

# *Crowdsourced Bathymetry Data via Electronic Charting Systems*

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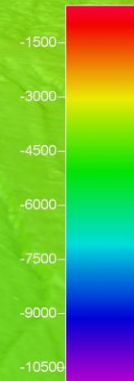
Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO  
NOAA National Centers for Environmental Information (NCEI), Boulder, CO  
***Co-located with the IHO Data Center for Digital Bathymetry***



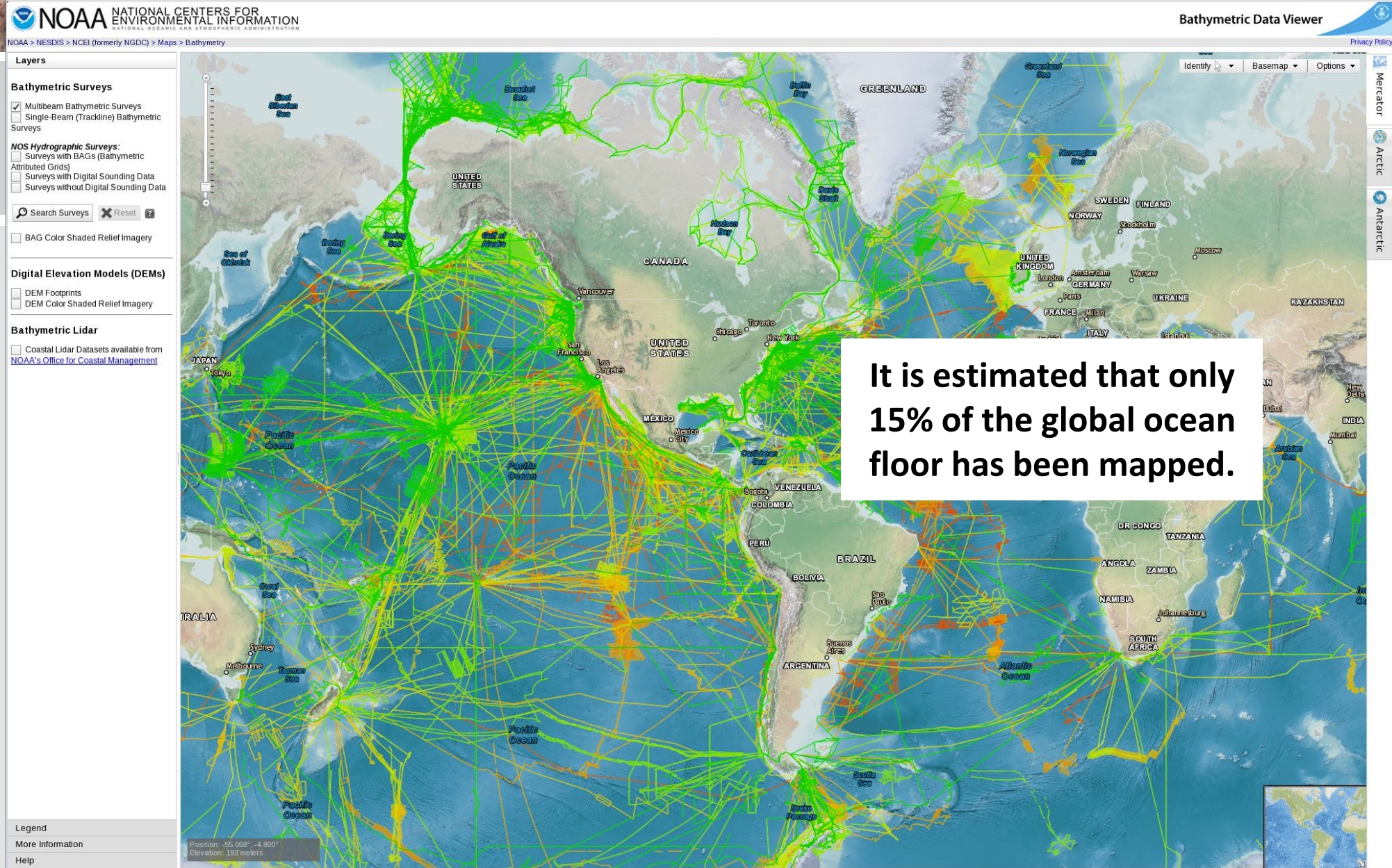
# Bathymetry

Bathymetry is a prerequisite for understanding how global earth systems interact.

