Atmospheric Administration

Project: S-1950-TJ-17
 Survey: F00705
 Locality: US Virgin Islands
 Sublocality: Charlotte Amalie, St Thomas

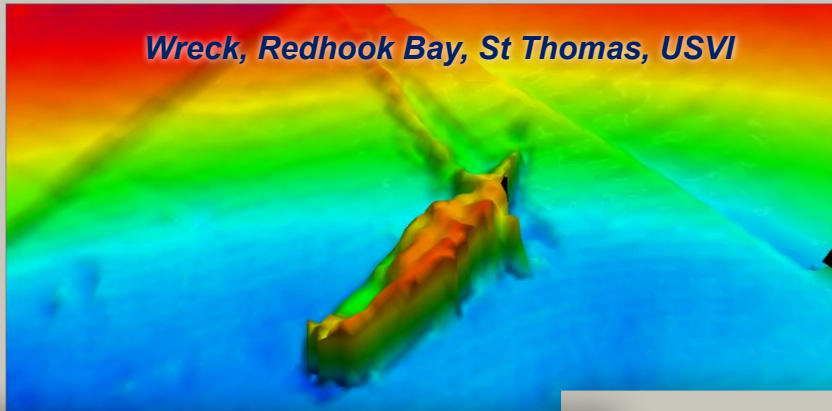
Chart Number: 25649
 Sounding Units: Feet (NOAA rounded)
 Datum: MLLW
 Date of survey: 3-4 October, 2017

NOAA Ship Thomas Jefferson S222
 CDR Chris van Westendorp, NOAA
 co.thomas.jefferson@noaa.gov

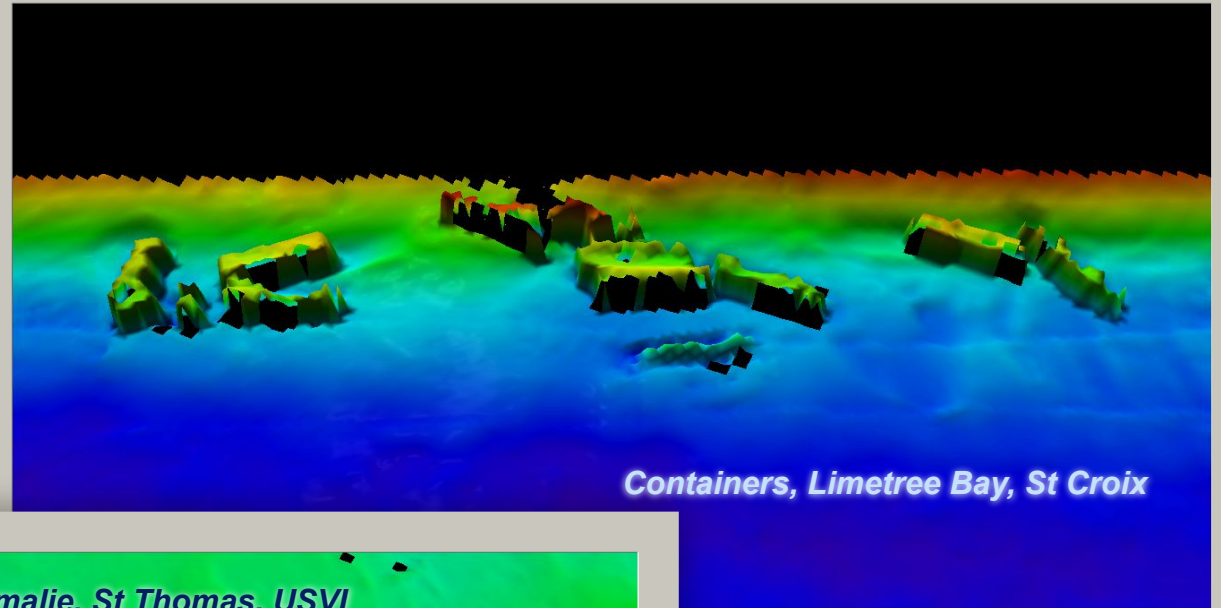
Chart: 141
 Date of Survey: 06 Oct 2017



Some Obstructions found in the multibeam and sidescan sonar data:



