

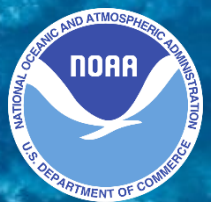
PRECISION MARINE NAVIGATION

Information Infrastructure for the New Blue Economy



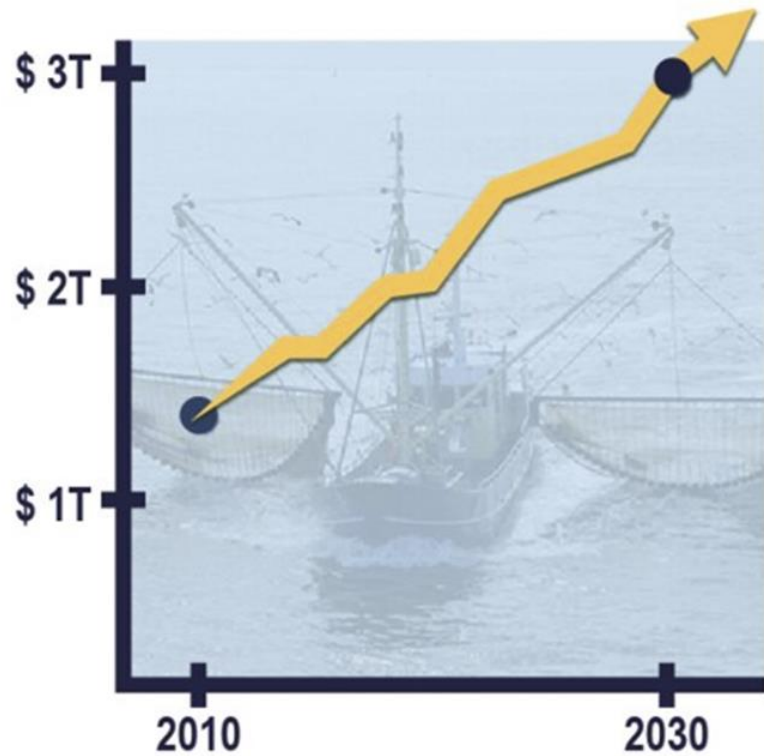
**What is precision
marine
navigation?**

**...the ability of a vessel to safely and efficiently
navigate within the U.S. EEZ and operate in close
proximity to the seafloor, bridges, narrow
channels, or other marine hazards.**

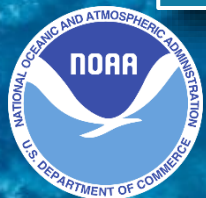


The Maritime Economy

Projected Global Growth by 2030



Source: OECD (2016) *The Ocean Economy in 2030*



Navigation Data Challenges

Difficult to access and process NOAA's navigation data, due to:

- ❑ Multiple devices and systems required to access the data
- ❑ Datasets spread across various websites and data servers
- ❑ Datasets are encoded in different formats that are not navigation standards

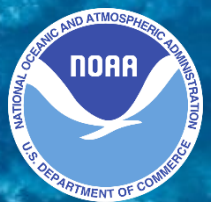
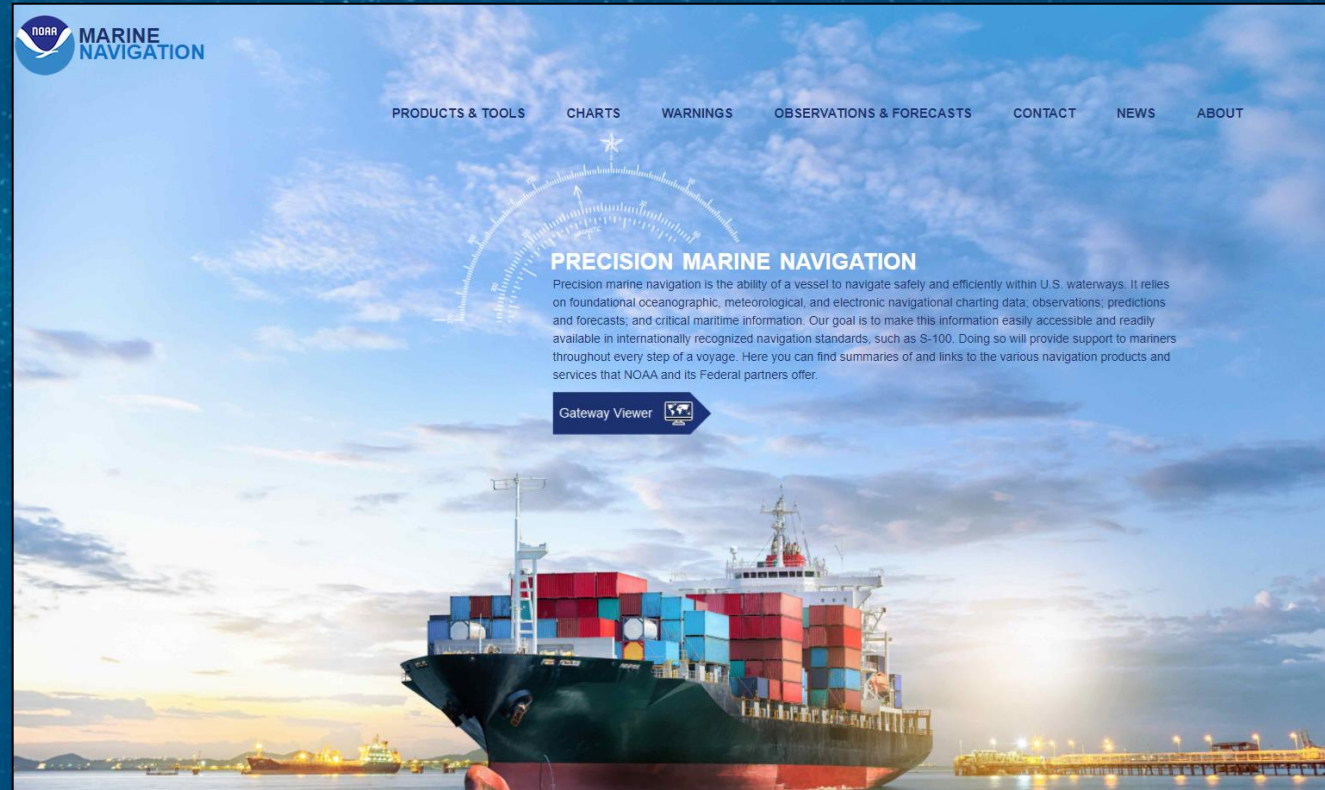
The collage displays several NOAA data portals:

- National Data Buoy Center:** Features a search interface for station IDs and a "Ship Observations Report" table. The table lists 16 observations from 08/03/2021 1700 GMT to 08/03/2021 1714 GMT, with columns for SHIP ID, HOUR, LAT, LON, MOIR, WSPD, GST, WMT, DPD, PRES, PTDY, ATNP, WTRP, DEWP, VES, TEC, S1HT, S1PD, S1DIR, S2HT, S2PD.
- nowCOAST:** NOAA's Web Mapping Portal to Real-Time Coastal Observations, Forecasts, and Warnings. It includes a "Chart Locator" and "What are ENC's?" section.
- PORTS®:** 8771341 Galveston Bay Entrance, TX. Shows a "Water Levels at Galveston Bay Entrance" graph with observed and predicted heights.
- OCEAN PREDICTION CENTER:** Provides "Weather Analysis & Forecasts" with a detailed weather map showing pressure systems and fronts.



