

# United States Coast Guard

## Office of Navigation Systems



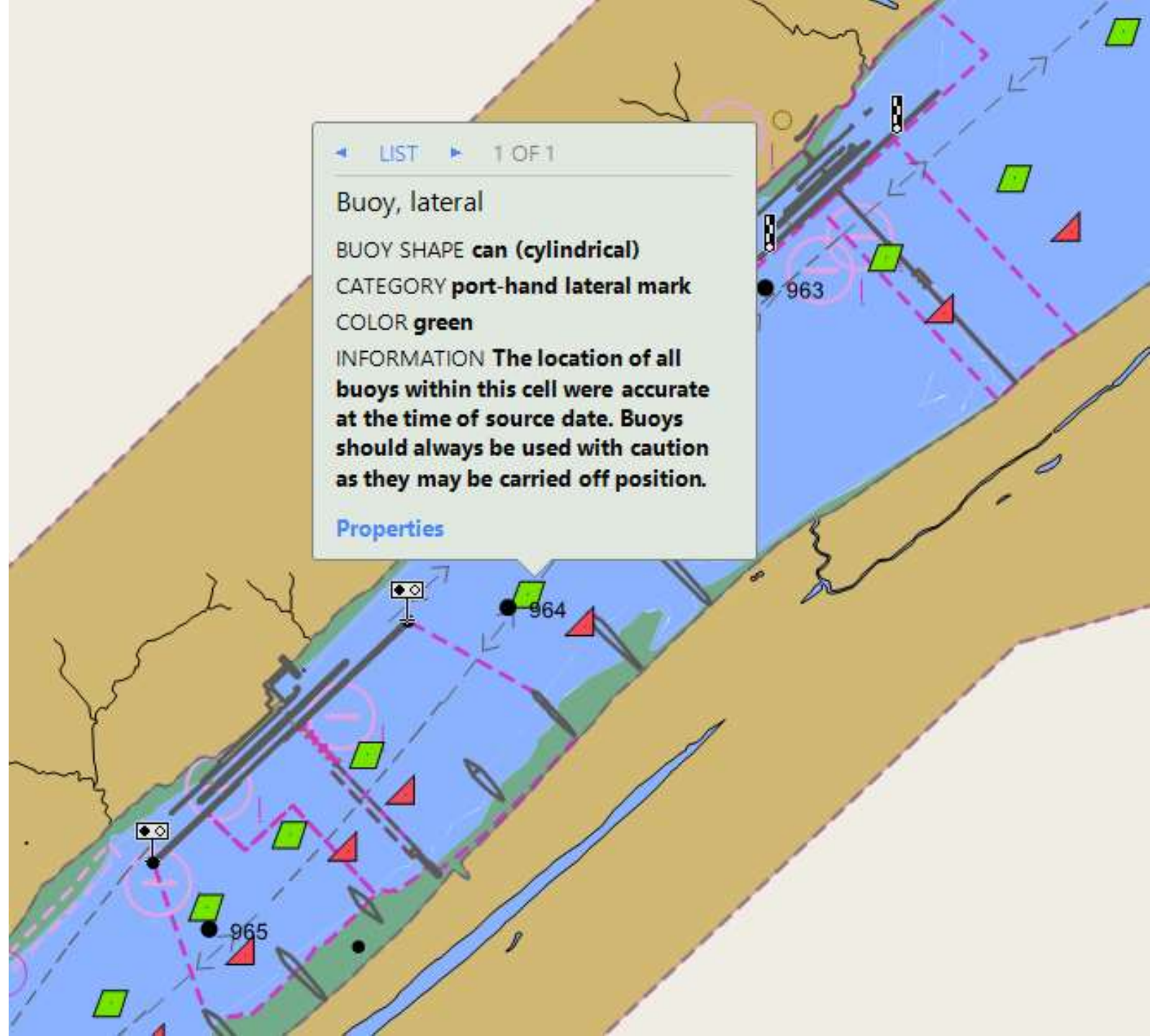
## Future of Navigation Initiatives & Operations

**IEHG Briefing Oct 2019**

**R. David Lewald | Program Analyst – Navigation Systems  
Office of Navigation Systems | U.S. Coast Guard | Washington, DC**

# USCG Buoy Layer Chart: 3UABUOYS

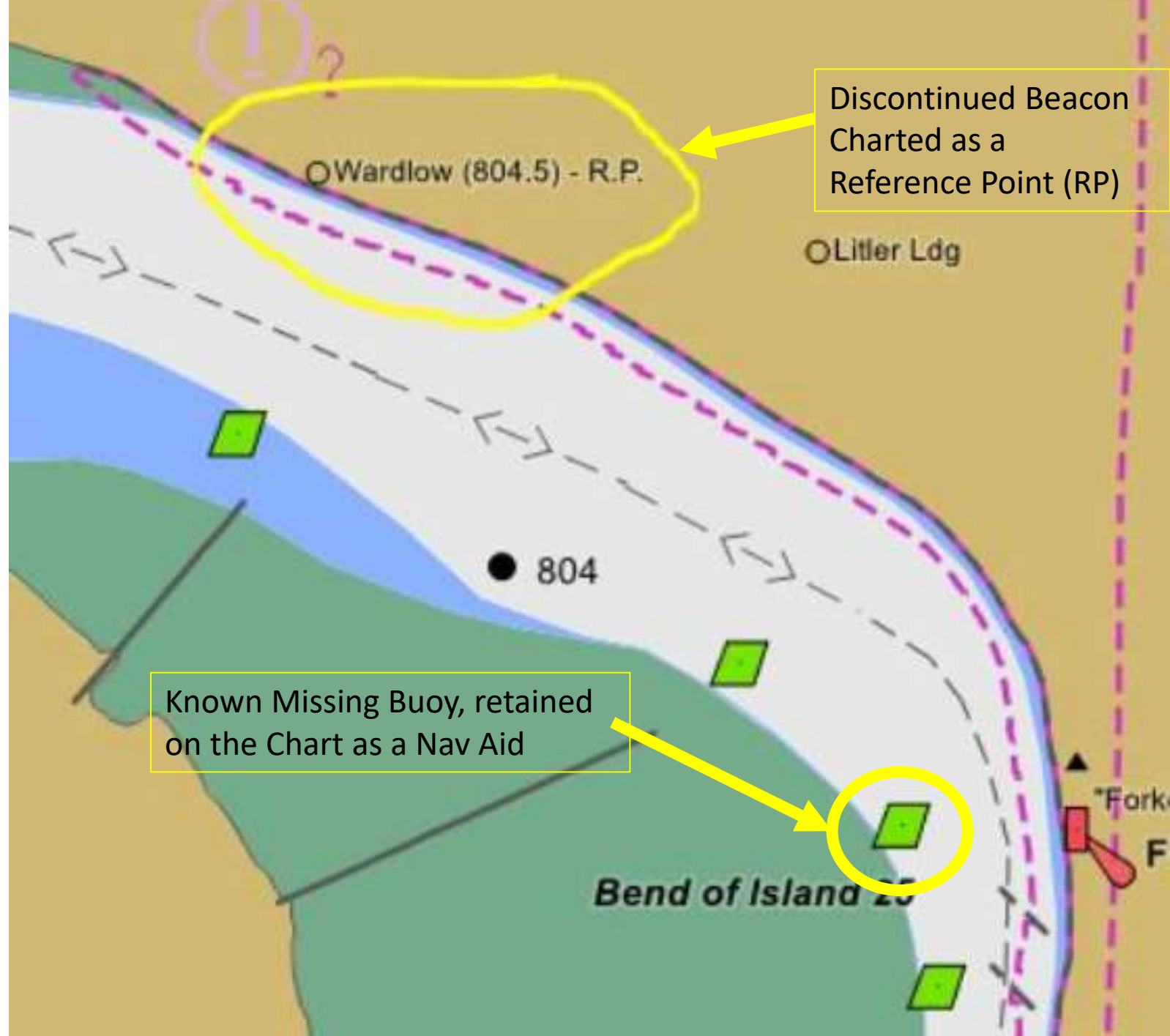
- USCG Buoy Tenders capture positions while setting the buoys using a specialized Electronic Charting System
- The Buoy Data is transferred to a centralized database from all 20 Aids to Navigation units operating on the U.S. Western River System
- The Buoy Data is sent weekly to USACE who converts the file into a new edition of chart 3UABUOYS
- The data is contained in a .CSV file with S-57 Attribute column headers



➤ Many AtoNs on the banks of our rivers have outlived their usefulness as a Navigational Aid, but USACE/USCG has concluded that a discontinued Beacon can provide a useful reference point to mariners to arranged passing/meeting points, etc.

➤ The USCG maintains approx. 11250 buoys on the Western Rivers System. Roughly half those buoys are lost each year due to Ice, High Water, etc. – The need for a chart feature to represent the location of a missing buoy has been expressed by mariners.

Thoughts?