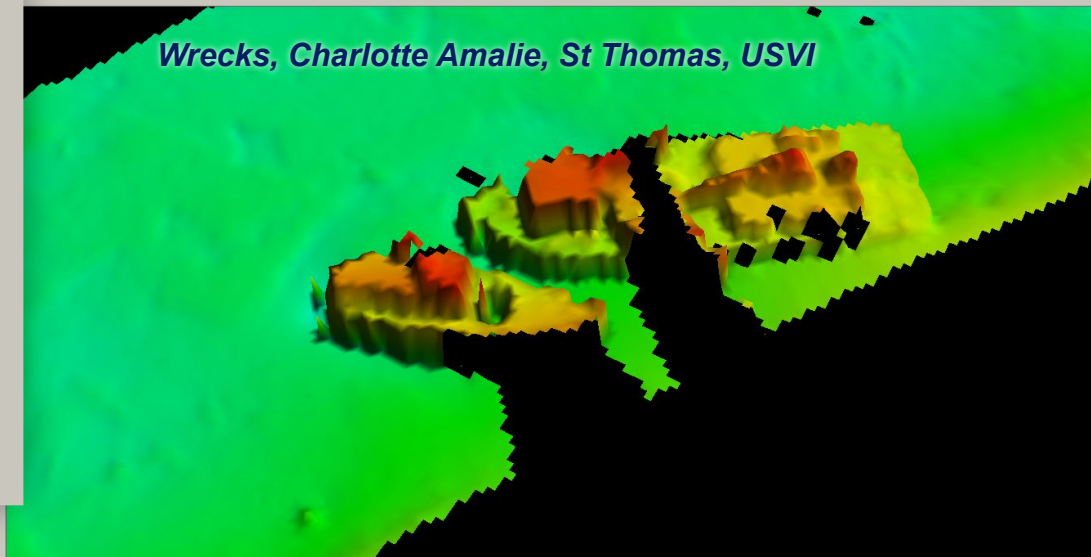
Wreck, Redhook Bay, St Thomas, USVI



Containers, Limetree Bay, St Croix



Wreck, Charlotte Amalie, St Thomas, USVI

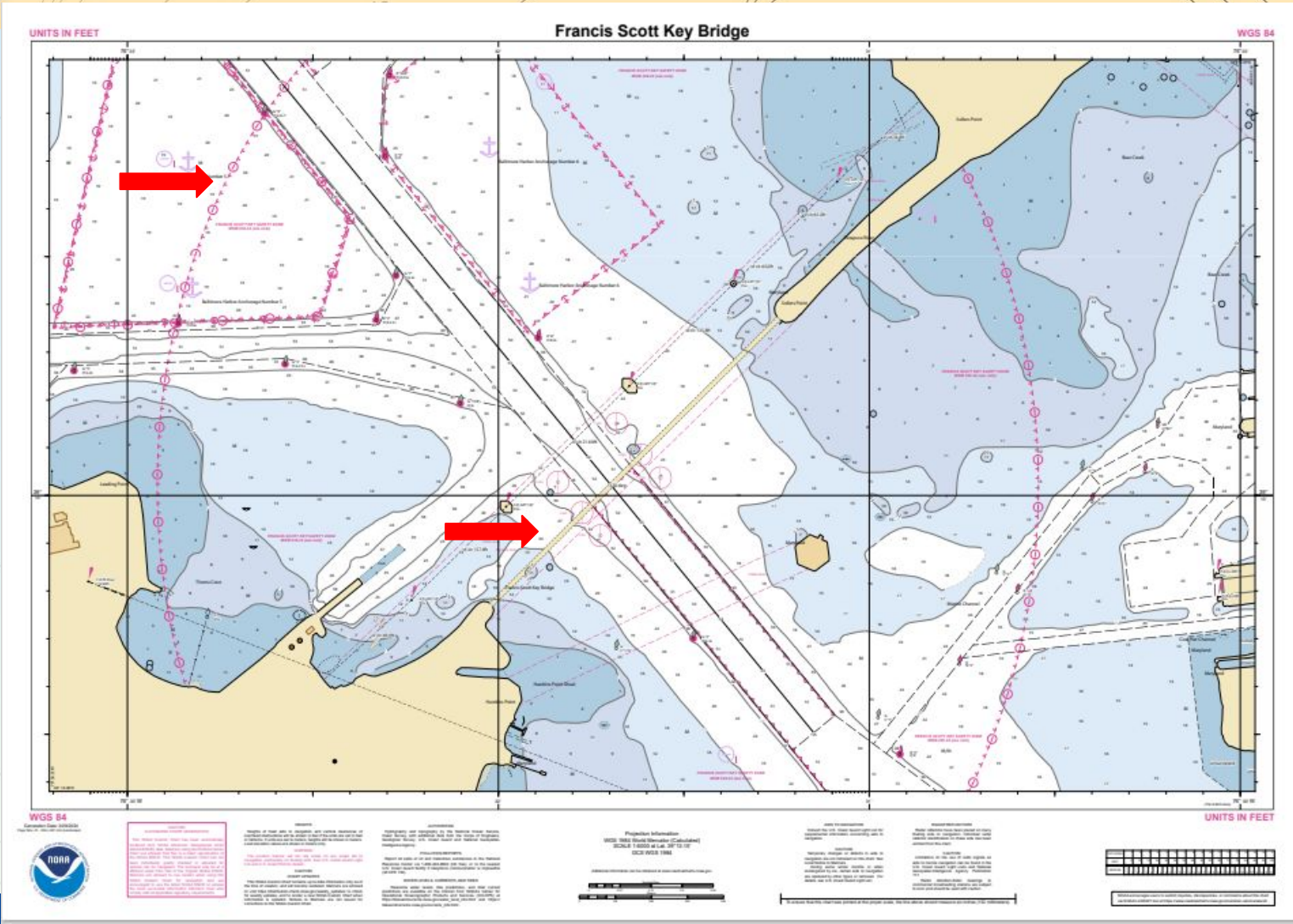


Wrecks, Charlotte Amalie, St Thomas, USVI



Coast Survey Marine Chart Division—Key Bridge Updates

March 28—Safety zone update; bridge in ruins



Office of Coast Survey

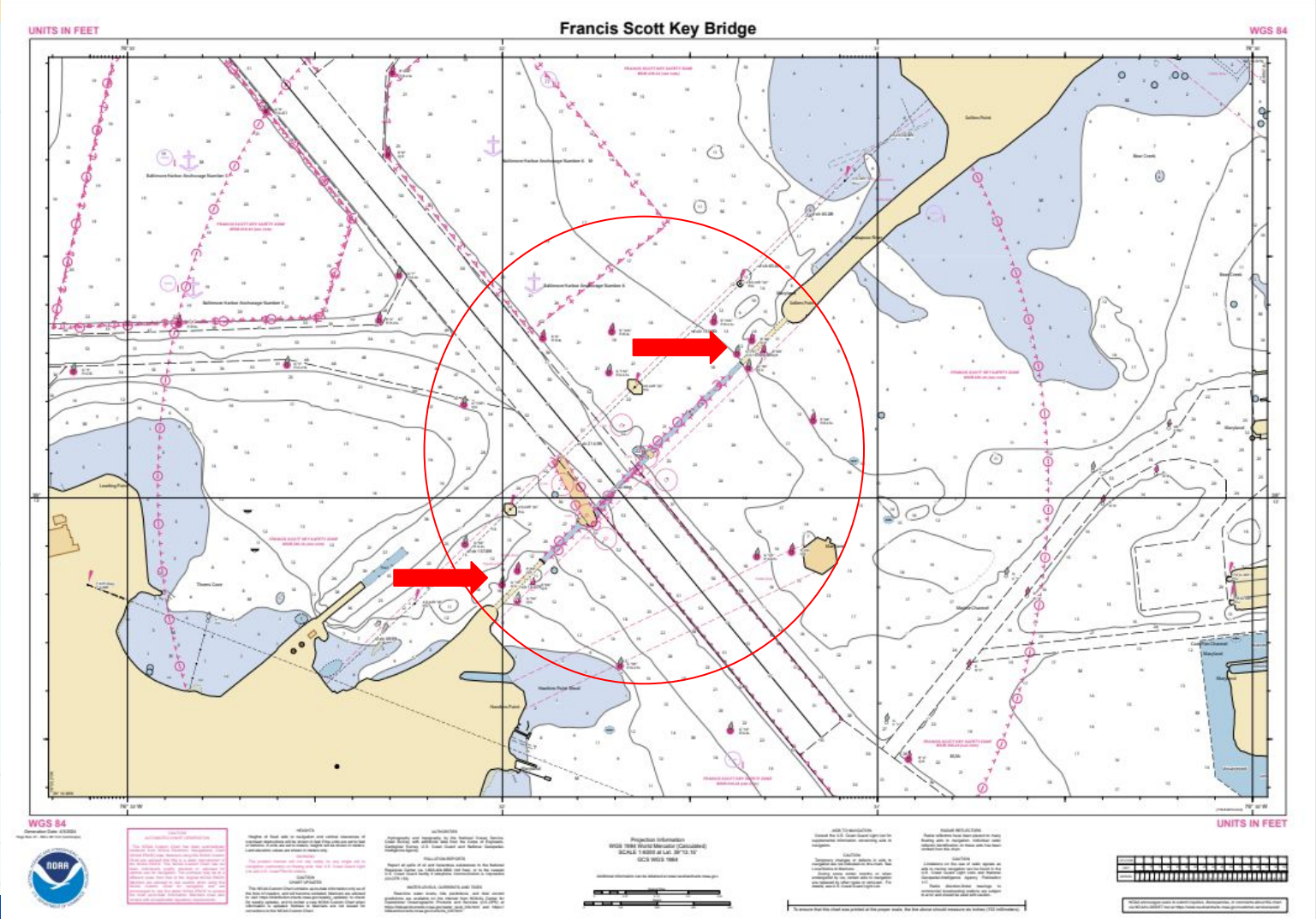
National Oceanic and Atmospheric Administration