Precision Marine Navigation Program

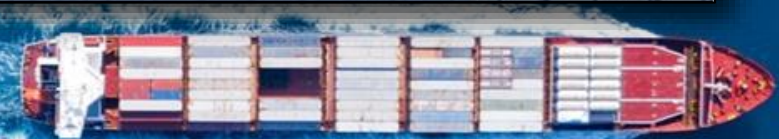
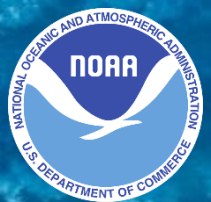
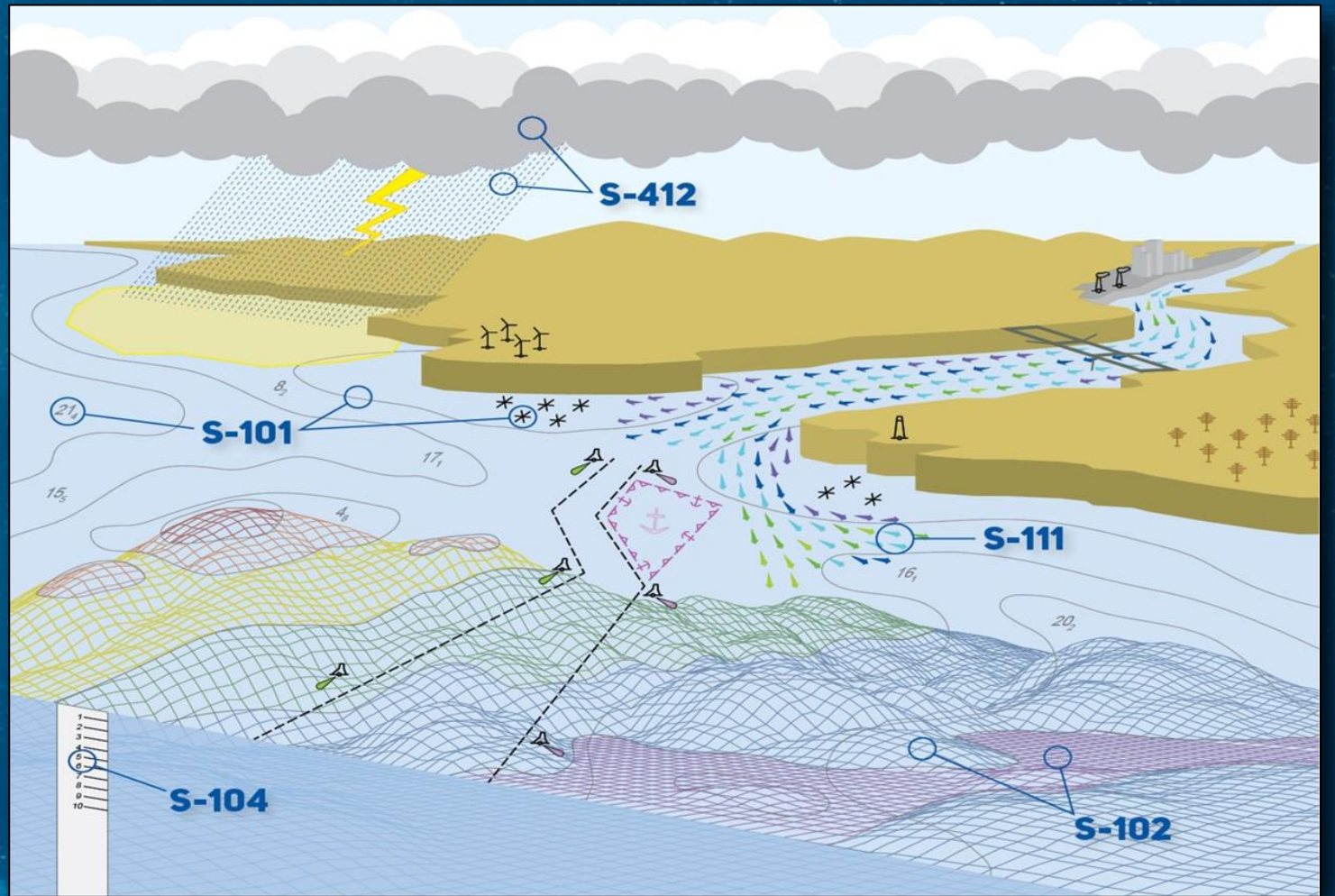
- ❑ Leveraging International Standards (S-100)
- ❑ Precision Marine Navigation Data and Dissemination Services
- ❑ Machine to Machine capability
- ❑ Marinenavigation.noaa.gov Website



S-100 Data Framework

S-100 Data Products

- S-101: Electronic Navigational Charts
- S-102: Bathymetric Surface
- S-104: Water Level Information
- S-111: Surface Currents
- S-41X: Weather Overlays



S-100 Data Development

S-102 High Resolution Bathymetry

- Developed S-102 conversion routines for the National Bathymetric Source (NBS)
- Integrate S-102 conversion as part of the NBS work flow
- Produce Test and Evaluation Data for S-102 for NY/NJ, LMR and LA/LB

S-104 Water Level Forecast Guidance

- Develop prototype S-104 water level forecast data using Global ESTOFS model
- Investigate incorporation of **real time** data feeds in S-100 compliant formats

S-111 Surface Current Forecast Guidance

- Developed S-111 data products several Operational Forecast Models (OFS)
- Develop S-111 data products for remaining OFS – Cook Inlet and WCOFS

S-41X Weather and Ice Services

- Coordinate with National Weather Service/Ocean Prediction Center to ingest S-41X weather and ice products into the dissemination system.