# S-201 Product Specification



- S-201 is an International Association of Lighthouse Authorities (IALA) Product Specification assigned to the ATON Risk Management Committee (ARM)
- S-201 will:
  - ✓ Digitize ATON information which can be used by an HO to ingest ATON data into an S-101 ENC
  - ✓ HO's may choose to maintain ATON data in a separate layer and not include in the S-101 ENC
- Annex C of S-201PS will contain Implementation recommendations to ATON Authorities as well as Hydrographic Offices





# S-125 AtoN Product Specification

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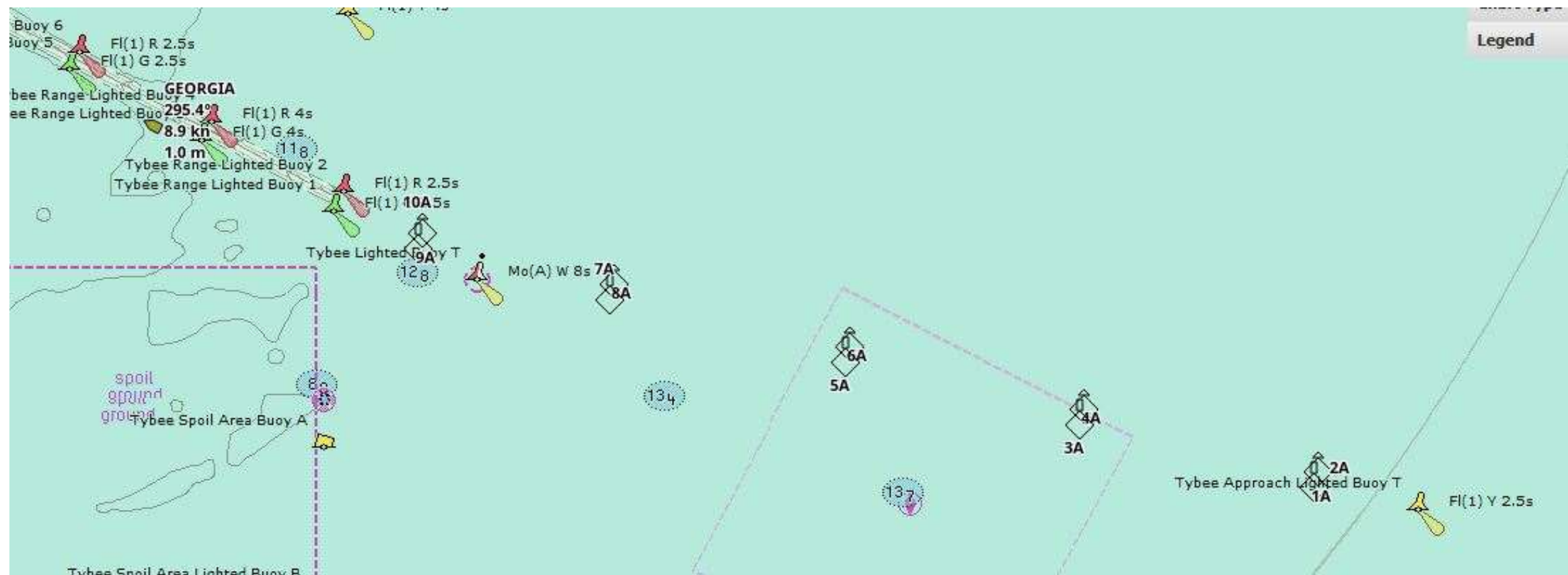
- S-125 is an International Hydrographic Organization Products Specification assigned to the Nautical Information Provision Work Group (NIPWG)
- Development of S-125 was transferred to the International Association of Lighthouse Authorities (IALA) and was assigned to the ATON Risk Management Committee (ARM)
- S-125 will:
  - ✓ Provide a digitized Light List
  - ✓ Provide digitized ATON information currently contained in Notice to Mariners (NtM) such as;
    - Temporary ATON Changes
    - Proposed ATON Changes
    - Advance Notice of ATON Changes
    - ATON Discrepancies
  - ✓ Provide a smaller sized data set to be used as an overlay until the S-101 ENC can be updated



# S-125 Use Case: Proposed Change to AtoN



## Proposed Change to ATON





# Mapping ATONIS Data to S-57



## Review of AtoN data

- Goal - “Gazetteer” - mapping AtoN data to S-57 standards-based product
- USCG delivers AtoN data to NOAA for conversion
- NOAA/USCG Meeting on a monthly basis – developing “translation” guidance
- FME – File Manipulation Engine
  - Create rules – app identifies data out of conformance with these rules



# Mapping ATONIS Data to S-57



Using FME to analyze multiple fields representing same info – used as a data check

Aid Number: 200100294568 Prim LLNR: 39000 Aid Name: Bogue Sound Daybeacon 36 Aid Type: Federal Sub Type: Fixed Desc Type: DBN

Locality Characteristics Miscellaneous

Physical Characteristics

Color: R Marking System: ICW Structure Type: SPW Structure Height: Tower Height: Emitter: Daymark:

Aid

Aid Number: 200100294568 Prim LLNR: 39000 Aid Name: Bogue Sound Daybeacon 36

Aid Light List Entries

LLNR	Prim Wtwy	Location Remarks	Structure Remarks
39000	<input checked="" type="checkbox"/>		TR-TY on pile.
	<input type="checkbox"/>		

PHYSICAL CHARACTERISTICS [BEACONS]

TOWER TYPE		ESTABLISHED	05/14/1985
TOWER HEIGHT		REBUILT	
STRUCTURE TYPE	SPS	MONITORED	PUBLIC
STRUCTURE HEIGHT	10	MONITOR EQUIPMENT	
CLIMBING QUAL. REQ.	BASIC	HISTORICAL STATUS	
FOUNDATION	OTHER	BOTTOM TYPE	MUD
PILING COUNT		DEPTH	8
DRAWING #		COLOR	G
		SOUND TYPE	

DAYBOARD

INSTALL DATE	ICW MARK	TYPE	SIZE	QTY	DIR	TEXT
	NONE	SG	3	2		

80	Ludlam Beach Buoy L	39-07-15.412N
	Marks south end of shoal.	074-38-09.070W
85	Avalon Shoal Lighted Buoy 2	39-05-23.412N
		074-22-56-550W

FIR 6s

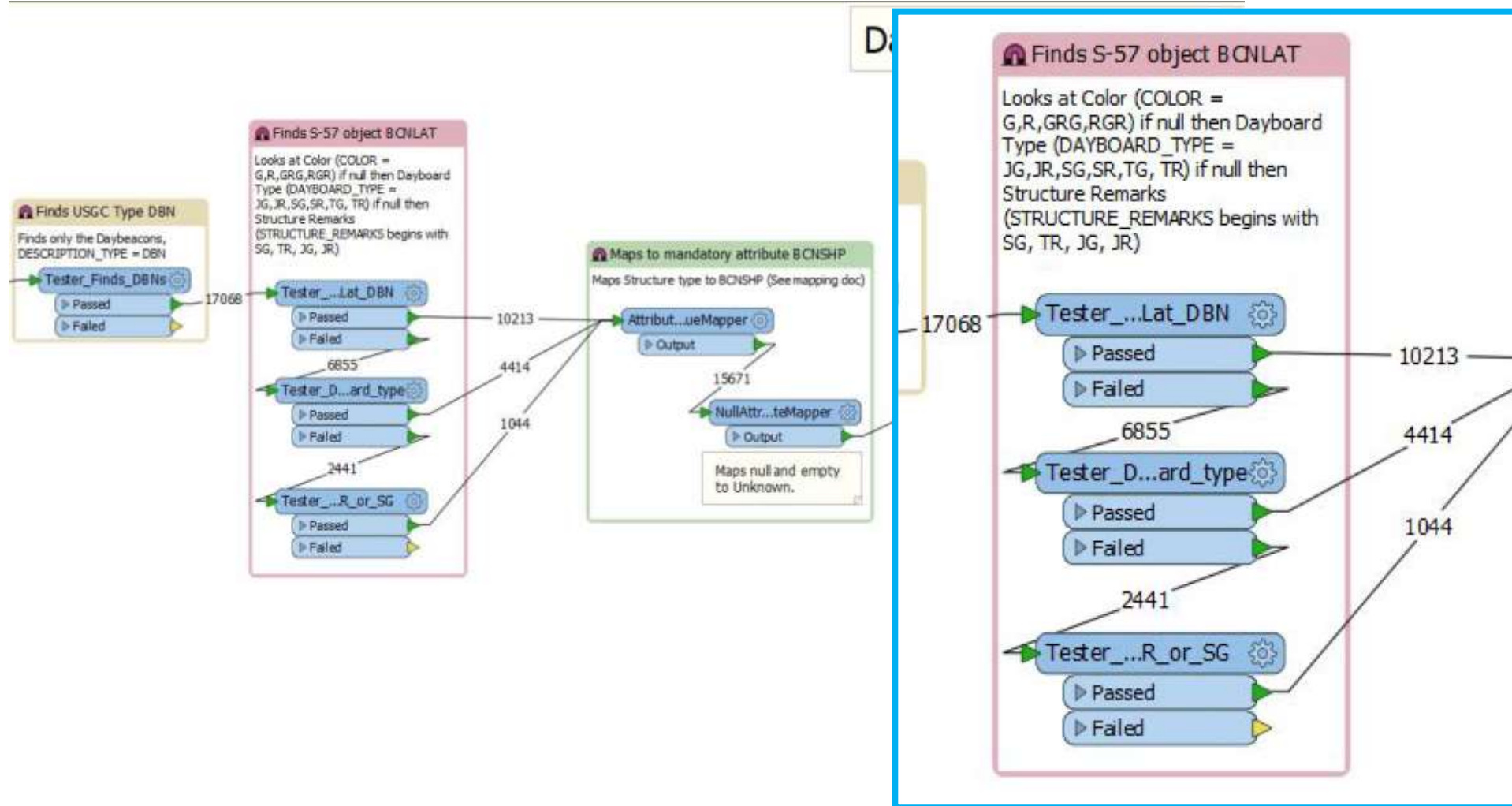
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Red and green  
bands; nun.  
Red.