- Influences the flow of sea water carrying heat, salt, nutrients, and pollutants
- Influences the propagation of energy from undersea seismic events
- Impacts navigation and commerce
- Defines habitats for sea life







Current multibeam bathymetry holdings in the IHO Data Center for Digital Bathymetry (DCDB)

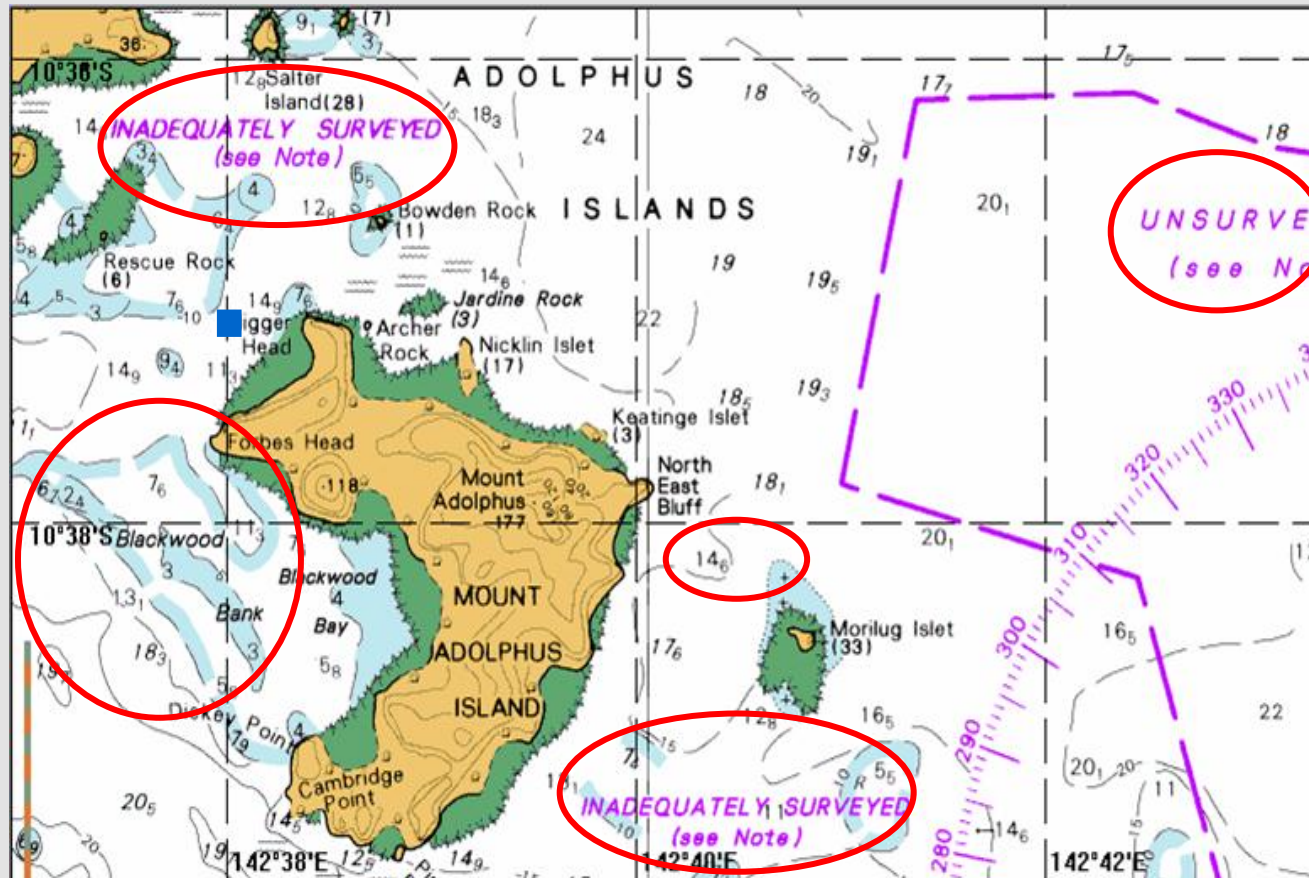


# How Crowdsourcing Helps

- GEBCO Seabed 2030 – global initiative to map the oceans will rely heavily on crowdsourced data
- Enables all mariners to help map the gaps



# How Crowdsourcing Helps



Hydrographic agencies worldwide are focusing on crowdsourced data as a viable and inexpensive source of data

- Planning
- Reconnaissance
- Chart adequacy
- Ground truthing



# IHO Data Center for Digital Bathymetry

The [IHO DCDB](#) is the recognized IHO repository for all deep ocean bathymetric data (greater than 100 m) collected by hydrographic, oceanographic and other vessels.