Coast Survey Marine Chart Division—Key Bridge Updates

April 2—NGS shoreline applied

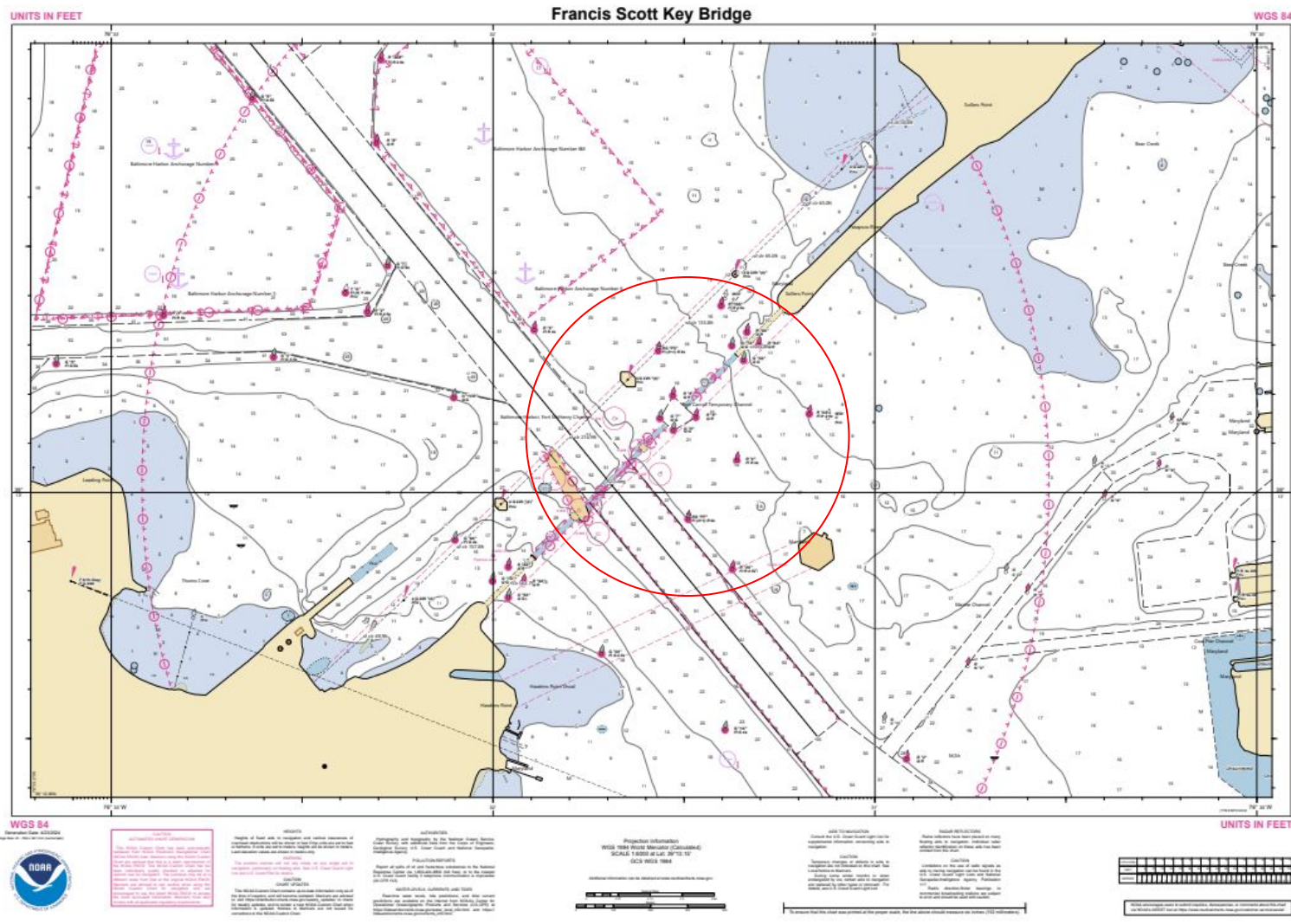
Auxiliary channels established

Established bridge clearance over auxiliary channels



Coast Survey Marine Chart Division—Key Bridge Updates

April 22 — Fort Carroll Temporary Channel charted (dredged area = 20ft)

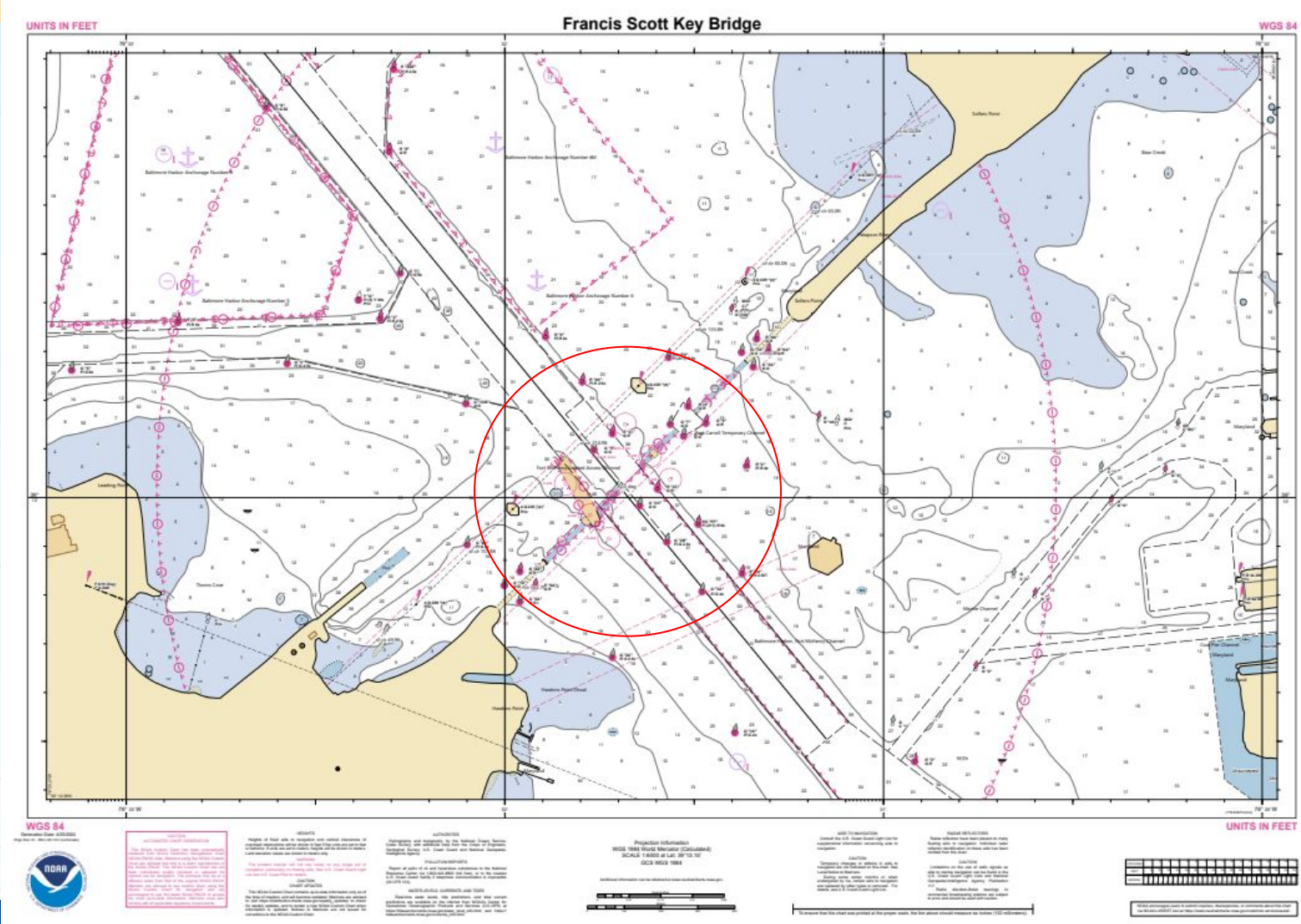


Office of Coast Survey

National Oceanic and Atmospheric Administration

Coast Survey Marine Chart Division—Key Bridge Updates

April 24 — Fort McHenry Temporary Channel charted (dredged area = 38ft)



Marine Chart Division—Key Bridge Updates





Emergency Response Imagery

National Geodetic Survey

[NGS Home](#) [About NGS](#) [Data & Imagery](#) [Tools](#) [Surveys](#) [Science & Education](#) [Search](#)



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 Lee \(2023\)](#)
[Hurricane Idalia \(2023\)](#)
[Maui Fire \(2023\)](#)
[Hurricane Nicole \(2022\)](#)
[Hurricane Ian \(2022\)](#)
[Hurricane Ida \(2021\)](#)
[Hurricane Henri \(2021\)](#)
[Hurricane Zeta \(2020\)](#)
[Hurricane Delta \(2020\)](#)
[Hurricane Sally \(2020\)](#)
[Hurricane Laura \(2020\)](#)
[Hurricane Isaias \(2020\)](#)
[Nashville Tornadoes \(2020\)](#)
[Hurricane Dorian \(2019\)](#)
[Hurricane Barry \(2019\)](#)
[Hurricane Michael \(2018\)](#)
[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](#)