S-101 ENC

- Develop an S-57 to S-101 Transition Plan



PMN Dissemination

Processing and Dissemination

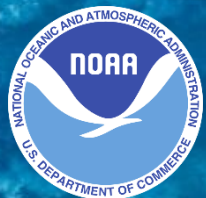
- Begin dissemination of S-104 water level products
- Begin dissemination of S-102 high resolution bathymetry
- Continue to disseminate S-111 Surface Current Products

Data Gateway Viewer

- Continue to incorporate NOAA's S-100 product suite into the viewer as they become available

Marine Navigation Website

- Continue to maintain content as new products become available - <https://marinenavigation.noaa.gov/>



Operations and Distribution

DevOps

- Determine an operational model for PMN as it transitions to operations
- Transition products to NOAA Readiness Level 8/9

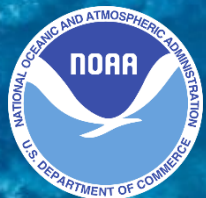
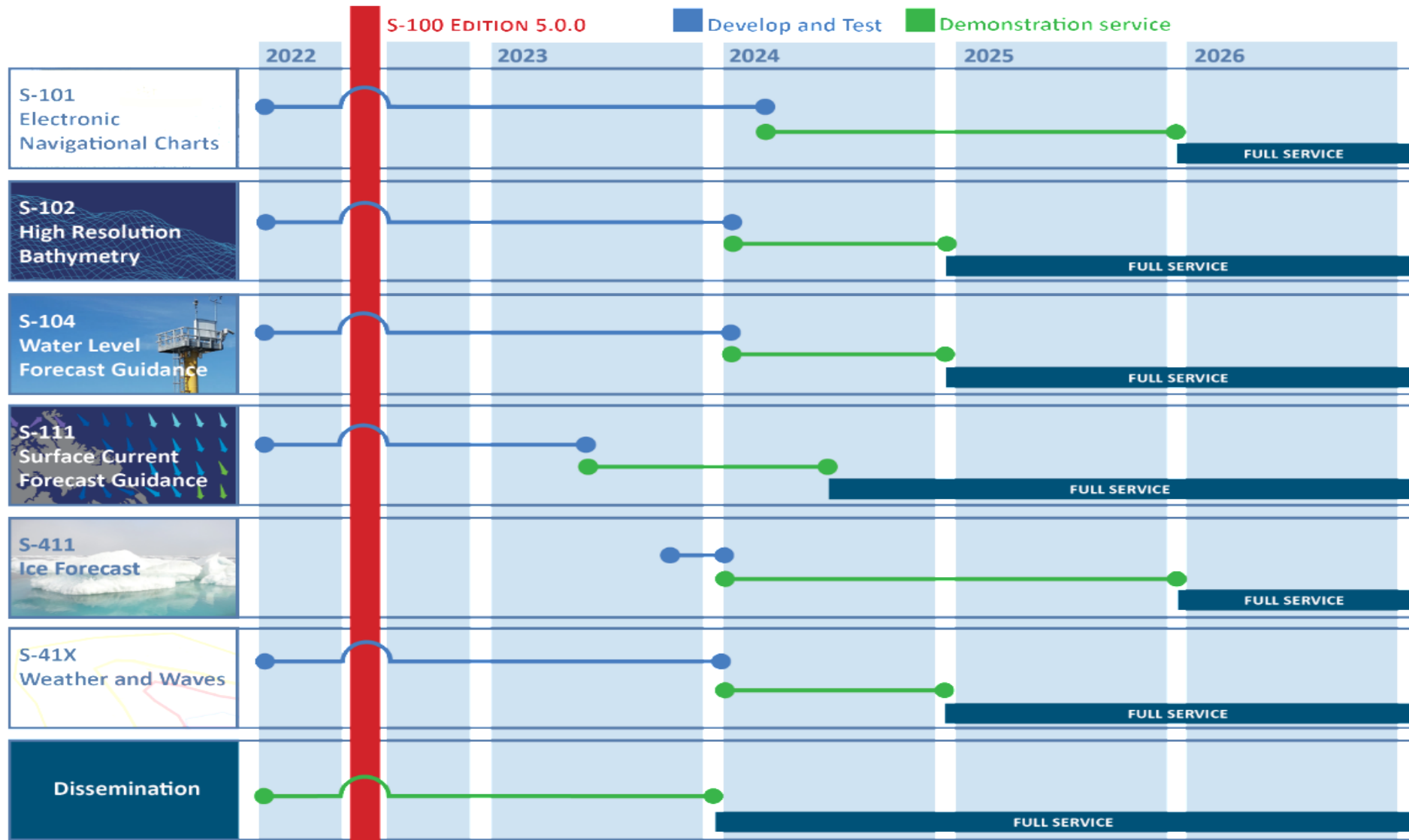
Distribution

- Determine when products are designated as “certified for navigation”
- Look into/determine cost recovery model for operations and maintenance of “certified for navigation” products (IC-ENC)