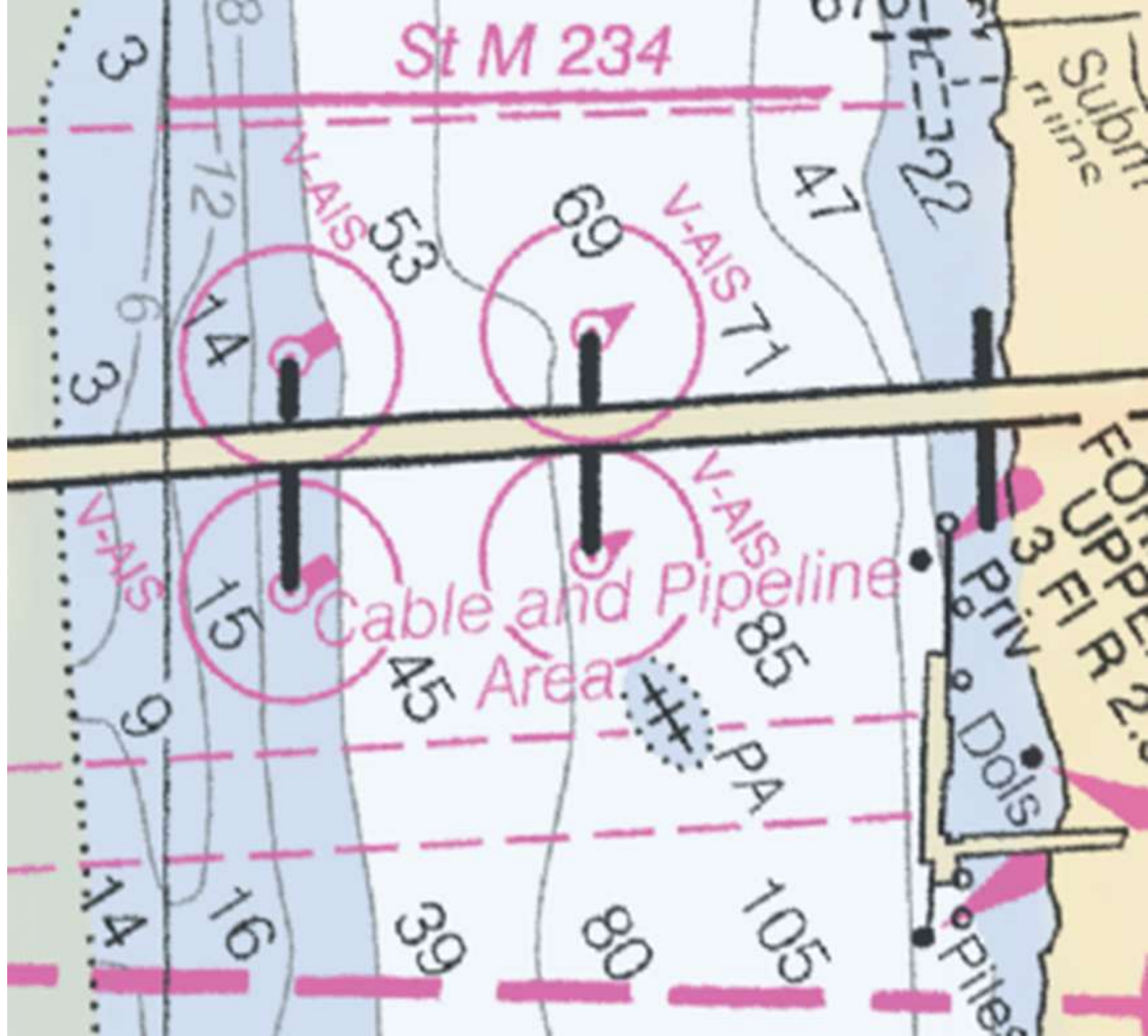


# Mapping ATONIS Data to S-57

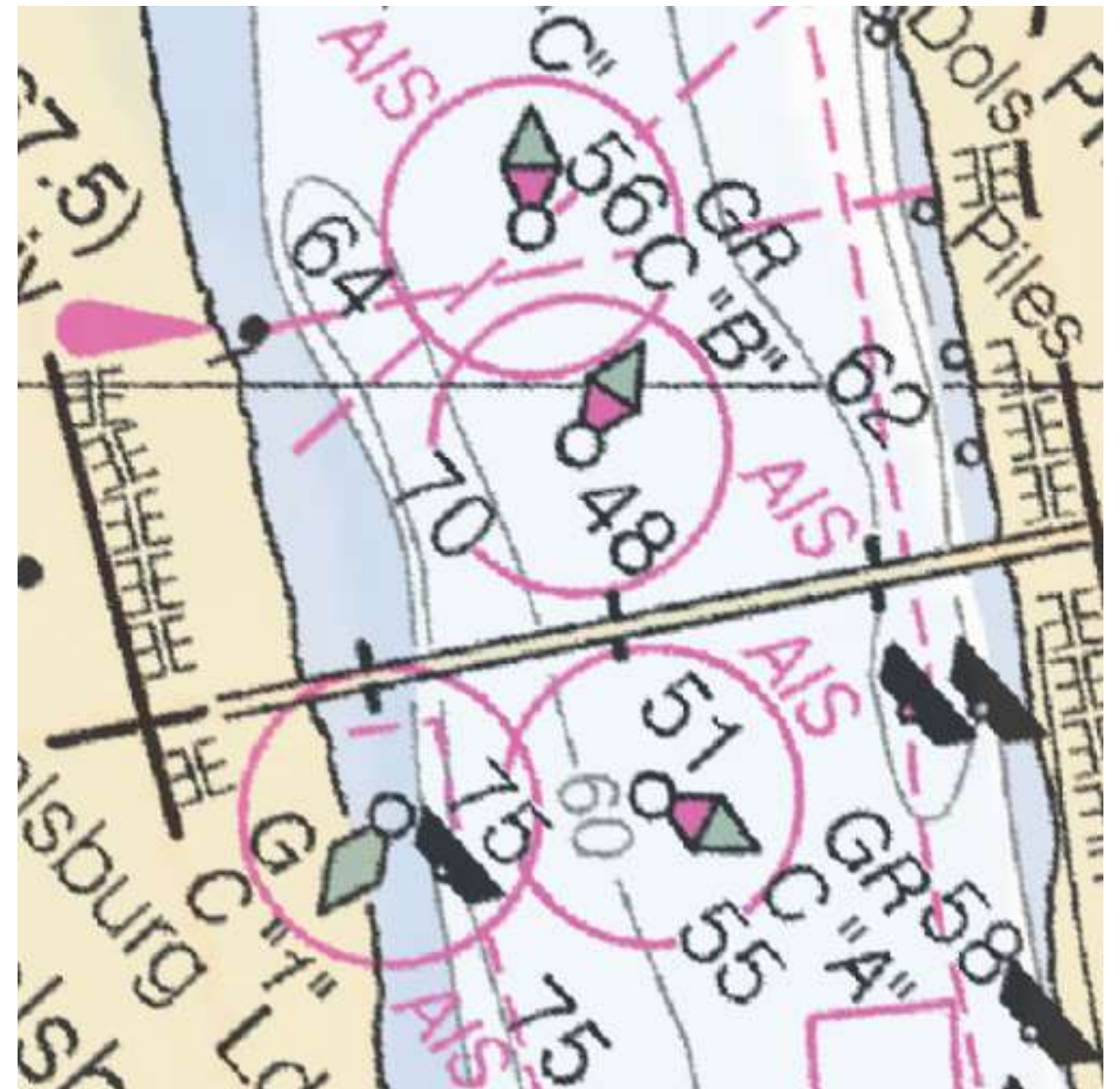
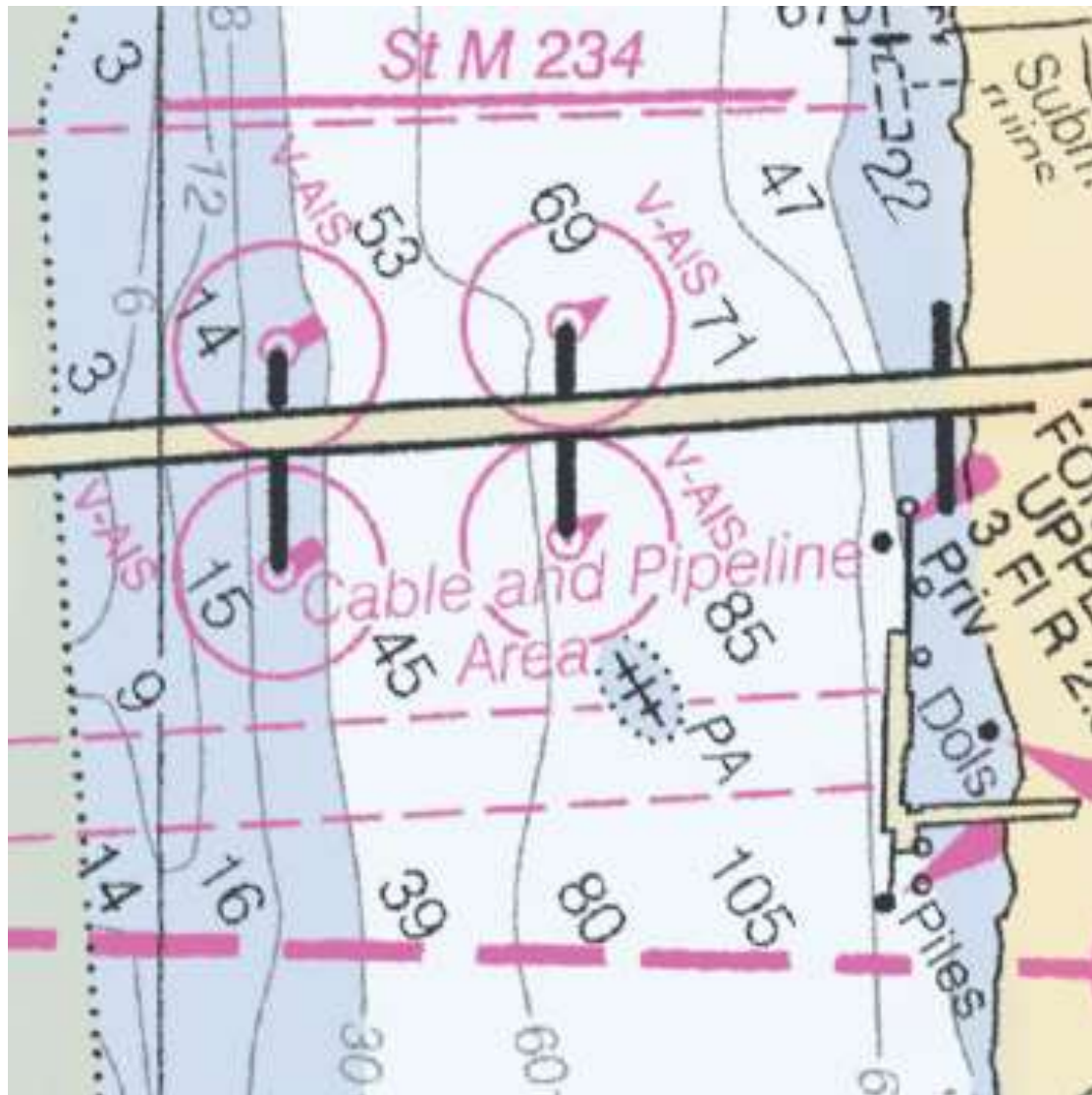


# SMART Bridge

- The USCG SMART Bridge concept uses a Physical AIS-ATON installed on the (or near) the bridge and connected to an array of sensors such as:
  - ✓ Current Meter(s)
  - ✓ Air Gap Measurement
  - ✓ Anemometer
  - ✓ Bridge Status (e.g. Open or Closed)
- The Physical AIS-ATON can broadcast virtual AIS-ATONs to assist with navigation and provide precise location of bridge piers.
- The AIS can be independently powered for resiliency and can be connected to the internet for remote programming and maintenance.