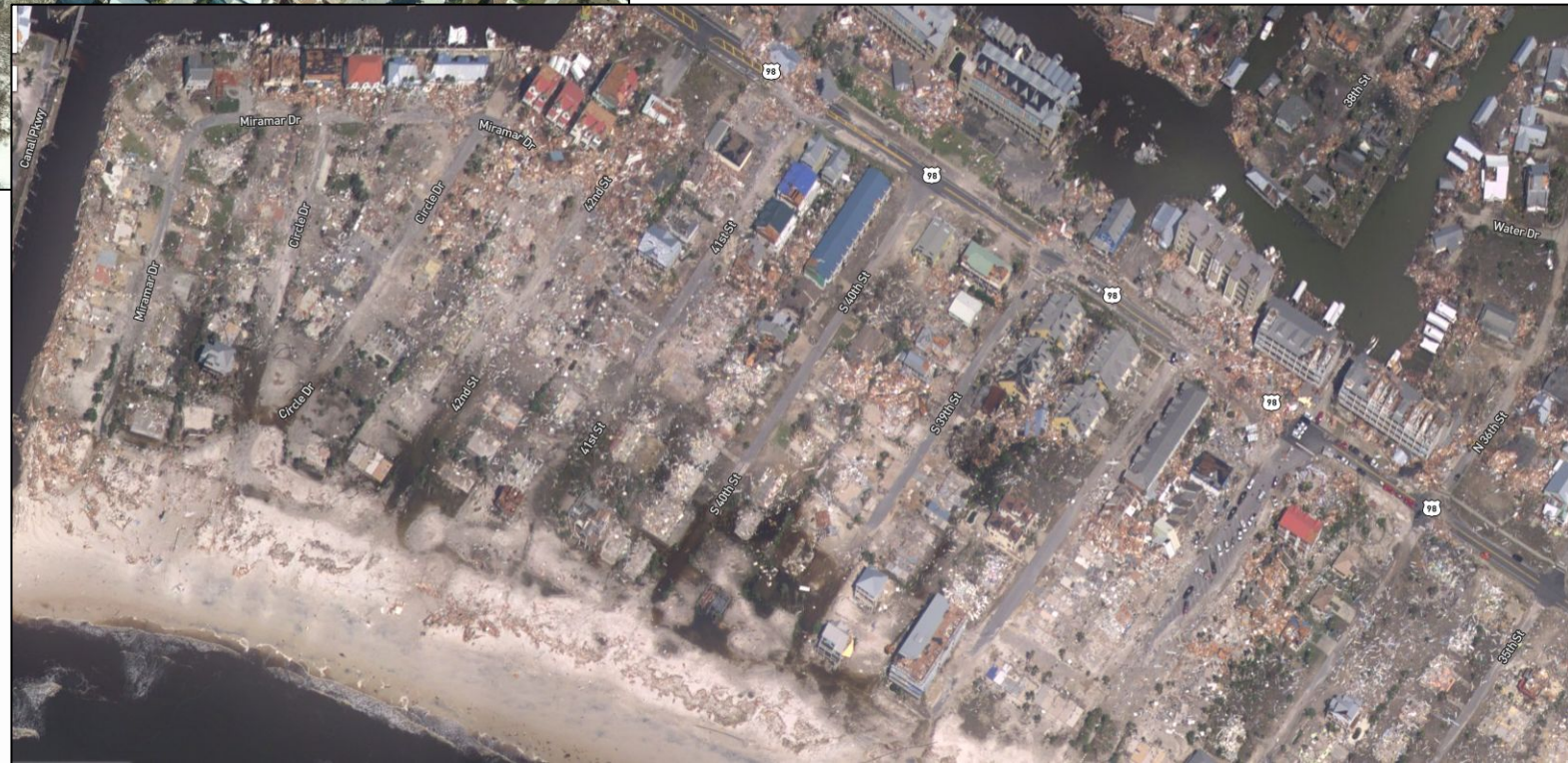
Contact Us

[Content and Technical Issues](#)
[Comments and Policy Issues](#)



Pre- and Post-
Hurricane Michael imagery

Mexico Beach, FL



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



Station List

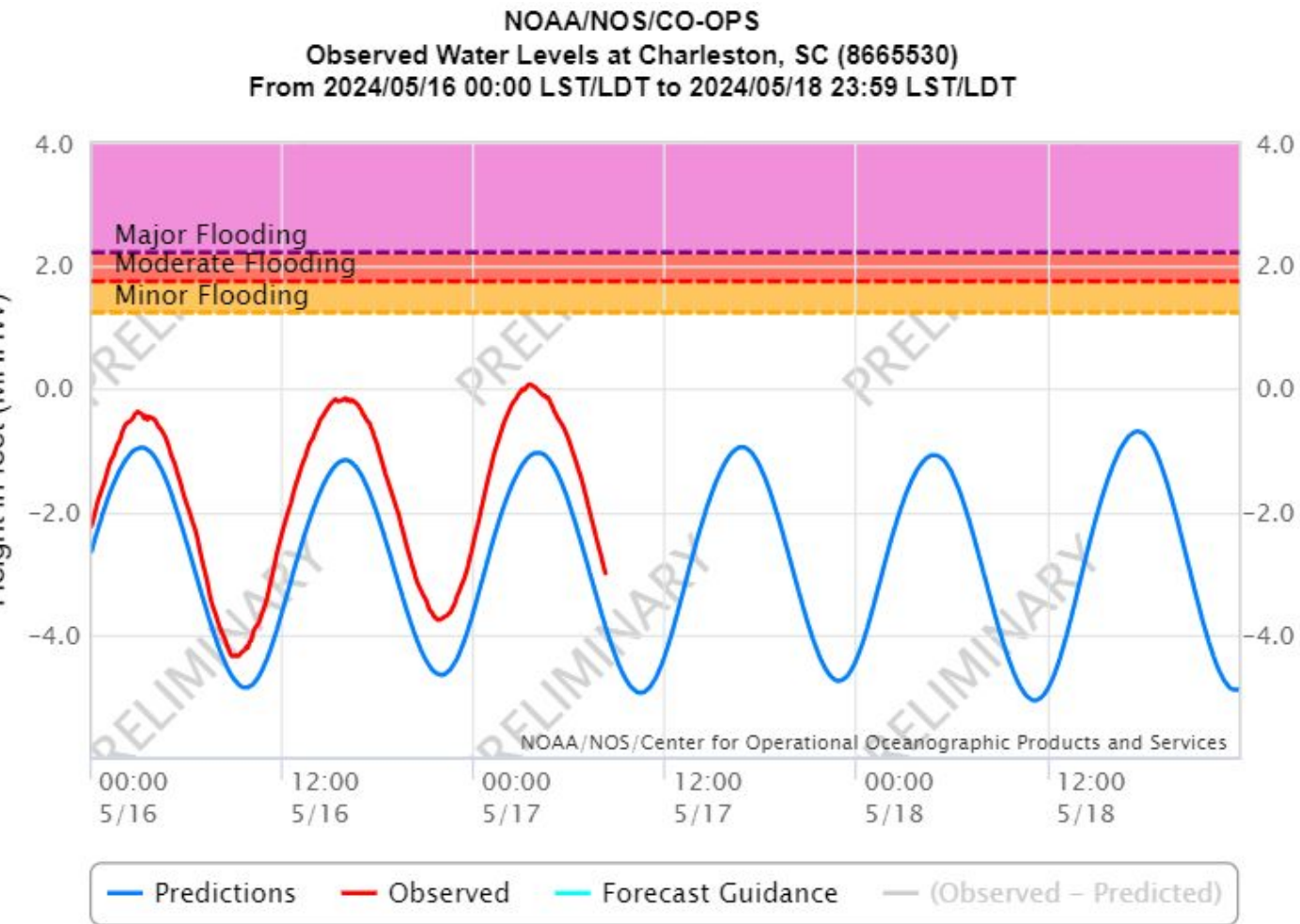
Sort ▾

- Bermuda Biological Station, >
- Ogdensburg, NY >
- Alexandria Bay, NY >
- Eastport, ME >
- Cutler Farris Wharf, ME >
- Bar Harbor, ME >
- Portland, ME >
- Seavey Island, ME >
- Boston, MA >
- Fall River, MA >
- Chatham, MA >
- New Bedford Harbor, >
- Woods Hole, MA >
- Nantucket Island, MA >
- Newport, RI >
- Conimicut Light RI >

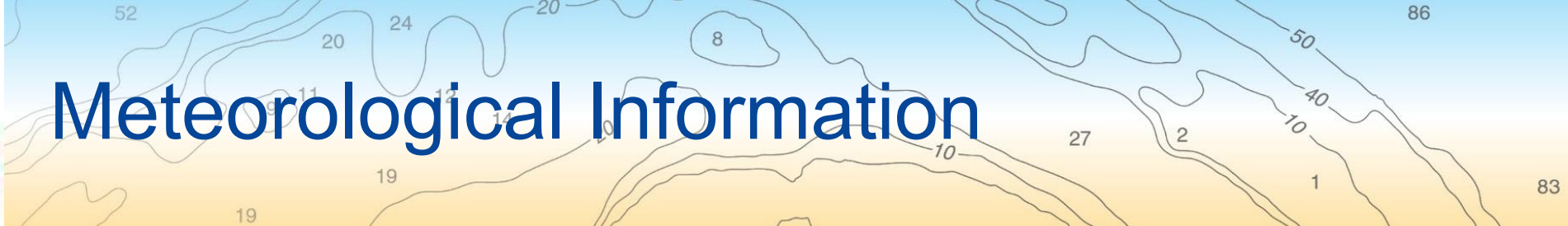


<https://tidesandcurrents.noaa.gov/inundationdb/>
 Google: NOAA Inundation Dashboard