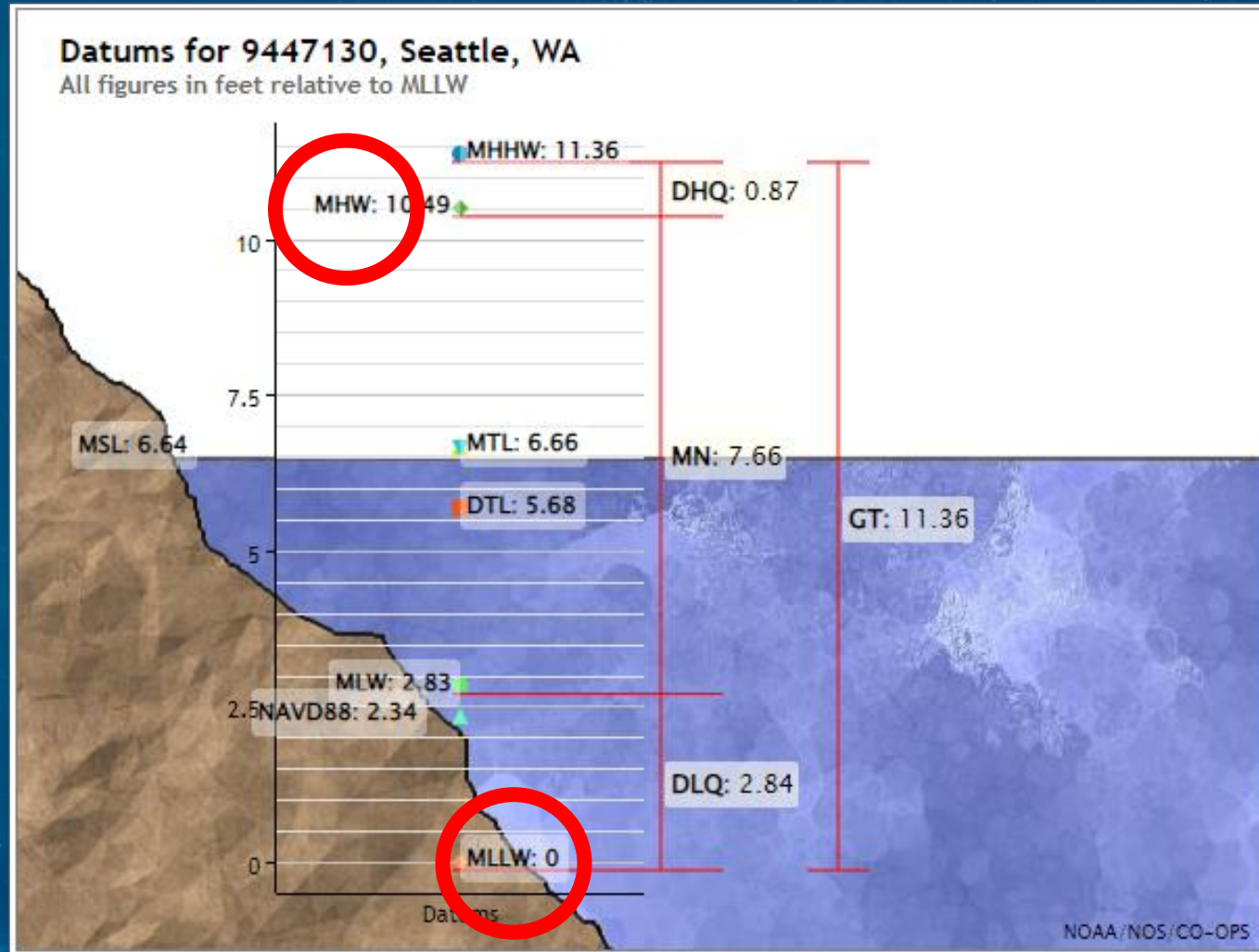


PMN Rollout

NOAA S-100 Timeline



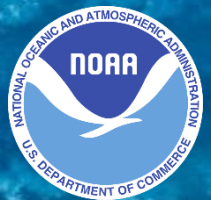
Datum Issue



Datum Issue

As we move towards producing interoperable products:

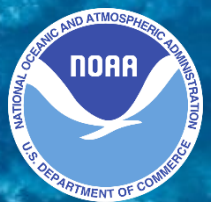
- The S-100 Framework has incorporated **water level adjustments to bathymetry** for use in navigation systems
 - Datums must be the same across the product stack
 - This has to be done by the producer of the product
- Navigation systems are not equipped to perform complex datum transformations
 - They would have to store all the possible corrections
 - They don't want to assume the liability



S-102 Data for New York Harbor



- Based on Edition 2.1.0
- Downloadable via AWS
- Full Discovery Metadata



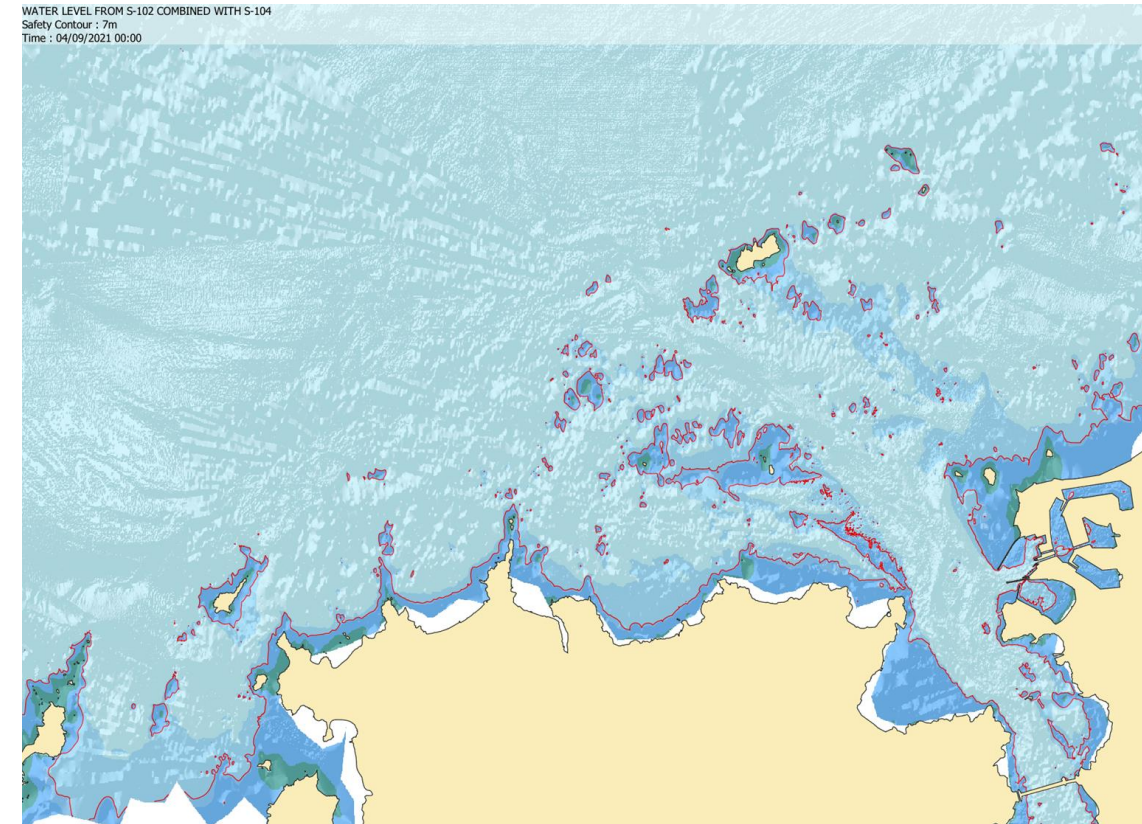
Example: The power of standardized and integrated data

S-104 Depth Value = 0.1m

11.41	11.46	11.43	11.43	
11.45	11.45	11.15	11.45	
9999	11.41	11.42	11.0	11.0
	9999	11.43	11.42	10.0

S-102 No Data Value

Safety Contour 7m. The safety contour changes are based on S-102 bathymetry and Water Level Adjustment (WLA), using S-104, over a period of 21 hours.