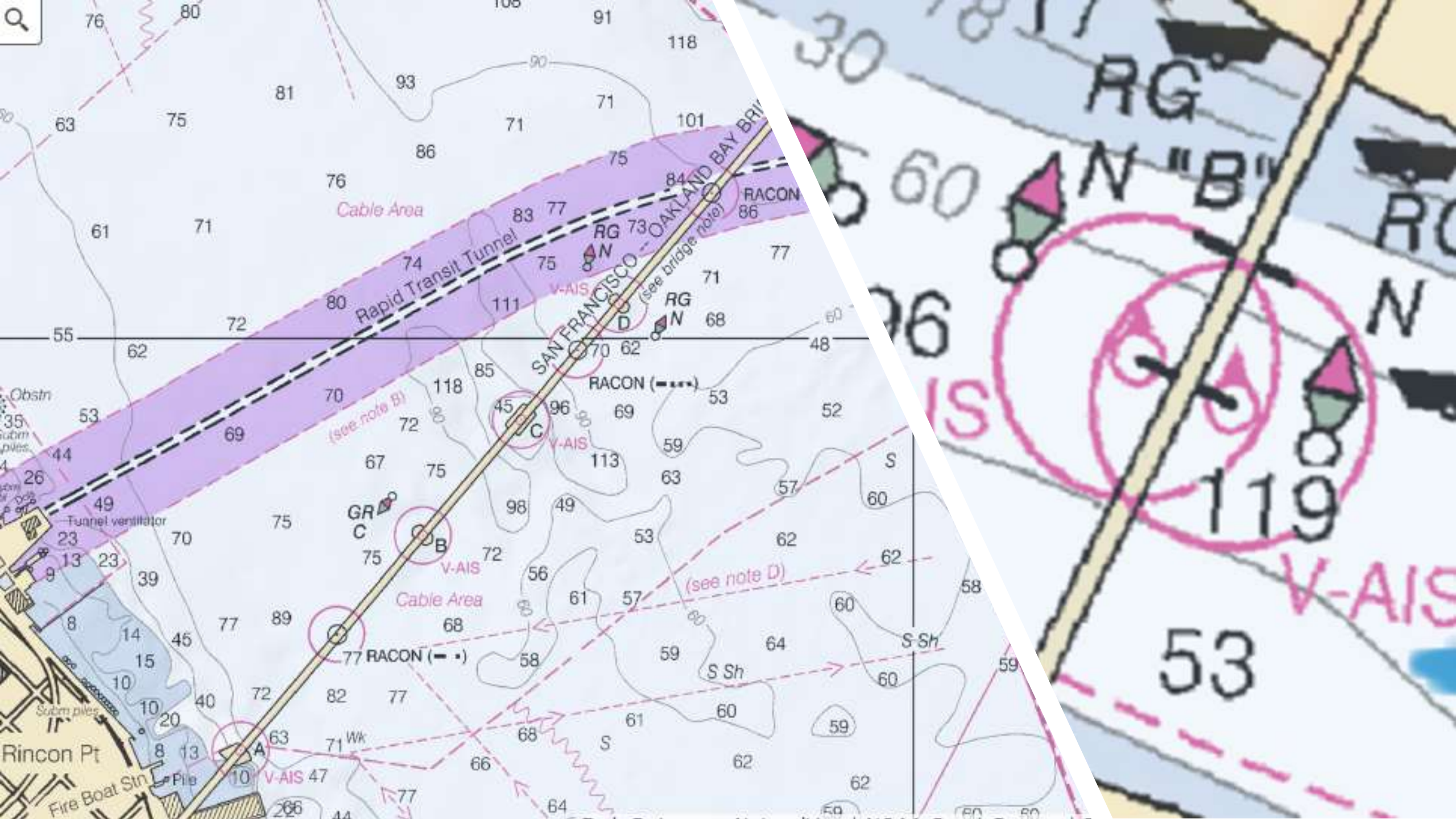


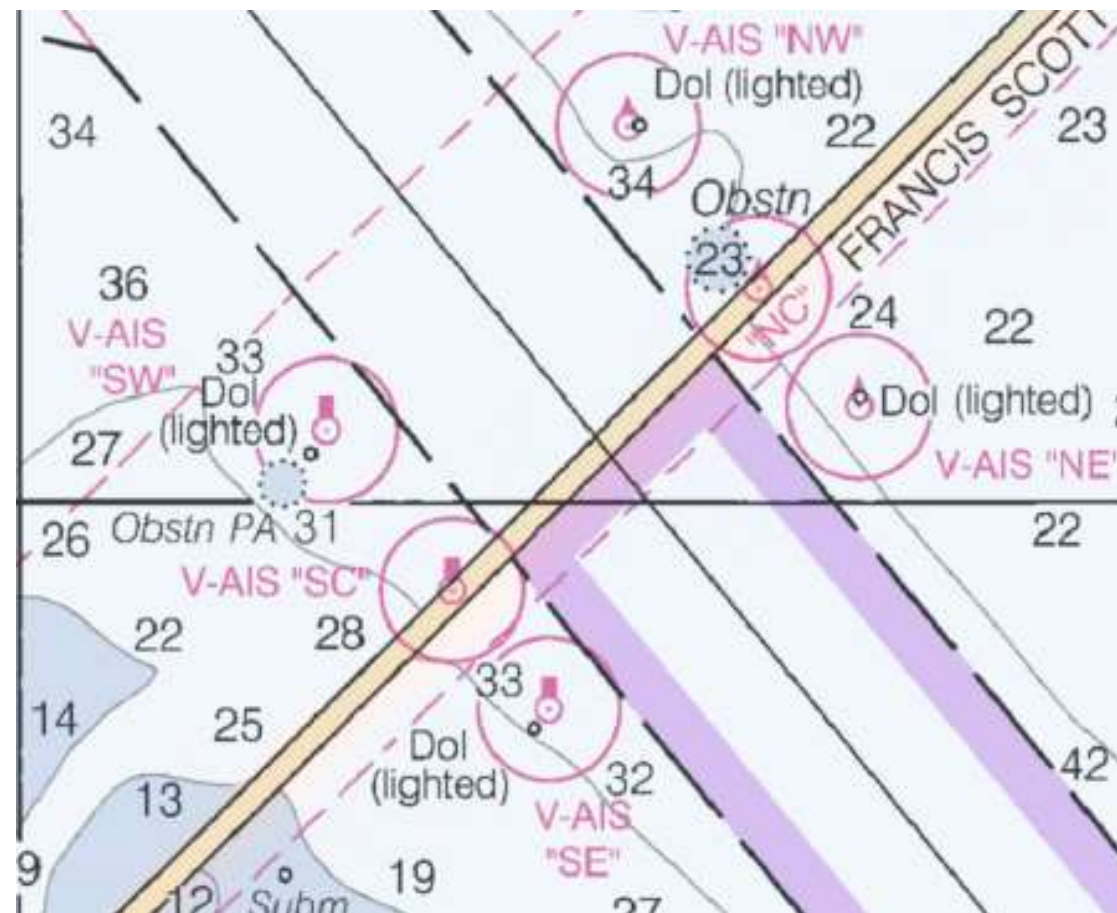
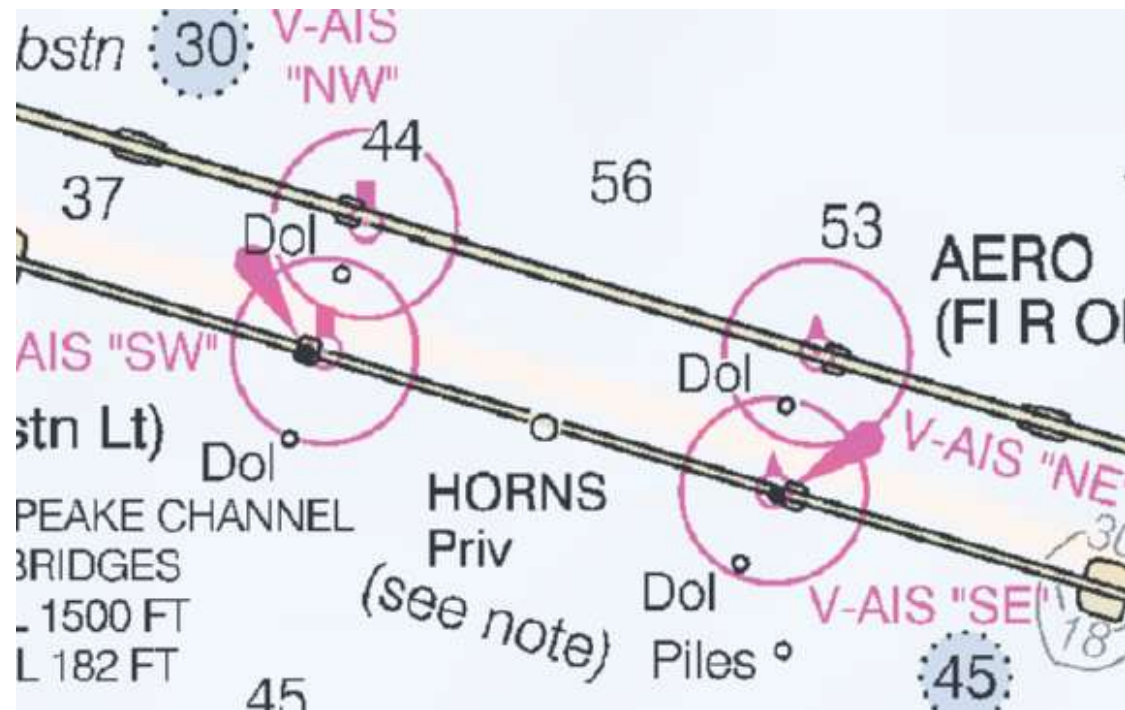