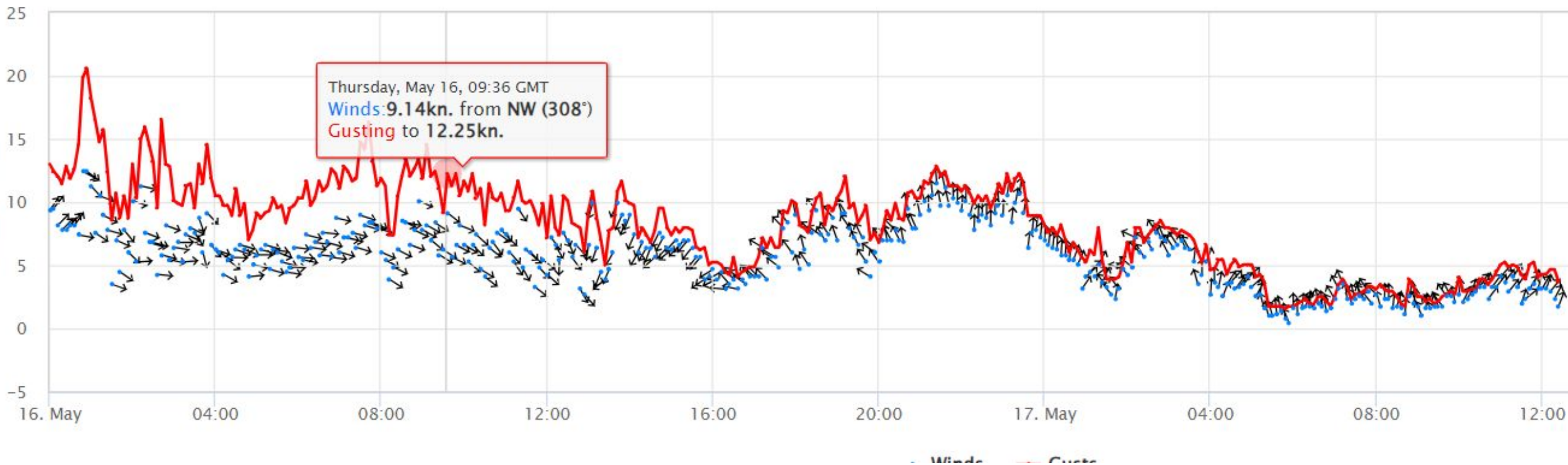
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Meteorological Information



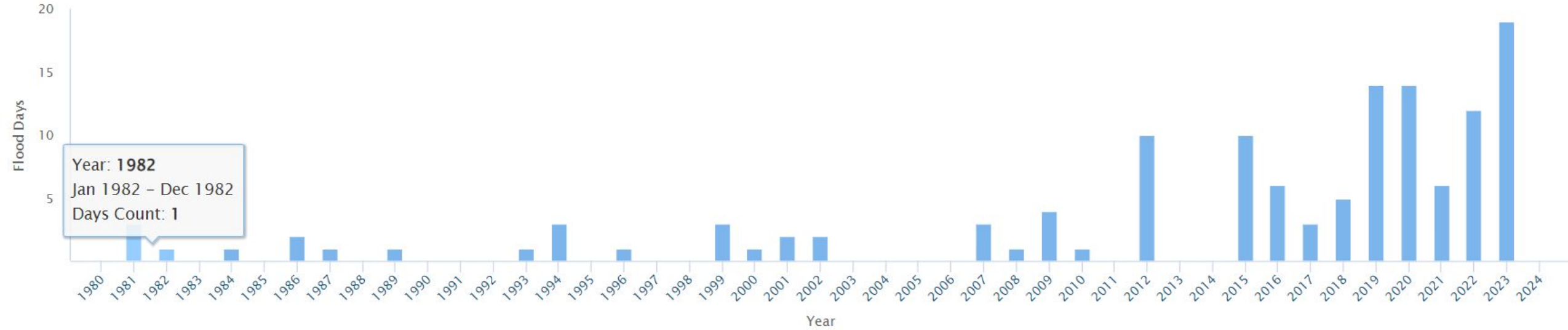
NOAA/NOS/CO-OPS
Winds at 8665530, Charleston SC
From 2024/05/16 00:00 GMT to 2024/05/17 23:59 GMT



Inundation History: Yearly Inundation Events



1980-2024 Annual Flood Days at 8665530, Charleston SC
Threshold: 1.87 feet above MHHW



Inundation History: Top 10 Water Levels

NOS/NOAA/CO-OPS
 Top-10 Highest Water Levels
 8665530, Charleston SC

Units

Datum

Standard

MHHW

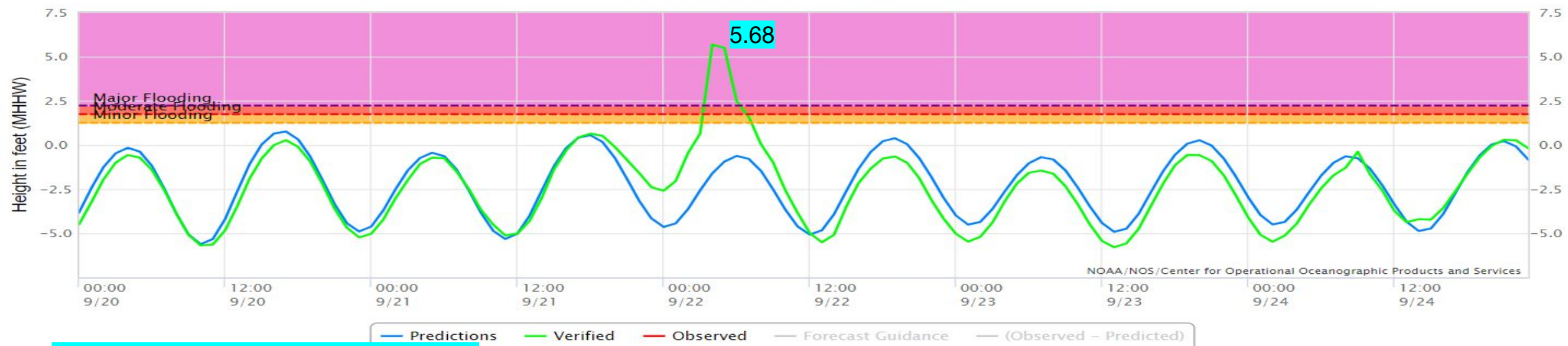
[JSON Link](#)

[XML Link](#)

Date	Height (Feet above MHHW)	Event Category	Event	Source
September 22, 1989	5.68	Tropical	Hurricane Hugo	Observed Peak Water Level
August 11, 1940	4.47	Tropical	1940 South Carolina Hurricane	High Water Mark
September 11, 2017	4.15	Tropical	Hurricane Irma	Observed Peak Water Level
December 17, 2023	4.09	Other	December East Coast Storm	Observed Peak Water Level
October 8, 2016	3.52	Tropical	Hurricane Matthew	Observed Peak Water Level
August 31, 2023	3.46	Tropical	Hurricane Idalia	Observed Peak Water Level
November 24, 2018	3.00	Extra Tropical	Coastal Low Pressure & Onshore Winds	Observed Peak Water Level
January 1, 1987	2.97	Extra Tropical	New Years Day Storm	Observed Peak Water Level
October 27, 2015	2.92	Other	Above Normal Tides & Onshore Winds	Observed Peak Water Level
September 5, 1979	2.87	Tropical	Hurricane David	Observed Peak Water Level

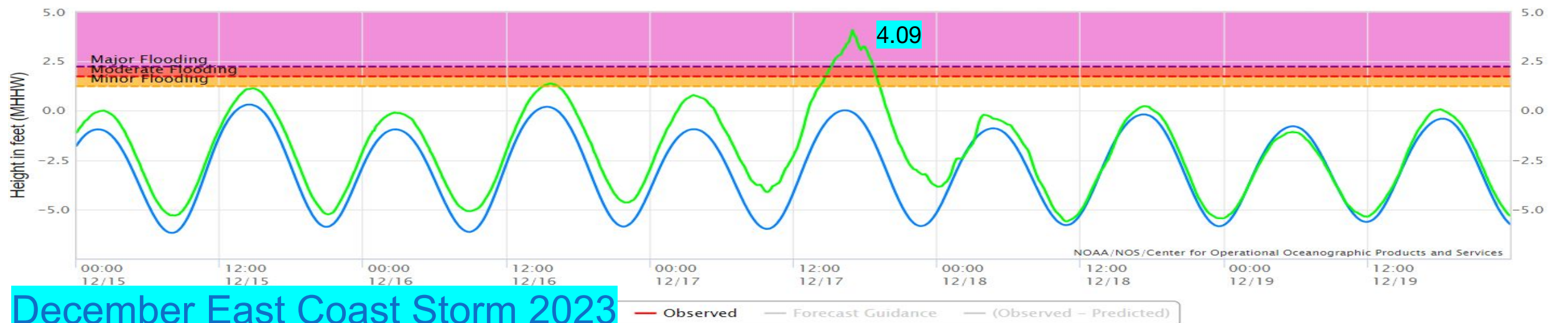


NOAA/NOS/CO-OPS
Verified Hourly Heights at 8665530, Charleston SC
From 1989/09/20 00:00 GMT to 1989/09/24 23:59 GMT