Data are sent to the IHO DCDB, where we provide long term archive and data management.



International Hydrographic Organization  
Organisation Hydrographique Internationale

Home Letters & Documents Standards & Publications Committees & WG Capacity Building ENC's & ECDIS Meetings External Liaisons IHO Membership World Bathymetry

IHO Home / IHO DCDB

## IHO Data Centre for Digital Bathymetry (DCDB)

The International Hydrographic Organization Data Centre for Digital Bathymetry (IHO DCDB) was established in 1988 to steward worldwide bathymetric data on behalf of the IHO Member States. The Centre provides long term archive of and access to single and multibeam deep and shallow water ocean depths contributed by a range of mariners.

[Access Data](#)

[Contribute Data](#) [Crowdsourced Bathymetry](#) [Shallow Water Bathymetry](#) [Data Uses](#) [Other Resources](#)

  
IHO Member States

[Contribute Data](#)

The IHO DCDB welcomes bathymetric data and metadata, accepts descriptions and spatial footprints of data that is already online and of data that are not publicly available to provide easy search and discovery. Thank you for contributing to more accurate and comprehensive bathymetric maps, grids and products.

We accept bathymetric data via File Transfer Protocol (FTP), email, CD and DVD, and hard drive in MGD77T format. Other formats will be considered on a case-by-case basis.

### Do You Know?

- Detailed knowledge of global bathymetry is critical for understanding how Earth's systems interact and to support coastal zone management, environmental protection, tsunami modelling, inundation forecasting, and charting.
- The shape of the ocean basins, ridges and mountains influence the flow of sea water carrying heat, salt, nutrients, and pollutants. These features also influence the propagation of energy from undersea seismic events that result in potential disasters such as tsunamis.
- Less than 5% of our oceans are mapped with in situ soundings, making it critical to preserve and share the data already collected and to identify and work together to fill high priority data gaps to support these important uses.

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IHO has endeavoured to make the information on this website as accurate as possible but cannot take any responsibility for it.

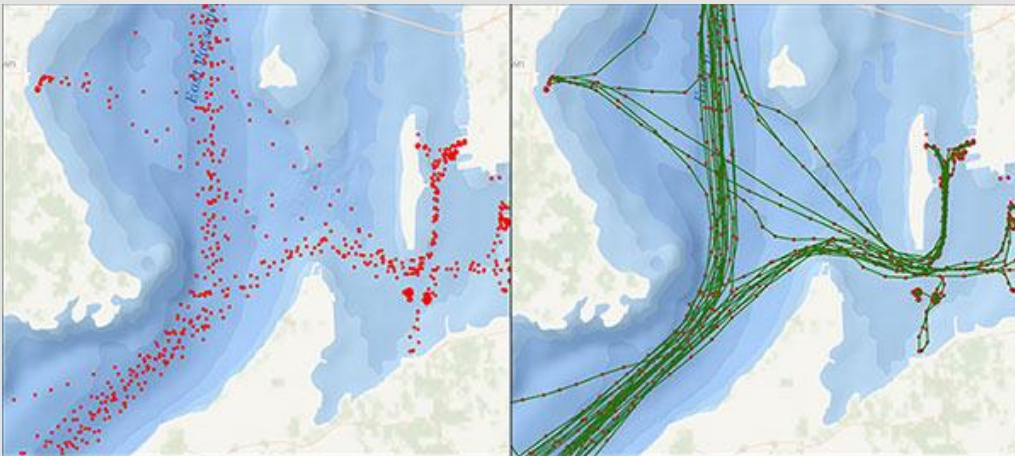
# Crowdsourced Bathymetry Projects

The IHO and NOAA have initiated a collaborative project to improve the DCDB through the collection of crowdsourced bathymetry (CSB) data.