Smart Bridge

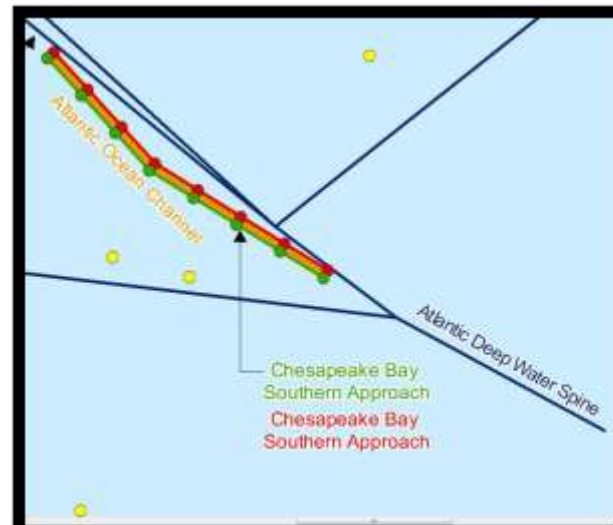
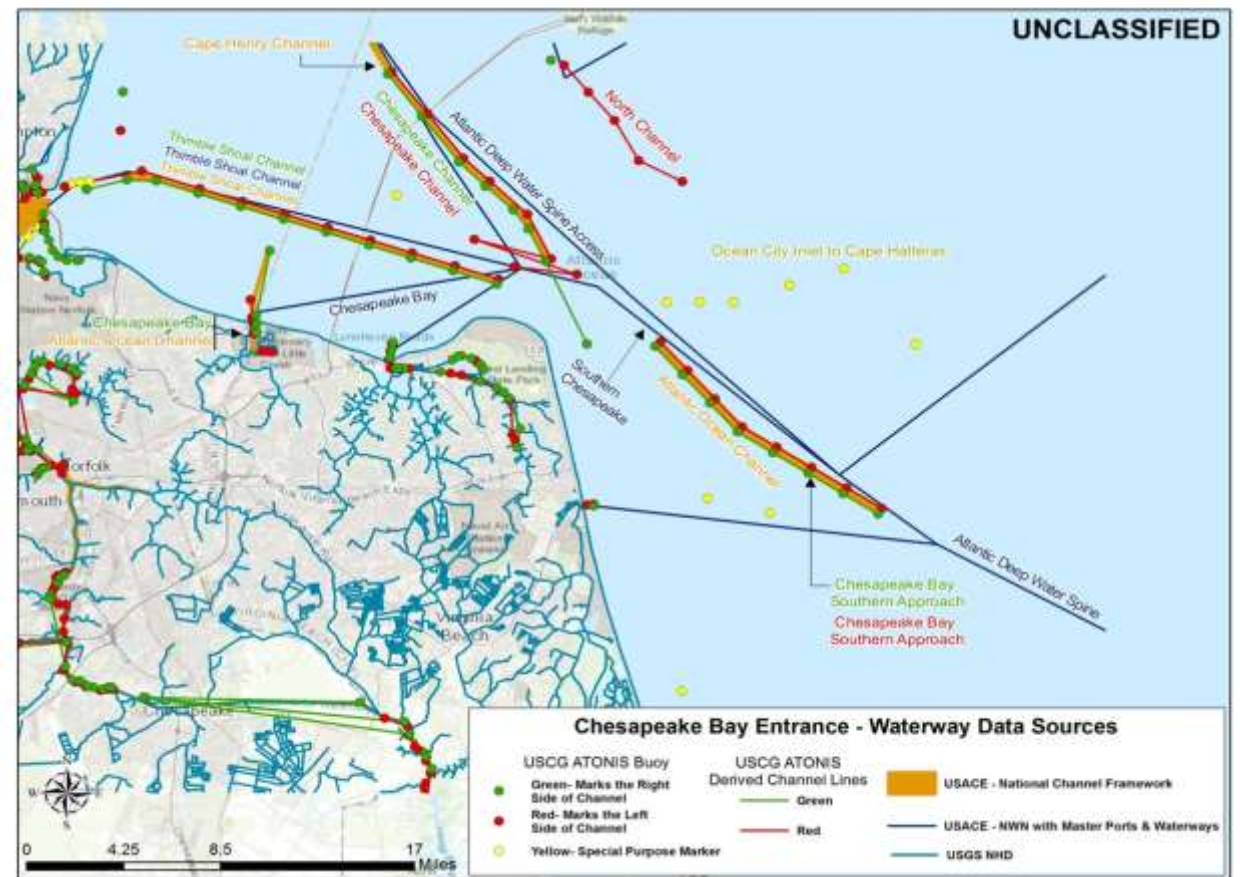




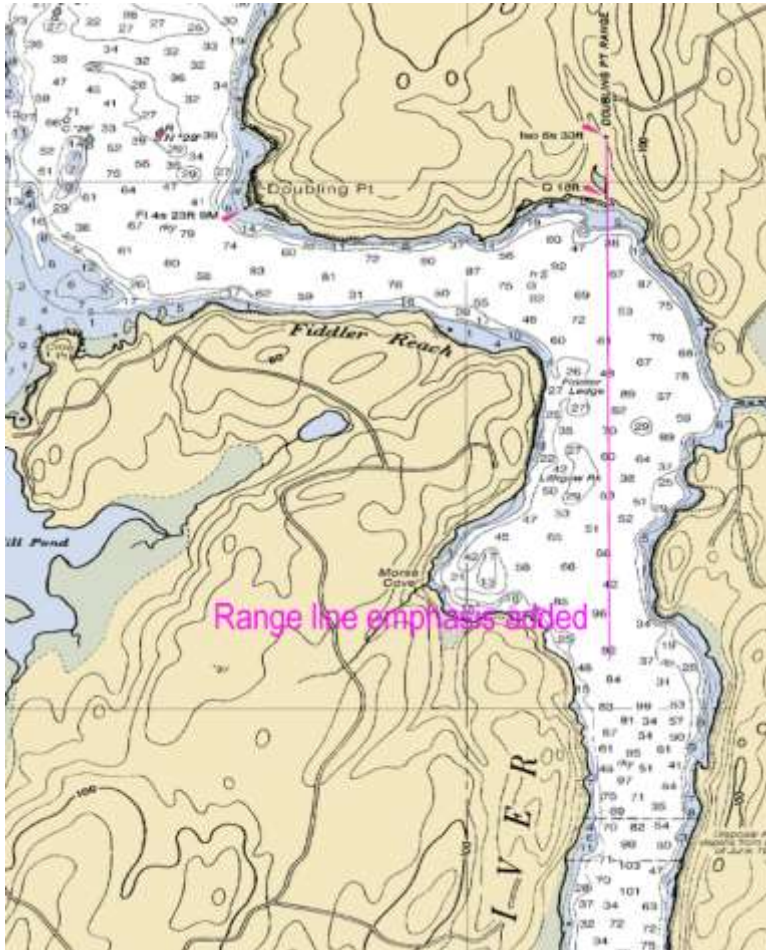




# Waterway Harmonization Project



# Maritime Resource Name



Doubling Point Range Lights on NOAA chart 13296. (Image from Wikipedia.com)

- Examples of how MRN identifiers from another domain may look in a product that mix data from different source producers:
- Feature: Recommended Track
  - Attribute: category of recommended track: Based on a system of fixed marks
  - Attribute: orientation: 270 degrees
  - Attribute: MRN: urn:mrn:iho:chart:jsho:12345678
- Feature: Navigational Line
  - Attribute: category of navigation line: leading line bearing a recommended track
  - Attribute: orientation: 270 degrees
  - Attribute: MRN: urn:mrn:iho:chart:jscg:87654321
- Feature: Landmark
  - Attribute: category of landmark: tower
  - Attribute: function: light support
  - Attribute: MRN: urn:mrn:iala:aton:jscg:54321678
- Feature: Light
  - Attribute: category of light: leading light
  - Attribute: colour: white
  - Attribute: MRN: urn:mrn:iala:aton:jscg:45678122
- Feature: Landmark
  - Attribute: category of landmark: tower
  - Attribute: function: light support
  - Attribute: MRN: urn:mrn:iala:aton:jscg:54321679
- Feature: Light
  - Attribute: category of light: leading light
  - Attribute: colour: white
  - Attribute: MRN: urn:mrn:iala:aton:jscg:45678123
- Feature: Range System
  - Attribute: name: Micklefirth approach range
  - Attribute MRN: urn:mrn:iho:chart:jsho:23456781
- Aggregation: Range System Aggregation
  - Consists of: MRN: urn:mrn:iho:chart:jsho:12345678
  - Consists of: MRN: urn:mrn:iho:chart:jsho:87654321
  - Consists of: MRN: urn:mrn:iala:aton:jscg:54321679
  - Consists of: MRN: urn:mrn:iala:aton:jscg:45678123
  - Consists of: MRN: urn:mrn:iala:aton:jscg:54321678
  - Consists of: MRN: urn:mrn:iala:aton:jscg:45678122





# Waterway Analysis Management System (WAMS)



## Data Analytics:

"Quantitative vs. Anecdotal"

### ✓ AIS

- Vessel Type Data
- Heat Maps
- Continuous Observation
- Design Vessel Ratification