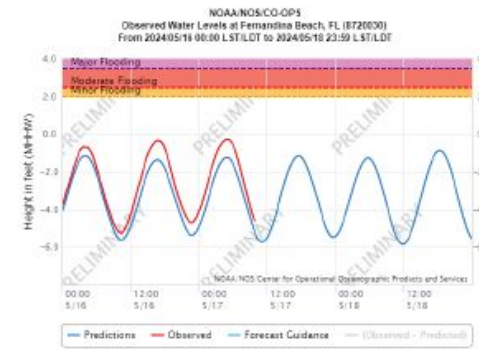
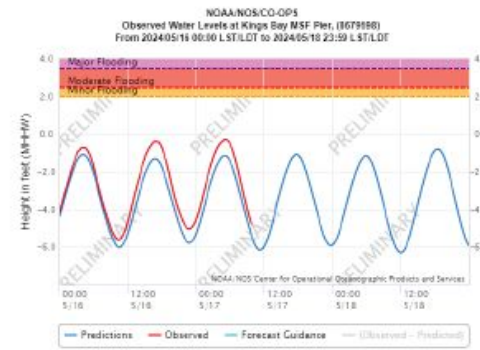
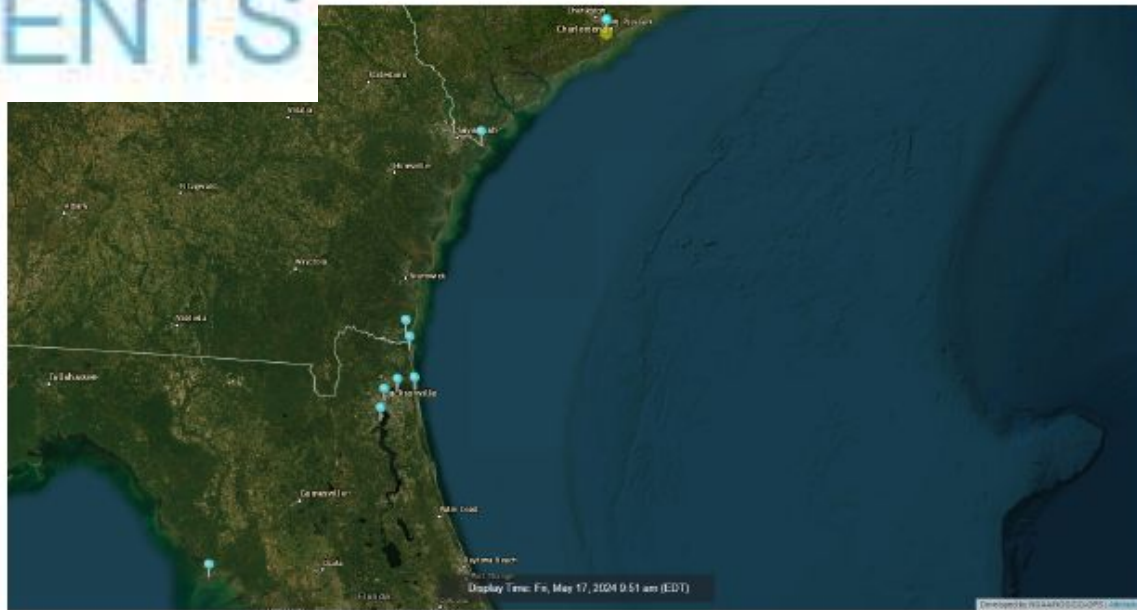
Hurricane HUGO - 1989

NOAA/NOS/CO-OPS
Observed Water Levels at 8665530, Charleston SC
From 2023/12/15 00:00 GMT to 2023/12/19 23:59 GMT



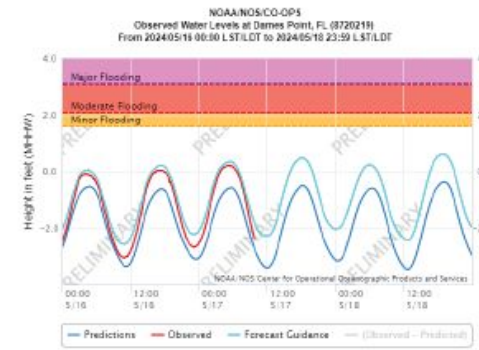
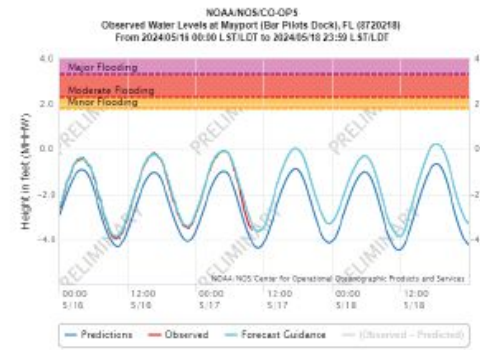
December East Coast Storm 2023





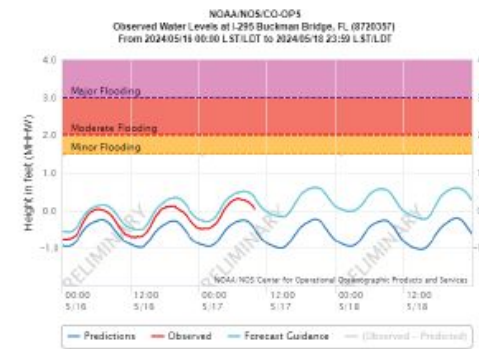
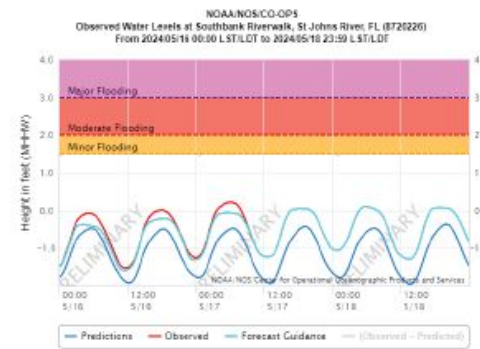
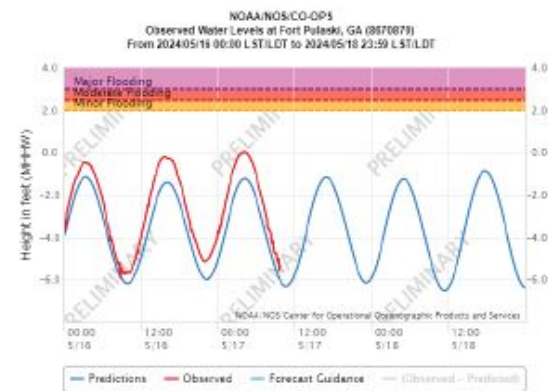
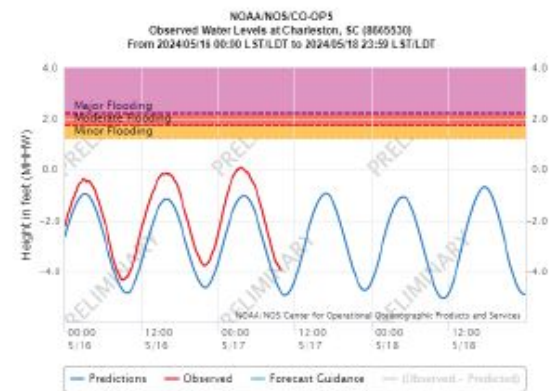
8179188 Kings Bay MSF Pier
Date/Time: 2024-05-14 10:02 (EDT)
Present Water Level: -1.74 feet (MHHW)
72 Hour Maximum Water Level: 0.99 feet (MHHW)
Wind Speed: 11.2 knots Gusting: 15.1 knots Pressure: 1012.0 mb