The project goal is to enhance the IHO DCDB infrastructure and interface to ultimately allow the public to **upload, discover, display and download** bathymetric data via a web-based interface.



The IHO has also established the Crowdsourced Bathymetry Working Group – an international group tasked with developing a guidance document to establish best practices for the collection and submission of CSB data.





# Electronic Charting Systems

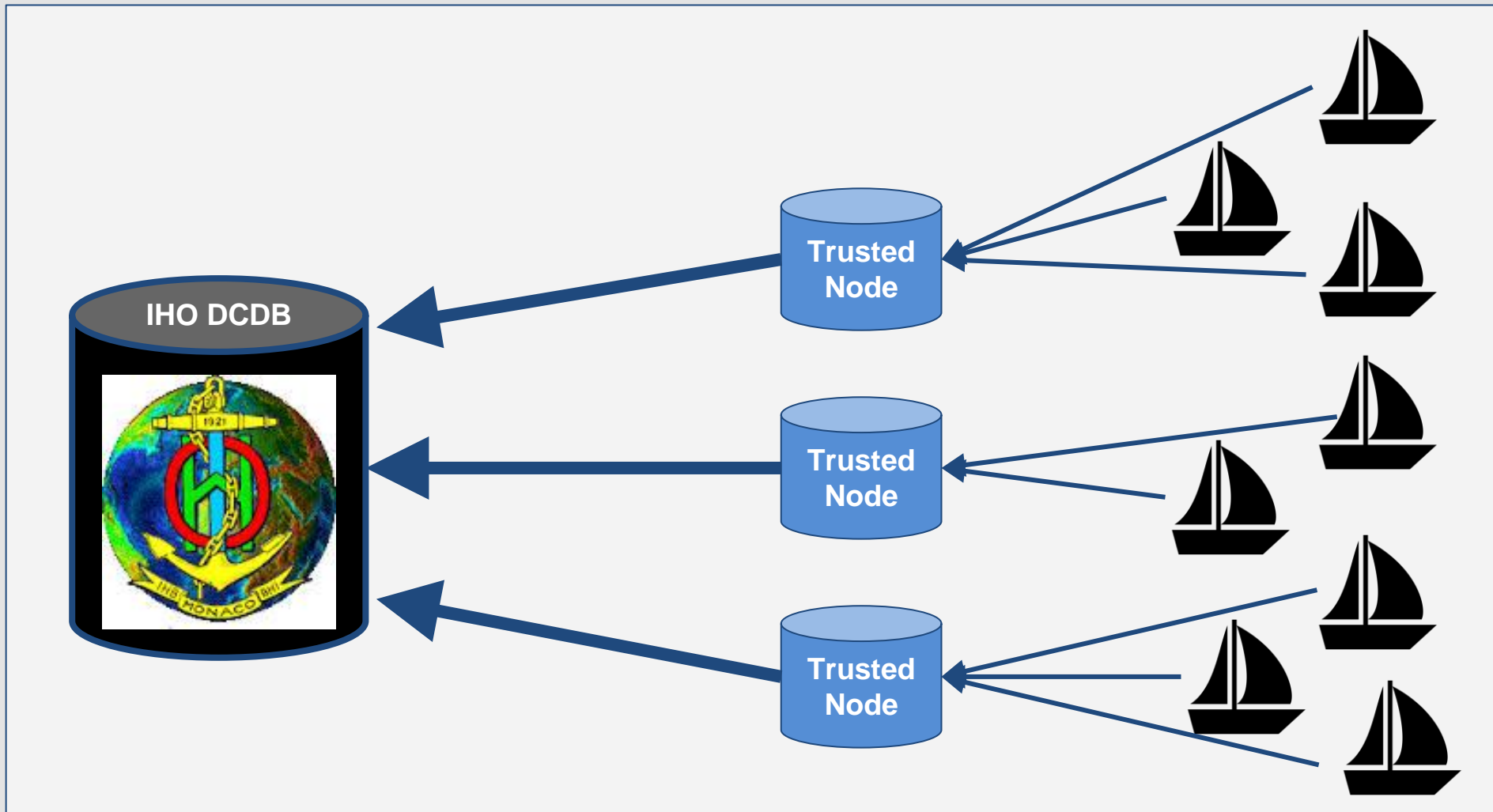
- GIS exclusively for electronic nautical charts
- Commonly found on many vessels
- Basic needs:
  - Charts
  - Position (from GNSS)
- Additional data can be fed into system
  - Depth feed from echosounder (fish finder)