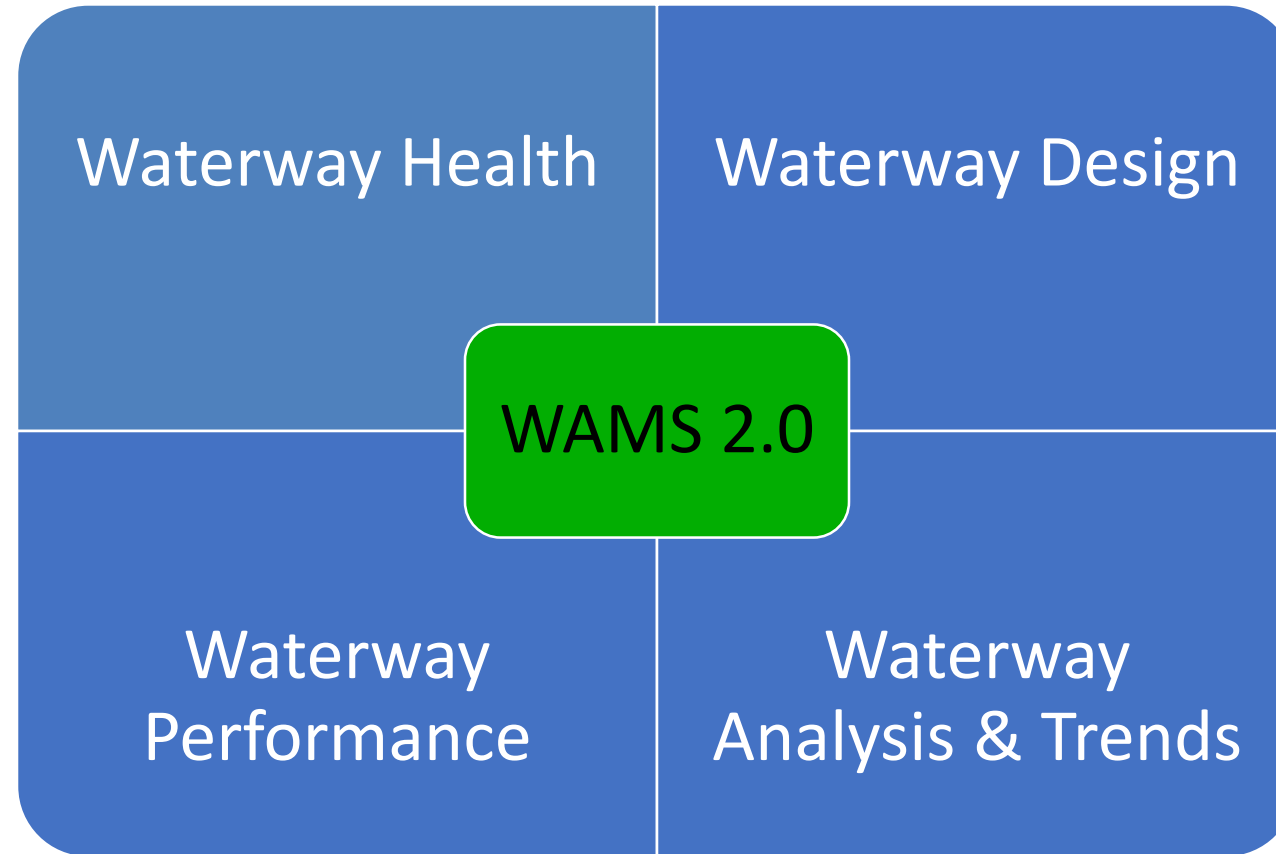
### ✓ USACE Data

- Waterborne Statistics (Cargo)

### ✓ eHydro Channel

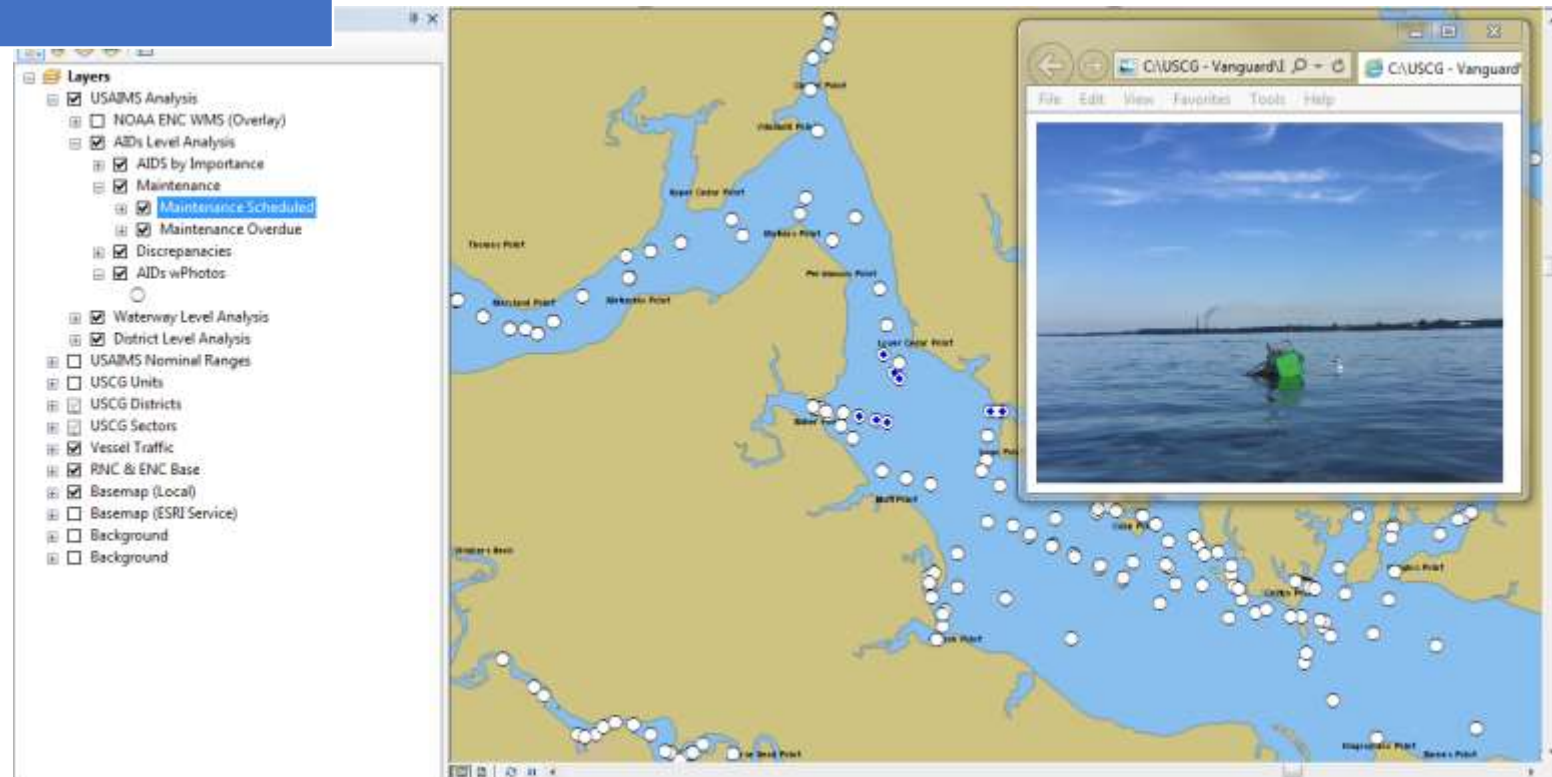
- Framework & Condition Reports (inactive projects)



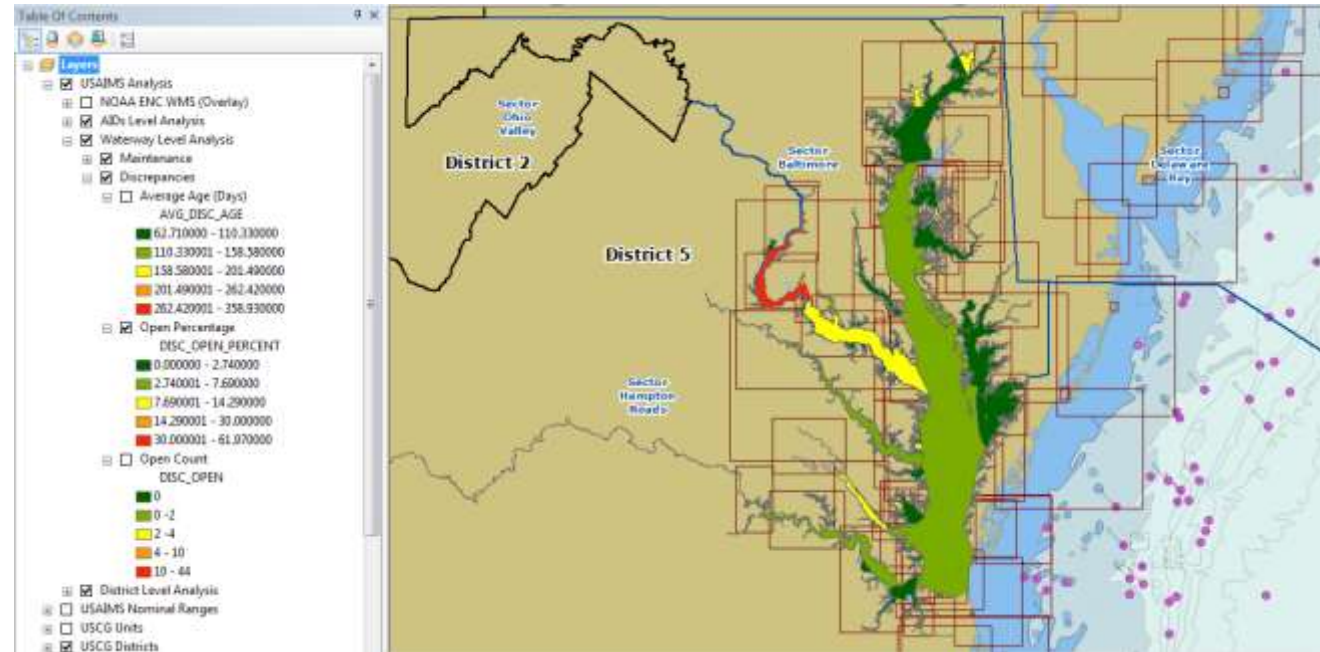


# Waterway Health

- Provides clear understanding of the waterway health at the Unit, Sector, District, Area, & HQ level
- Decision support tool for routine – extraordinary event planning, response, & recovery
- User Defined Reports