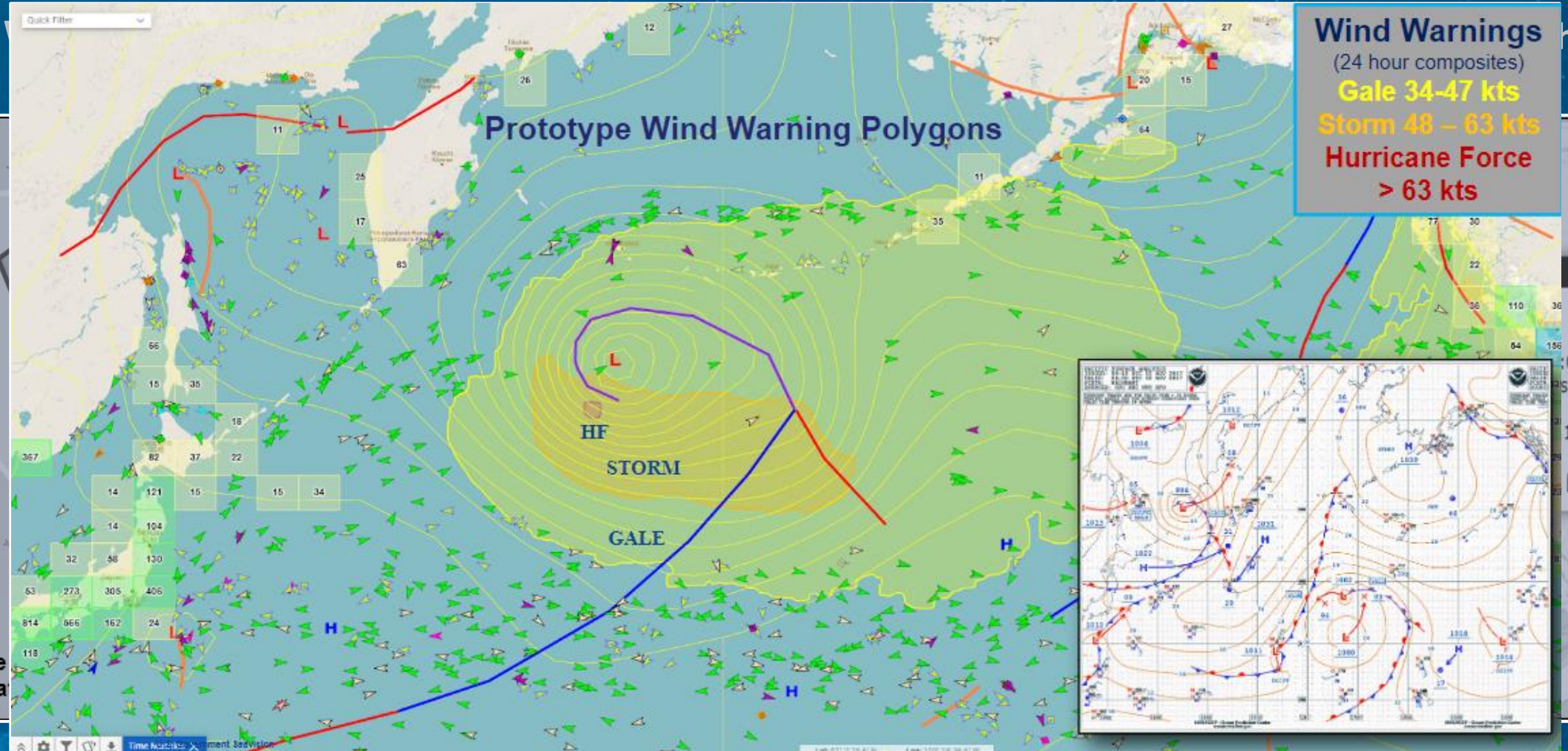
S-102 Data (Safety Contour) + S-104 (Water Level) = Corrected Depths

NOAA Navigaton Services

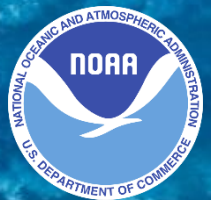


At Sea: Waves and Weather

S-412:



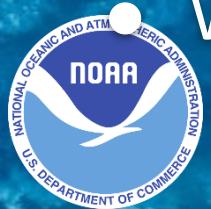
S-41X will provide critical marine weather information to ensure safety at sea



PMN Take Aways

- NOAA's Precision Marine Program (PMN) Program endeavours to consolidate it's important marine information in a internationally standard format in one location for easy accessibility
- These international standards have not been finalized and will take time
- NOAA's PMN development is tied to these standards
- In the meantime we are building out our **infrastructure** (*retiring RNCs, reschemeing ENC's, S-57 to S-101 and continuing to build the NBS*)
- As we add S-102 (bathymetry) information in your region we seek **YOUR** input on the quality of the information to assure it's accuracy.

We are in this together to get it right!



NWS Marine Weather Update

Proposed New Coastal Waters Forecast Format for Waves

- **From:** Seas 5 to 7 ft. or Wind waves 7 feet. Northeast swell 8 feet. Swell north 3 feet
- **To:** Seas 5 to 7 ft, occasionally to 10 ft. Wave Detail: NW 5 ft at 5 seconds, and SW 6 ft at 15 seconds

<https://www.weather.gov/marine/WaveDetail>

<https://www.youtube.com/watch?v=A8XBsAwAB7w>



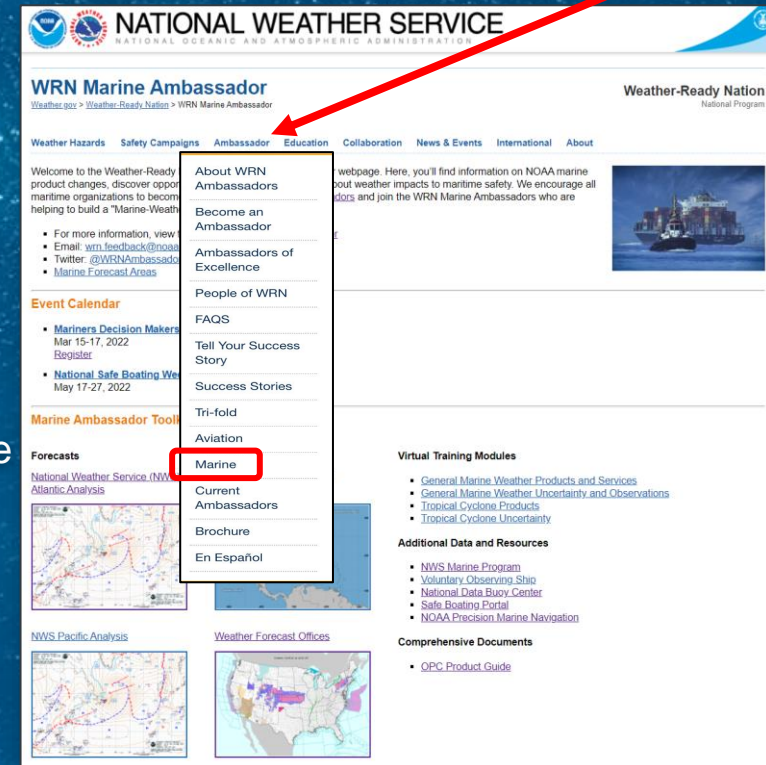
NWS Marine Weather Update

Weather-Ready Nation **Marine** Ambassador

Strengthen partnerships with external organizations toward building communities resilience to extreme weather and water events.