8720030 Fernandina Beach, FL
Date/Time: 2024-05-14 10:08 (EDT)
Present Water Level: -1.00 feet (MHHW)
72 Hour Maximum Water Level: 1.97 feet (MHHW)
Wind Speed: 11.2 knots Gusting: 15.3 knots Pressure: 1011.2 mb



8720218 Mayport (Bar Pilots Dock), FL
Date/Time: 2024-05-14 10:08 (EDT)
Present Water Level: -1.62 feet (MHHW)
72 Hour Maximum Water Level: 0.81 feet (MHHW)
Wind Speed: 10.3 knots Gusting: 12.6 knots Pressure: 1012.8 mb

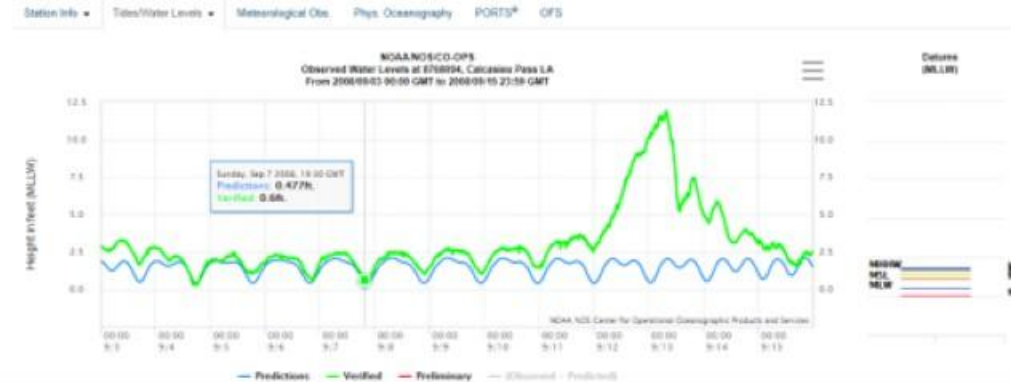
8720219 Dames Point, FL
Date/Time: 2024-05-14 10:08 (EDT)
Present Water Level: -2.24 feet (MHHW)
72 Hour Maximum Water Level: 0.81 feet (MHHW)
Wind Speed: N/A Gusting: N/A Pressure: N/A



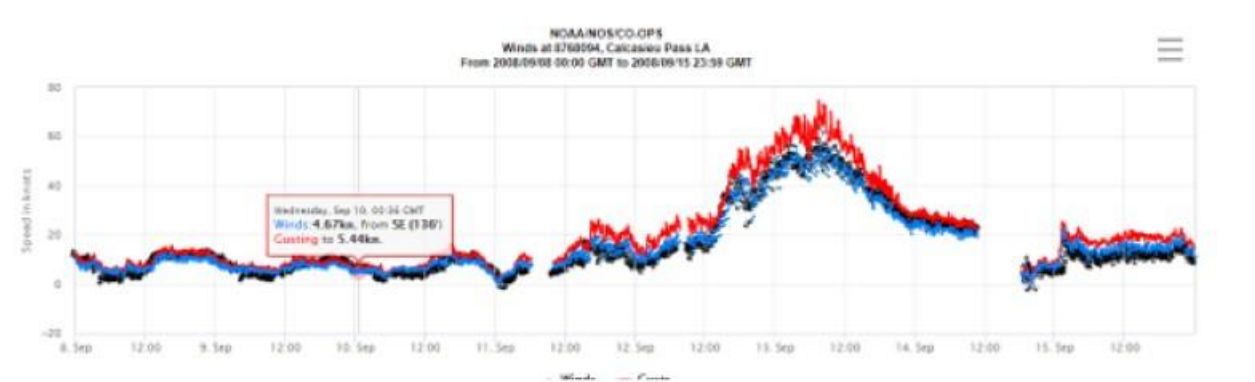
8720226 Southbank Riverwalk, St Johns River, FL
Date/Time: 2024-05-14 10:08 (EDT)
Present Water Level: -1.54 feet (MHHW)
72 Hour Maximum Water Level: 0.68 feet (MHHW)
Wind Speed: 11.4 knots Gusting: N/A Pressure: N/A

8720357 1295 Buckman Bridge, FL
Date/Time: 2024-05-14 10:08 (EDT)
Present Water Level: -0.86 feet (MHHW)
72 Hour Maximum Water Level: 0.47 feet (MHHW)
Wind Speed: 1.8 knots Gusting: 8.4 knots Pressure: 1012.0 mb

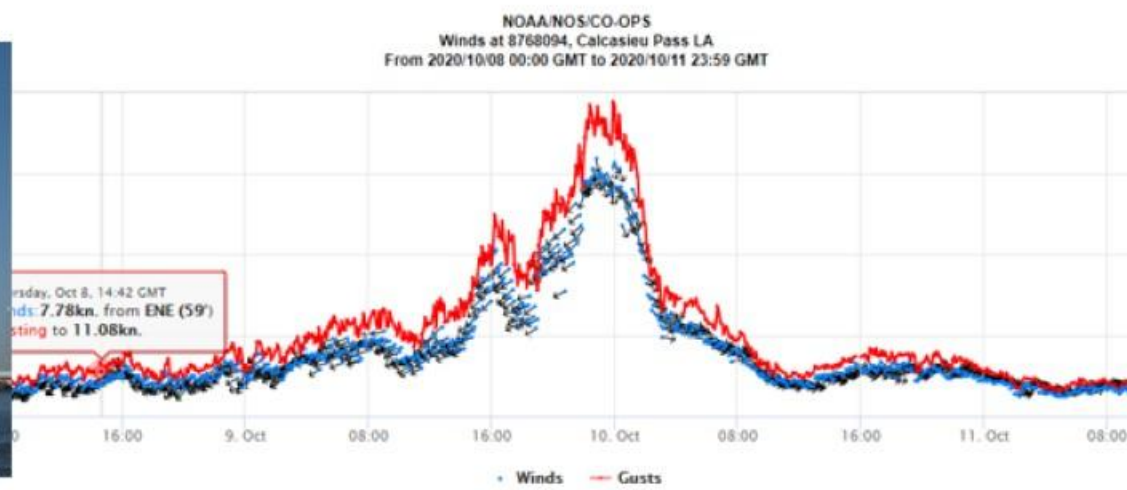
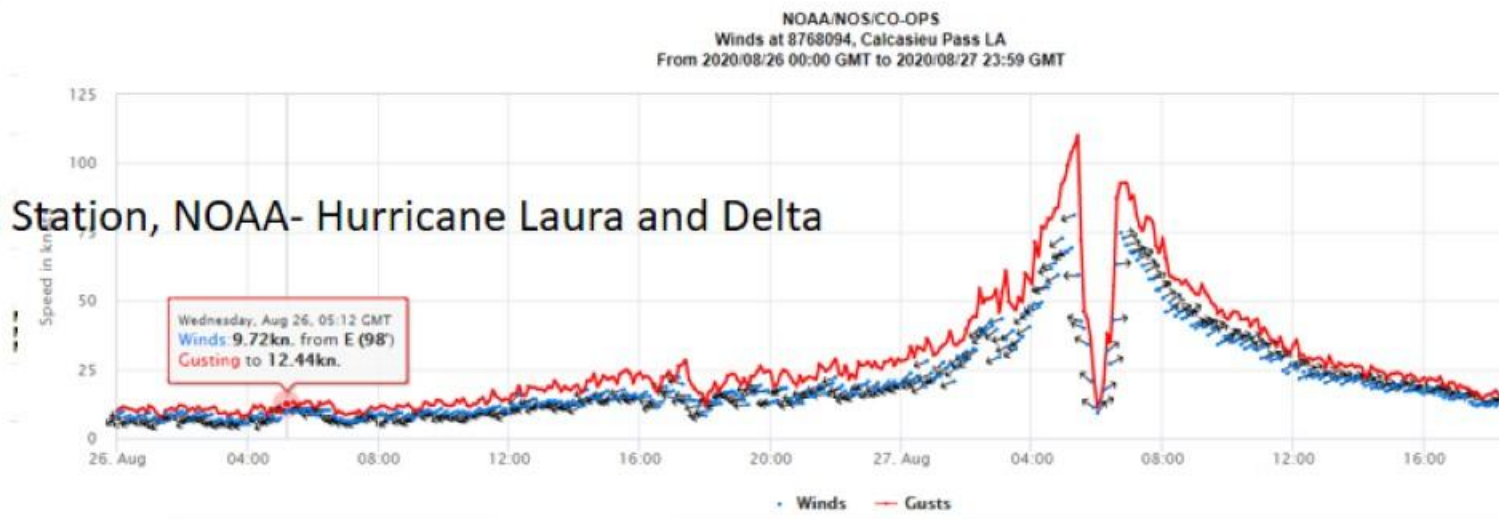