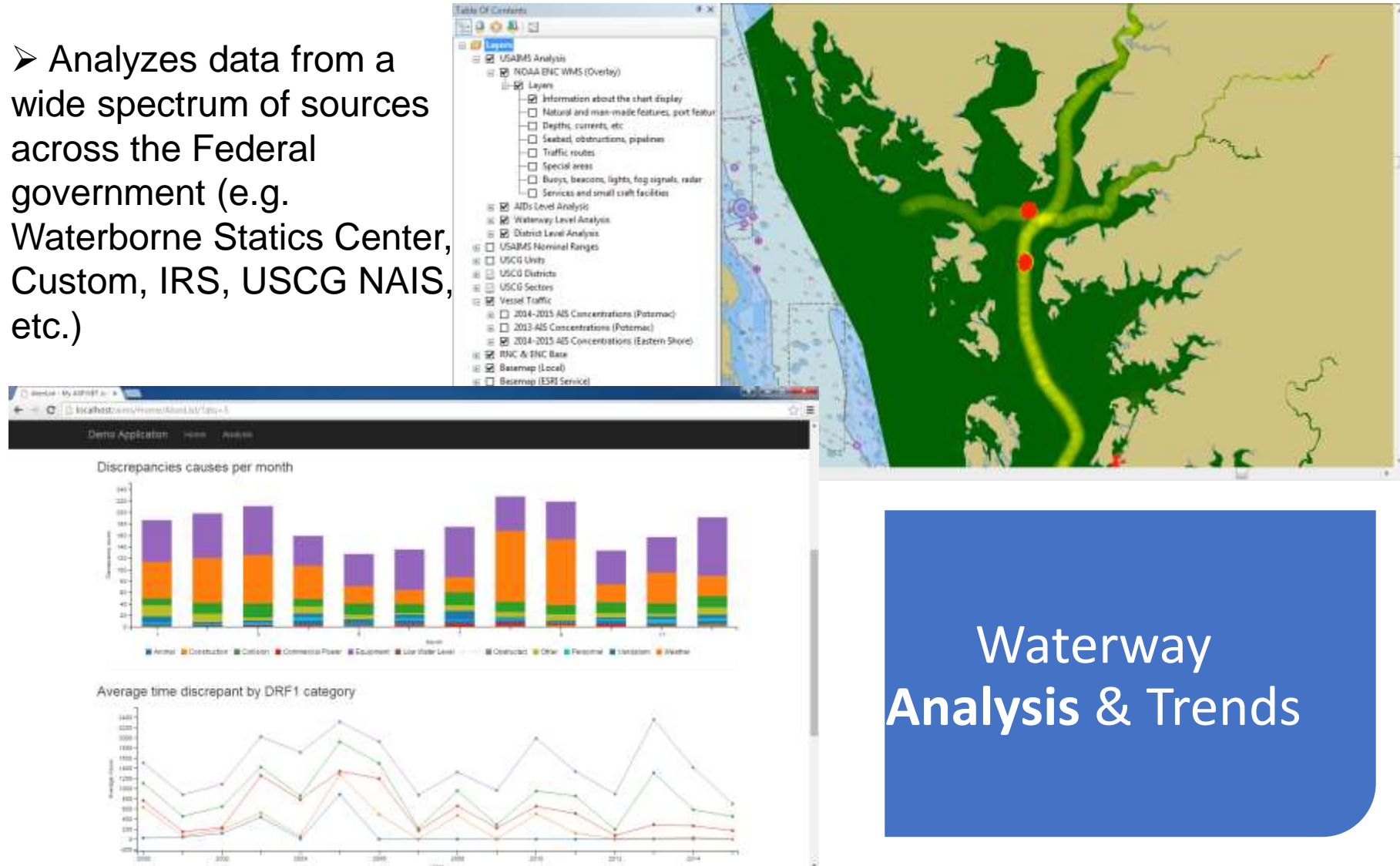


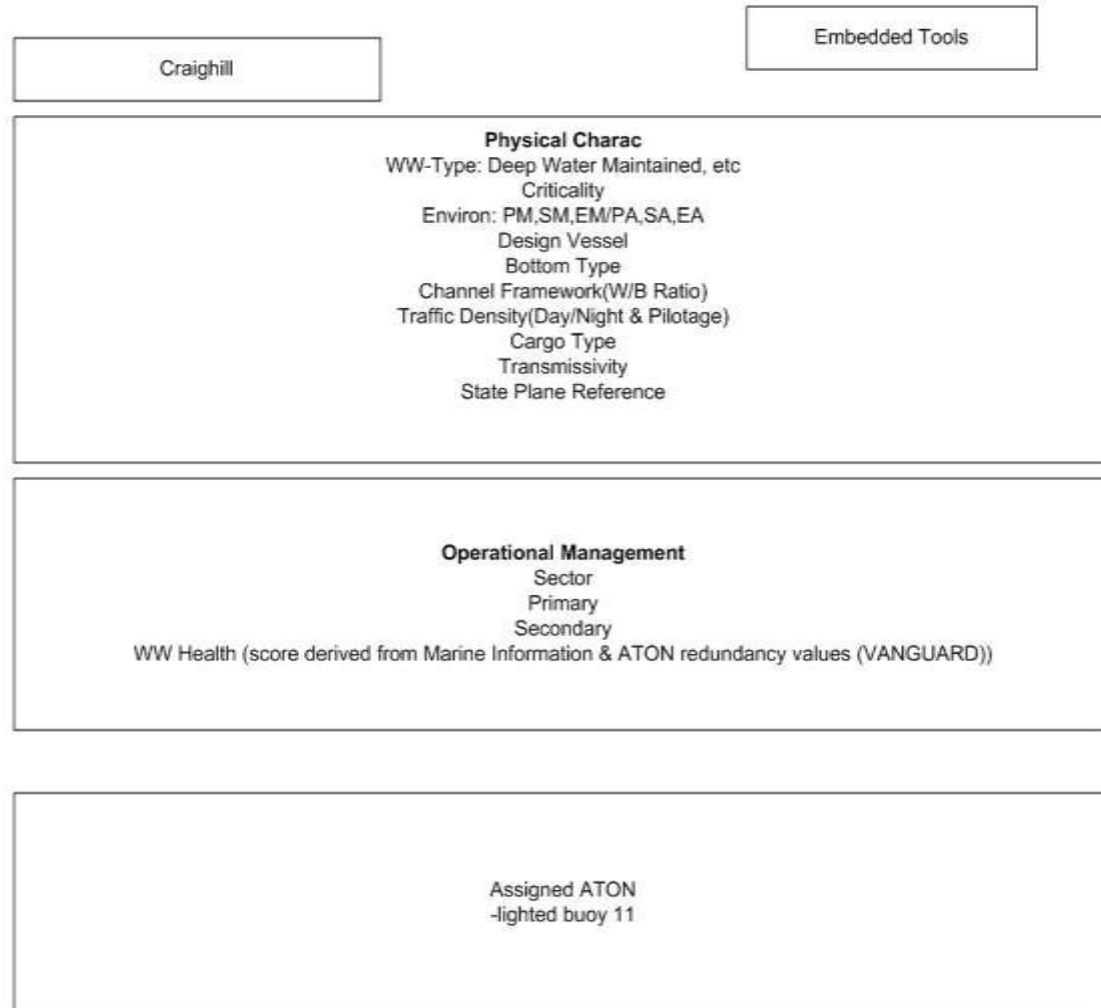


## Waterway Performance

- Analyzes Key Performance Indicators (KPI) – Aid Availability, PASOT, etc.
- Provides clear understanding of the waterway performance at the Unit, Sector, District, Area, & HQ level
- User Defined Reports

➤ Analyzes data from a wide spectrum of sources across the Federal government (e.g. Waterborne Statics Center, Custom, IRS, USCG NAIS, etc.)





## Waterway Design

- Waterway Design Characteristics based on Authoritative data (e.g. USACE Channel Framework)
- Reassigns Risk Analysis from individual ATON to the overall Waterway

- **Capability Gap:** U.S. Coast Guard District Commanders are required to conduct Waterways Analysis and Management System (WAMS) analysis of critical waterways at least once every five years and at least once for non-critical waterways, and/or update as user needs change. The Coast Guard looks for two primary results from the WAMS; first, what may be done to enhance safe navigation, and second, uses the data collected for budget planning at both the regional and national level. Currently, the Coast Guard has no computer-based tool to review, modify and/or design ATON systems in support of the WAMS process; nor does it possess the capability to conduct a routine waterway health assessments or analyze the condition of a waterway in a post disaster environment.
- **Operational Impact:** The USCG (CG-NAV) is seeking to develop a tool to support the WAMS process which will take advantage of the digital data available internally to the USCG and externally from other government agencies (NOAA, USACE, DOT, and DHS components). The WAMS 2.0 tool will improve the WAMS process by reducing the time to analyze a waterway, and rapidly designing and evaluating ATON system alternatives for a waterway. WAMS 2.0 will be used to optimize and modernize the USATONS based on reduced reliance on physical ATON due to advances in ATON design, electronic navigation, and waterway user requirements.