Weather-Ready Nation **Marine** Ambassador

- Virtual marine weather hazard training
- Weather safety messaging
- Collaboration opportunities
- Virtual WRN recognition and share the **WRN logo** for your use
- **Direct line of feedback** for NWS product improvements
- Receive a **quarterly newsletter** from the NWS about marine weather



The screenshot shows the NWS WRN Marine Ambassador webpage. A red arrow points to the 'Marine' link in the navigation menu. The page includes sections for 'About WRN Ambassadors', 'Become an Ambassador', 'Ambassadors of Excellence', 'People of WRN', 'FAQS', 'Tell Your Success Story', 'Success Stories', 'Tri-fold', 'Aviation', and 'Marine'. The 'Marine' link is highlighted with a red box. Other sections include 'Event Calendar', 'Marine Ambassador Tools', 'Forecasts', 'Virtual Training Modules', 'Additional Data and Resources', and 'Comprehensive Documents'.



<https://www.weather.gov/wrn/wrna-marine>



NWS Marine Weather Update

Weather-Ready Nation **Marine** Ambassador

- About WRN Ambassadors
- Become an Ambassador
- Ambassadors of Excellence
- People of WRN
- FAQS
- Tell Your Success Story
- Success Stories
- Tri-fold
- Aviation
- Marine**
- Current Ambassadors
- Brochure
- En Español

The screenshot shows the NWS WRN Marine Ambassador website. A navigation menu is overlaid on the left side of the page, with the 'Marine' option highlighted in a red box. A red arrow points to the 'Ambassador Tab' in the top navigation bar. The website content includes sections for 'About WRN Ambassadors', 'Become an Ambassador', 'Ambassadors of Excellence', 'People of WRN', 'FAQS', 'Tell Your Success Story', 'Success Stories', 'Tri-fold', 'Aviation', 'Marine', 'Current Ambassadors', 'Brochure', and 'En Español'. There are also sections for 'Event Calendar', 'Marine Ambassador Tools', 'Forecasts', 'Virtual Training Modules', 'Additional Data and Resources', and 'Comprehensive Documents'.

<https://www.weather.gov/wrn/wrna-marine>

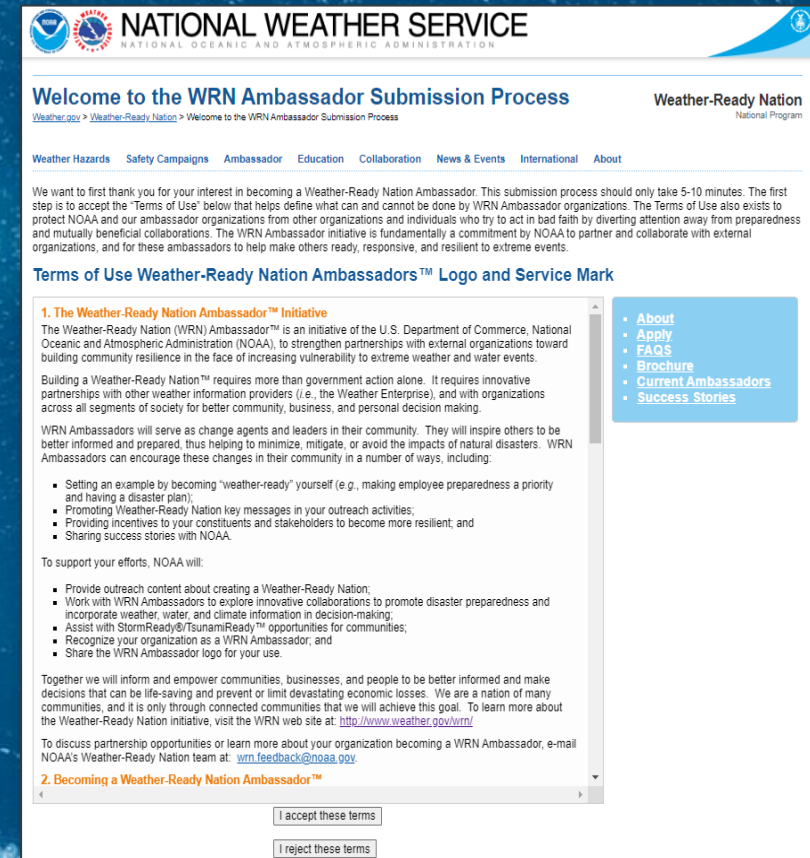


NWS Marine Weather Update

Weather-Ready Nation **Marine** Ambassador

Sign Up Today!

- See URL Below
- Read and Accept Terms of Service
- Fill out form
- Under “option that best applies to your organization” select **Maritime/Marine**
- That is it!



The screenshot shows the NOAA National Weather Service website page for the Weather-Ready Nation (WRN) Ambassador Submission Process. The page is titled "Welcome to the WRN Ambassador Submission Process" and includes a navigation menu with links for Weather Hazards, Safety Campaigns, Ambassador, Education, Collaboration, News & Events, International, and About. The main content area explains the submission process and provides the "Terms of Use Weather-Ready Nation Ambassadors™ Logo and Service Mark". The terms of use are divided into two sections: "1. The Weather-Ready Nation Ambassador™ Initiative" and "2. Becoming a Weather-Ready Nation Ambassador™". The first section describes the initiative's purpose and lists several ways to support the effort, such as setting an example, promoting key messages, providing incentives, and sharing success stories. The second section describes the process of becoming an ambassador and lists several ways to support the effort, such as providing outreach content, working with ambassadors, assisting with opportunities, recognizing the organization, and sharing the logo. The page also includes a sidebar with links for About, Apply, FAQs, Brochure, Current Ambassadors, and Success Stories. At the bottom of the page, there are two buttons: "I accept these terms" and "I reject these terms".