Ike2008
Laura 2020
Delta 2020



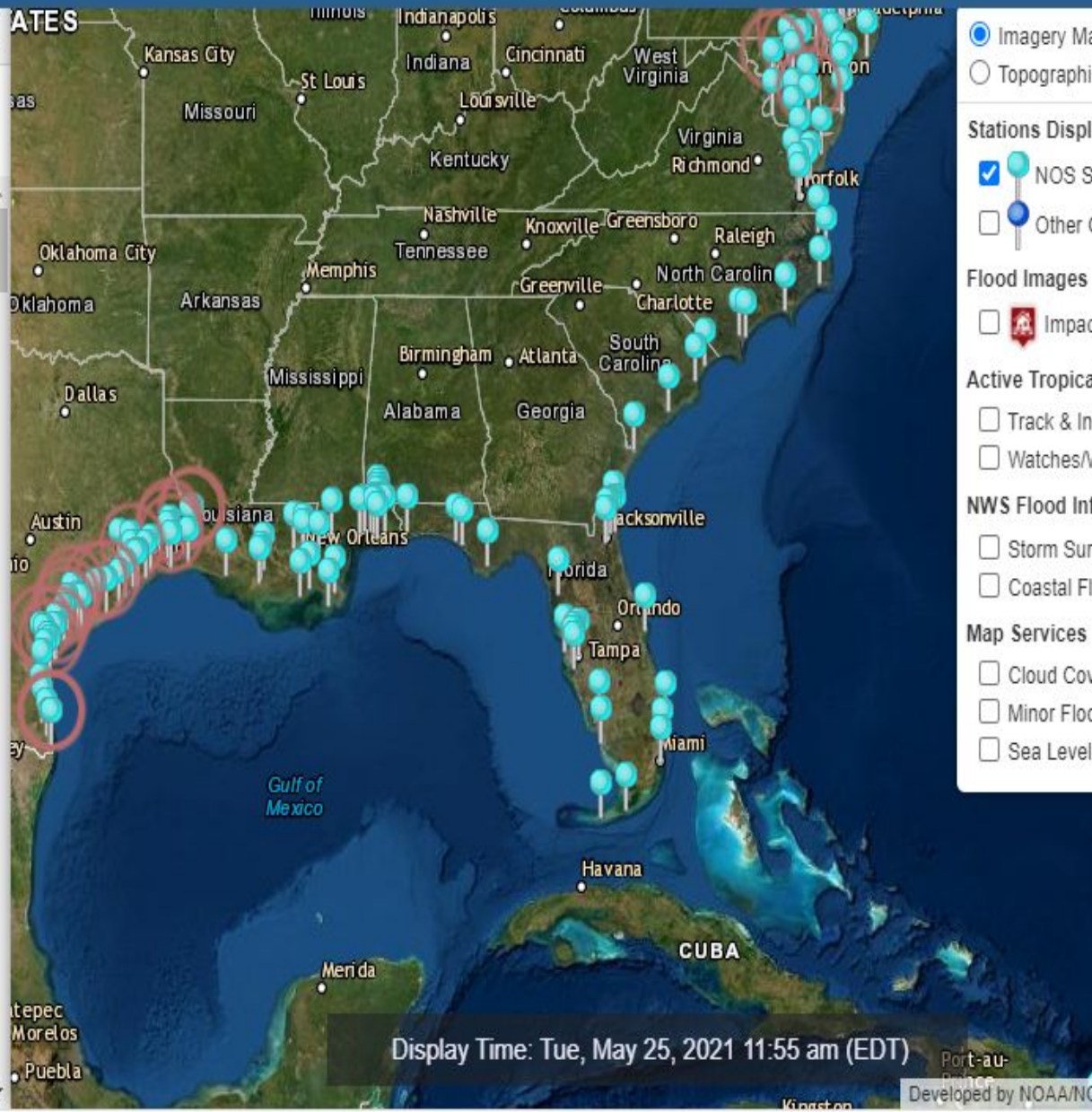
Calcasieu Pass Sentinel Station, NOAA- Hurricane Laura and Delta



Station List

Filter Sort

- Bermuda Biological Station, >
- Bermuda, St. Georges Island, Bermuda >
- Bergen Point West Reach, NY >
- Sandy Hook, NJ >
- Atlantic City, NJ >
- Cape May, NJ >
- Ship John Shoal, NJ >
- Burlington, Delaware River, NJ >
- Marcus Hook, PA >
- Philadelphia, PA >
- Bridesburg, PA >
- Newbold, PA >
- Delaware City, DE >



Imagery Map
 Topographic Map

Stations Display

NOS Stations
 Other Stations

Flood Images

Impact

Active Tropics

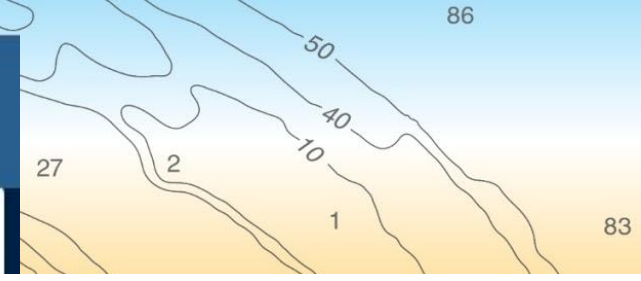
Track & In
 Watches/N

NWS Flood Int

Storm Sur
 Coastal Fl

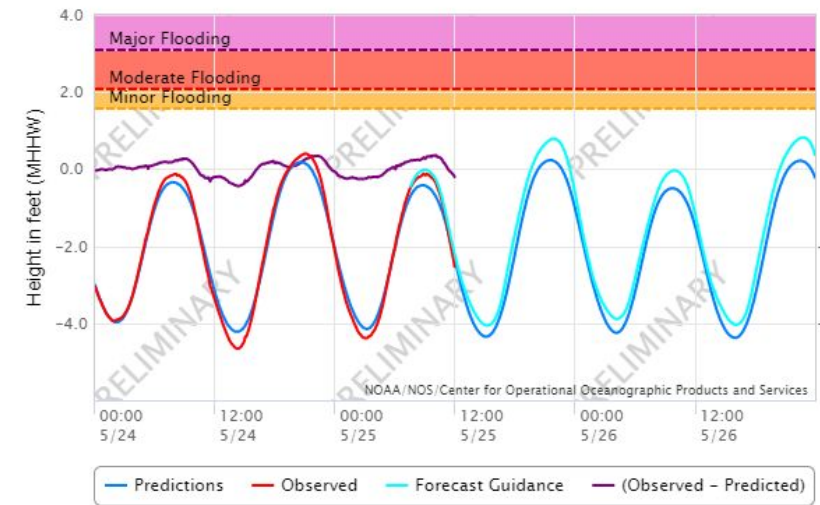
Map Services

Cloud Cov
 Minor Flocc
 Sea Level



Dames Point, FL (8720219)

NOAA/NOS/CO-OPS
 Observed Water Levels at Dames Point, FL (8720219)
 From 2021/05/24 00:00 LST/LDT to 2021/05/26 23:59 LST/LDT



Previous Station

Next Station

Water Level Units: Feet Timezone: LST/LDT Datum: MHHW

Present Water Level	2021-05-25 11:54 AM	-2.53
Latest Wind Speed (kts)	n/a	n/a
Latest Barometric Pressure (mb)	n/a	n/a
Next High Tide	2021-05-25 09:27 PM	0.23
Highest Tomorrow	2021-05-26 10:42 PM	0.82

* Flood levels displayed above have been established by the National Weather Service local Weather Forecast Office (WFO).

Display Time: Tue, May 25, 2021 11:55 am (EDT)

Kyle R. Ward
NOAA Office of Coast Survey
kyle.ward@noaa.gov
301-651-4852

<https://nauticalcharts.noaa.gov/>