- The WAMS 2.0 tool will:
- Automate a manual process that will reduce time to complete a WAMS analysis of current and alternative ATON systems.
- Allow for the analysis of ATON systems based on business rules described in the USCG Aids to Navigation Manual.
- Allow geospatial visual analysis of ATON systems in relation to vessel transit and track data, collisions, allisions and groundings, natural resources, channel data, ATON cost data.
- Allow geospatial visual analysis of ATON systems in a post disaster environment to develop port recovery and effective resource allocation strategies.
- Allow for analysis of a layered approach to modernize and optimize alternative ATON configurations based on physical and electronic ATON and shipboard navigational aids and the implementation of e-navigation.
- Allow for rapid development and analysis of ATON system alternatives for a waterway using drag and drop interface and ATON spacing based on business rules for positioning of ATON.
- Enable visual presentation of alternative ATON configurations displaying ATON coverage of the waterway to stakeholders.
- Facilitate the budgeting process at both the regional and national levels.





## Nationwide AIS



- NAIS achieved FMC Summer 2018
- NOAA PORTS® Transmission still a problem
  - Technical solution has been identified
- Transmission of Enhanced Marine Safety Information (e.g. Air Gap, etc.) is under development



# AIS-ATON



## USAIMS - NAIS

AIS TYPE

SYNTHETIC

EATON TYPE

DEFAULT

EATON NAME

Apra Outer Harbor Buoy 9

AP LATITUDE

13-26-54.198N

AP LONGITUDE

144-39-36.197E

ESTABLISH

SELECTED BASE STATIONS

LOCATION	RANGE	TO AP	
Merizo	24nm	10.0nm	—
Mount Alutom	24nm	3.2nm	—

AVAILABLE BASE STATIONS

LOCATION	RANGE	TO AP	
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13° 19' 02.88" N 144° 52' 36.15" E

Apra Outer Harbor Buoy 9

BASE

BASE

Mount Alutom | 3.2 nm

WATERWAY MANAGEMENT

MARINE INFORMATION

IATONIS

REPORTS

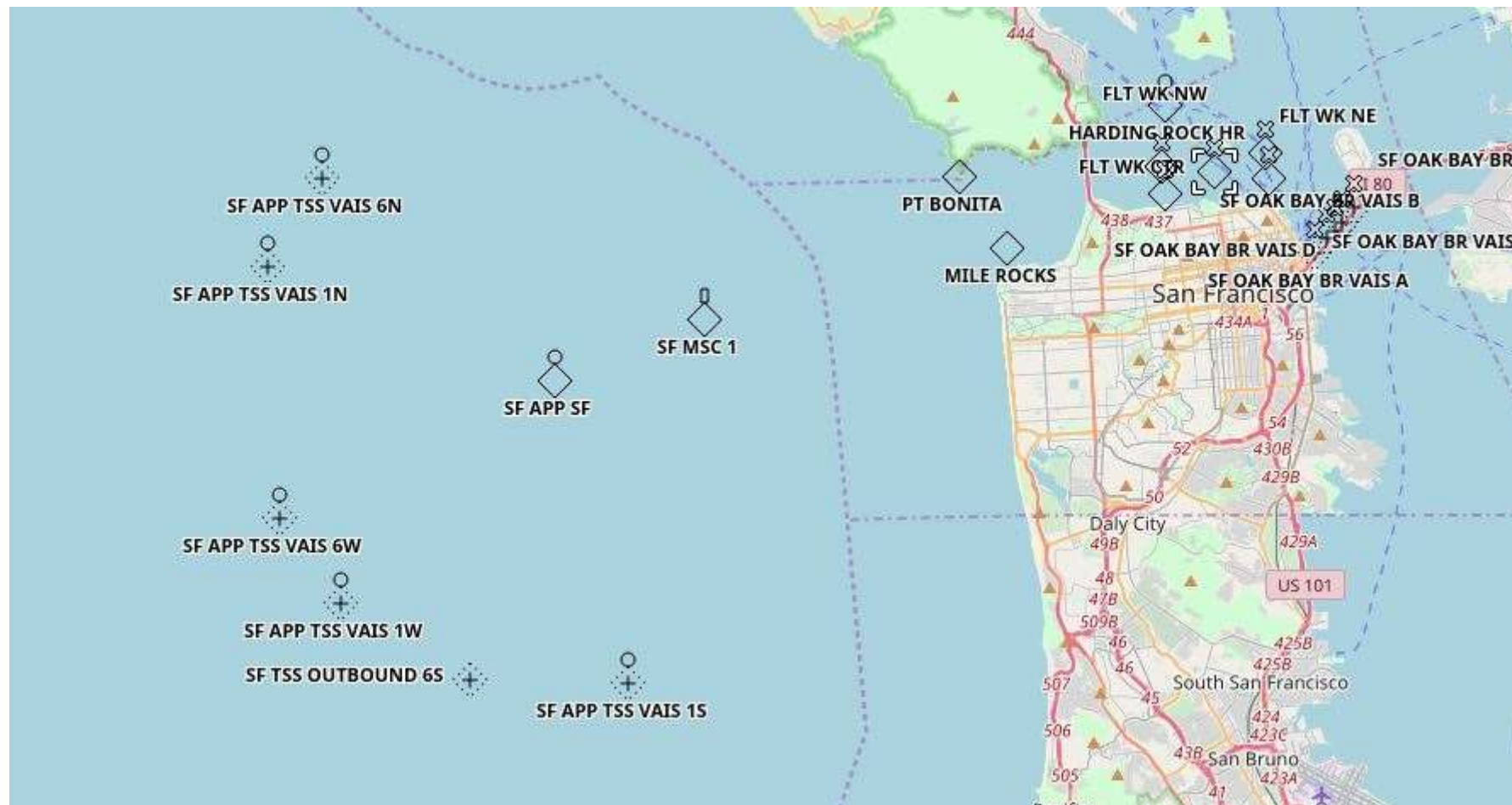
HELP



# AIS-ATON & Waterway Design



## Waterway Design Concepts using AIS-ATON





# AIS-ATON & Waterway Design



## AIS-ATON USE CASES:

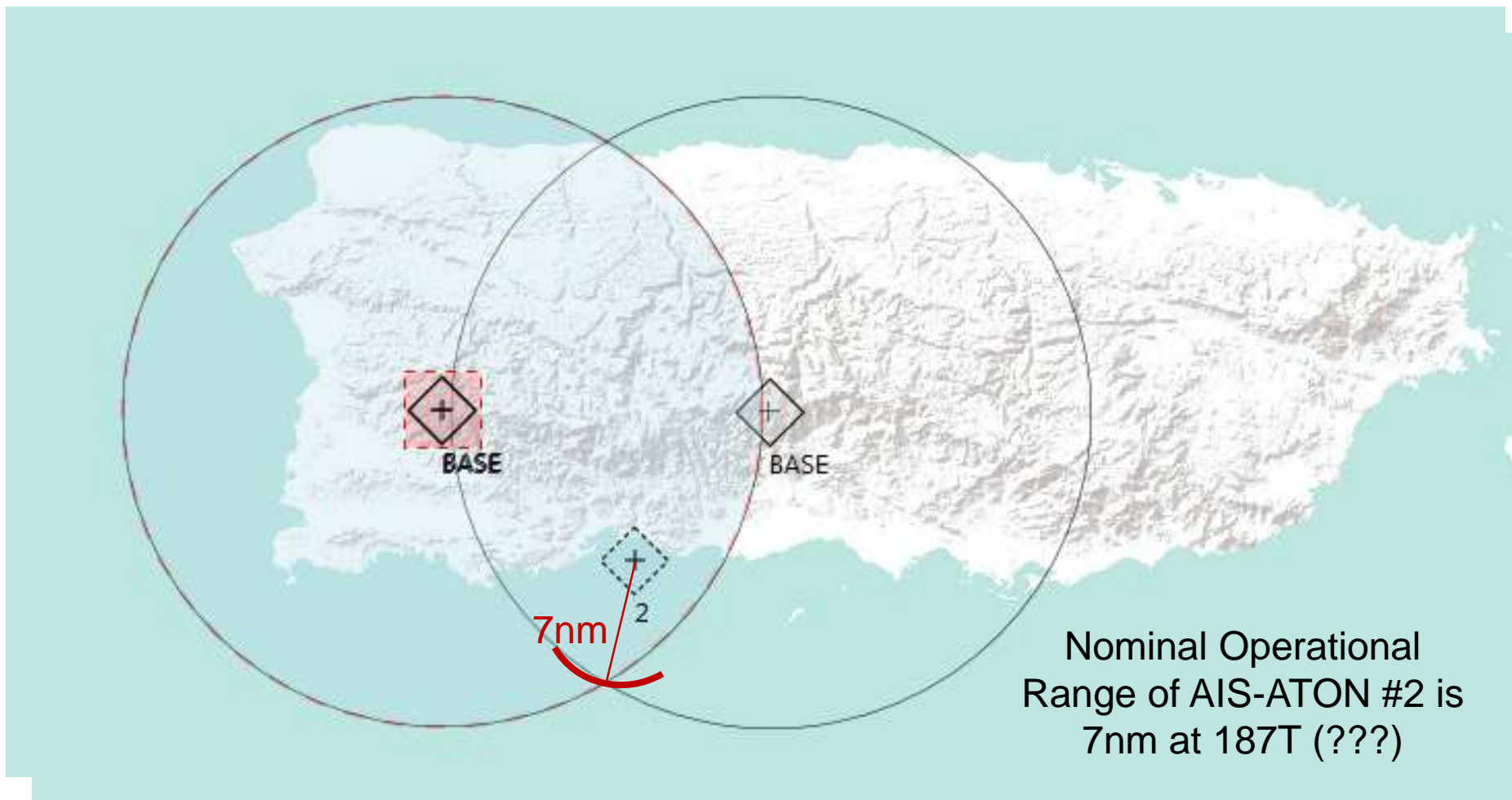
Use	Example	Pros	Cons
Landfall Approach	Safe Water Buoys	?	?
Discrepancy Response	Virtual Wreck	?	?
Historically Unreliable	Ice, Vessel Allisions	?	?
Disaster Response	Hurricane, High Water, Flooding	?	?
Temp Changes	Dredging, Channel Alterations	?	?



# AIS-ATON



## Additional Waterway Design Considerations







# AIS-ATON



## Deployable AIS-ATON





# IEHG Brief



Questions?