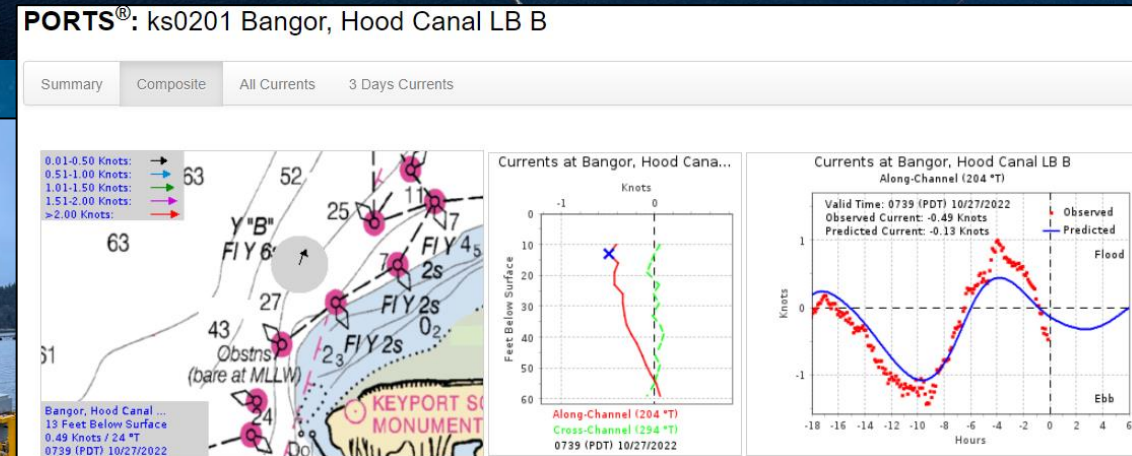
<https://www.weather.gov/wrn/amb-tou>



PORTS® Updates

Kitsap PORTS®

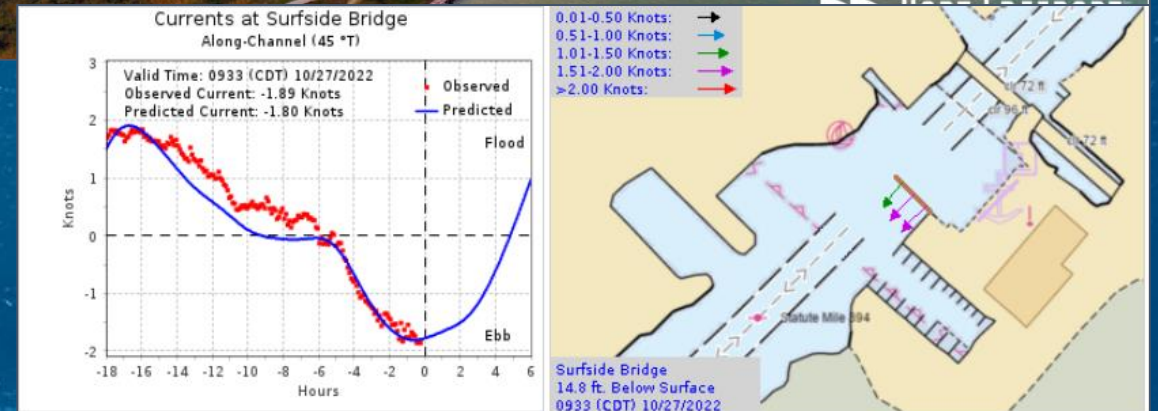
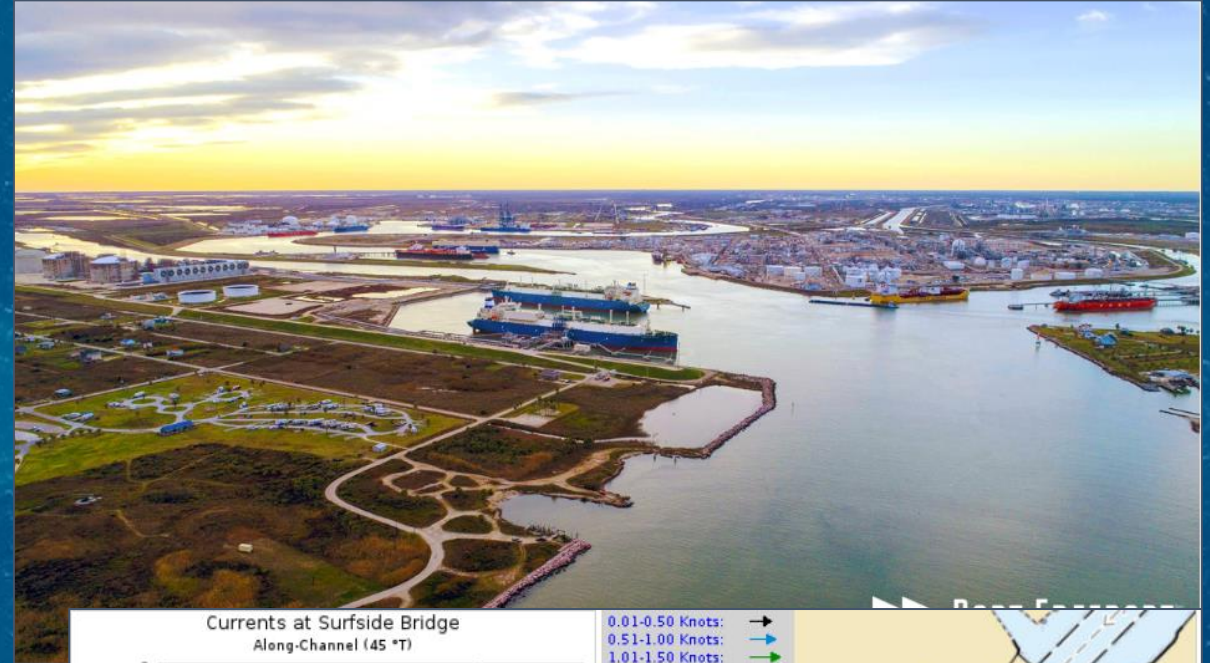
- Kitsap PORTS NOAA's 37th system-operational in June 2022
- Partnership between NOAA and U.S. Navy
- Added two current meters and one water level/meteorological station
- Third-largest U.S. Navy installation and provides base operating services to submarines, aircraft carriers, Puget Sound Naval Shipyard and the largest fuel depot in the Continental U.S.
- <https://tidesandcurrents.noaa.gov/ports/index.html?port=ks>



PORTS® Updates

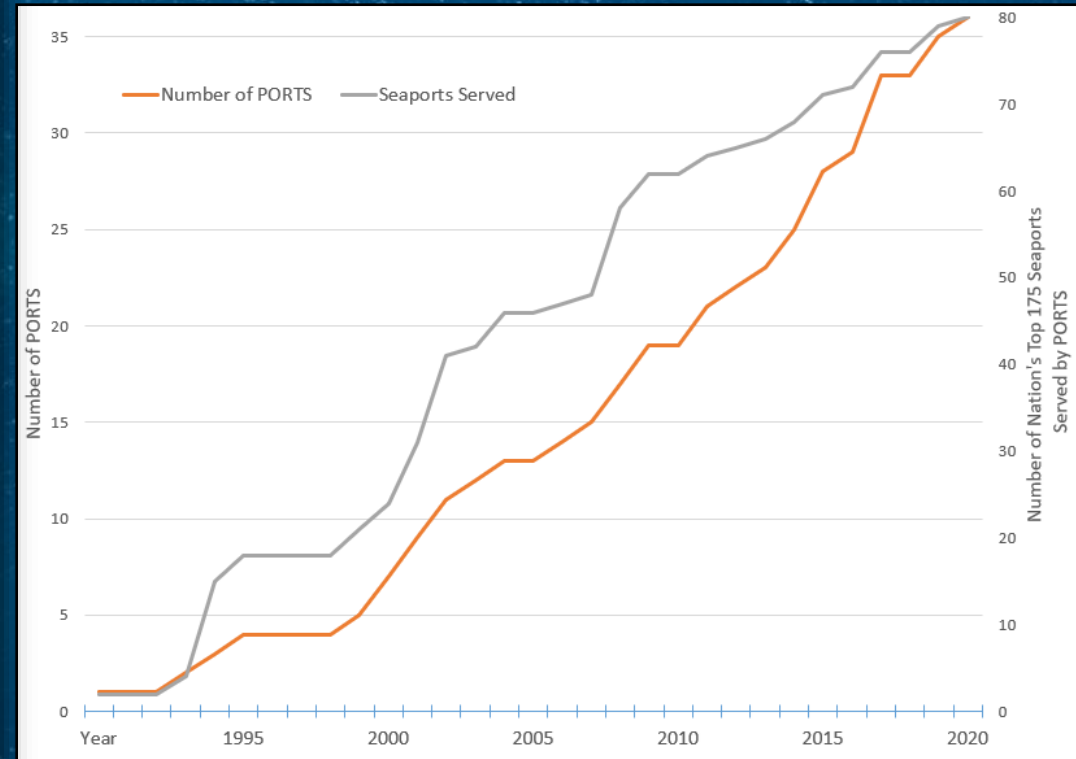
Freeport PORTS®

- Freeport PORTS NOAA's 38th system-operational in October 2022
- Partnership between NOAA and Port Freeport
- Added two current meters and integrated one existing NOAA NWLON
- This will greatly increase the navigation safety of vessels entering and exiting Port Freeport
- Large LNG seaport
- <https://tidesandcurrents.noaa.gov/ports/index.html?port=fr>

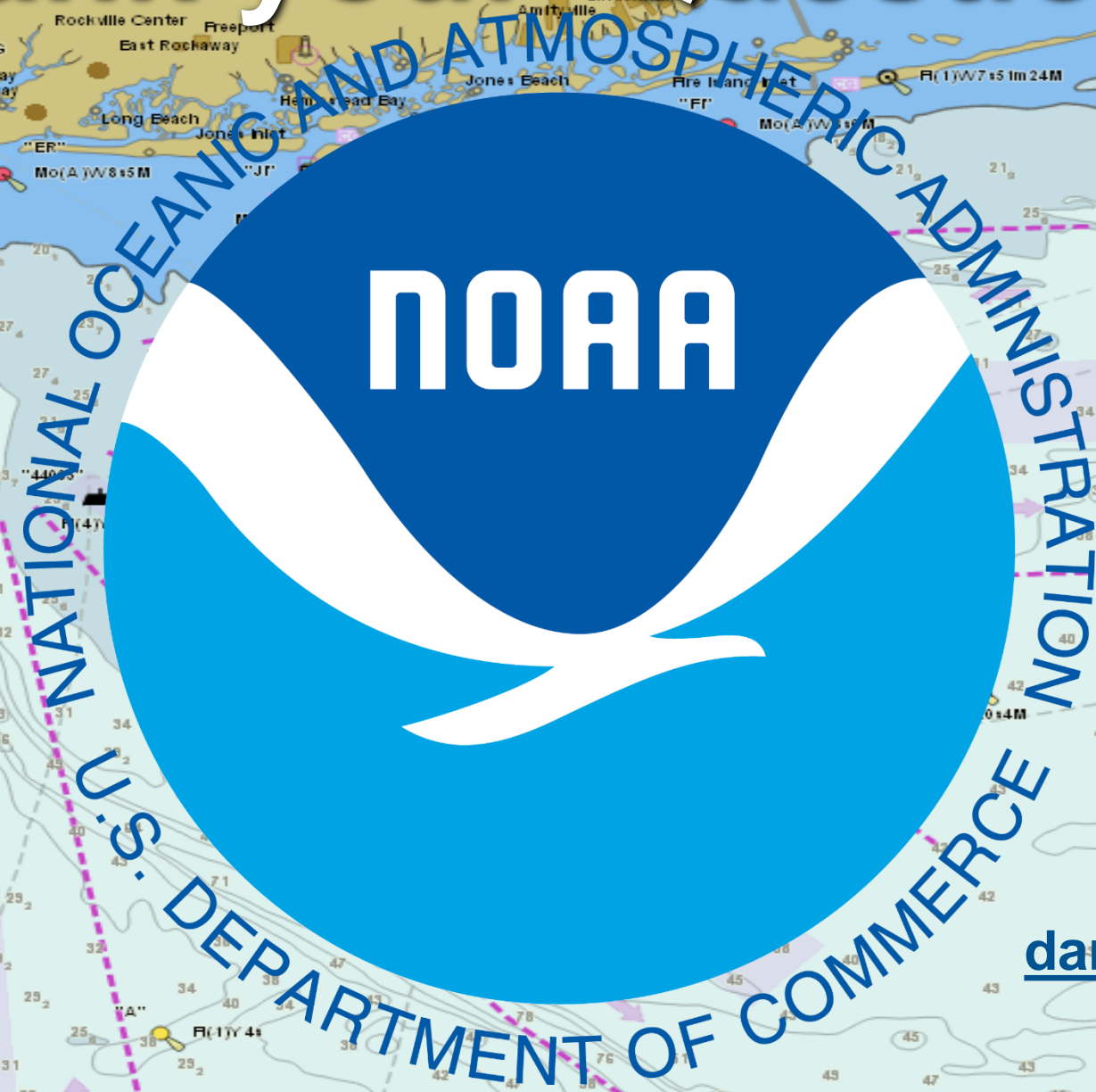


PORTS® Updates

38 Systems Nationwide Supporting 84 top U.S. Seaports



Thank you! Questions?



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Precision Marine Navigation
Program Manager

darren.wright@noaa.gov

(202) 936-5993