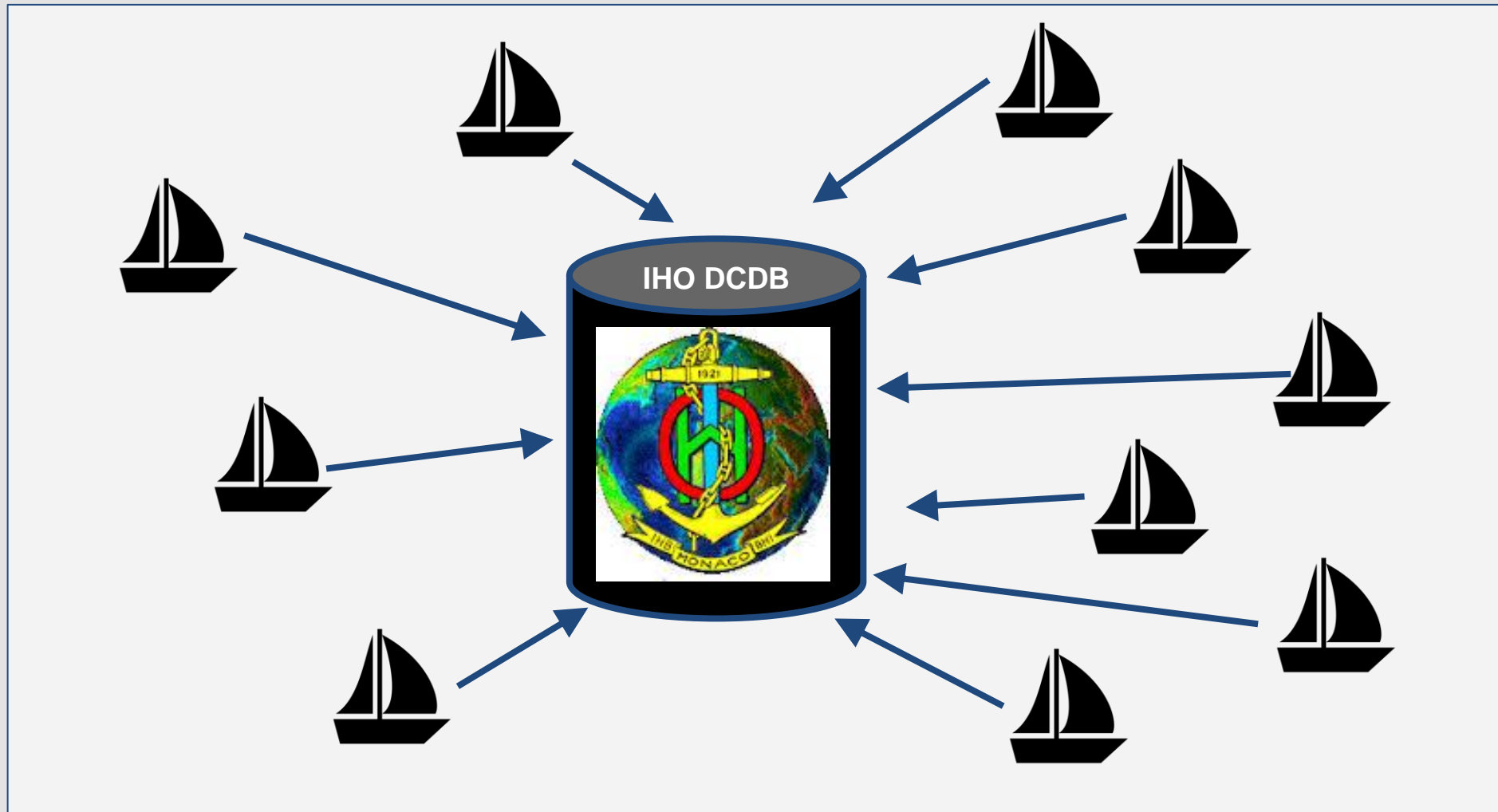
[www.pcmaritime.com](http://www.pcmaritime.com)



# Trusted Node Model



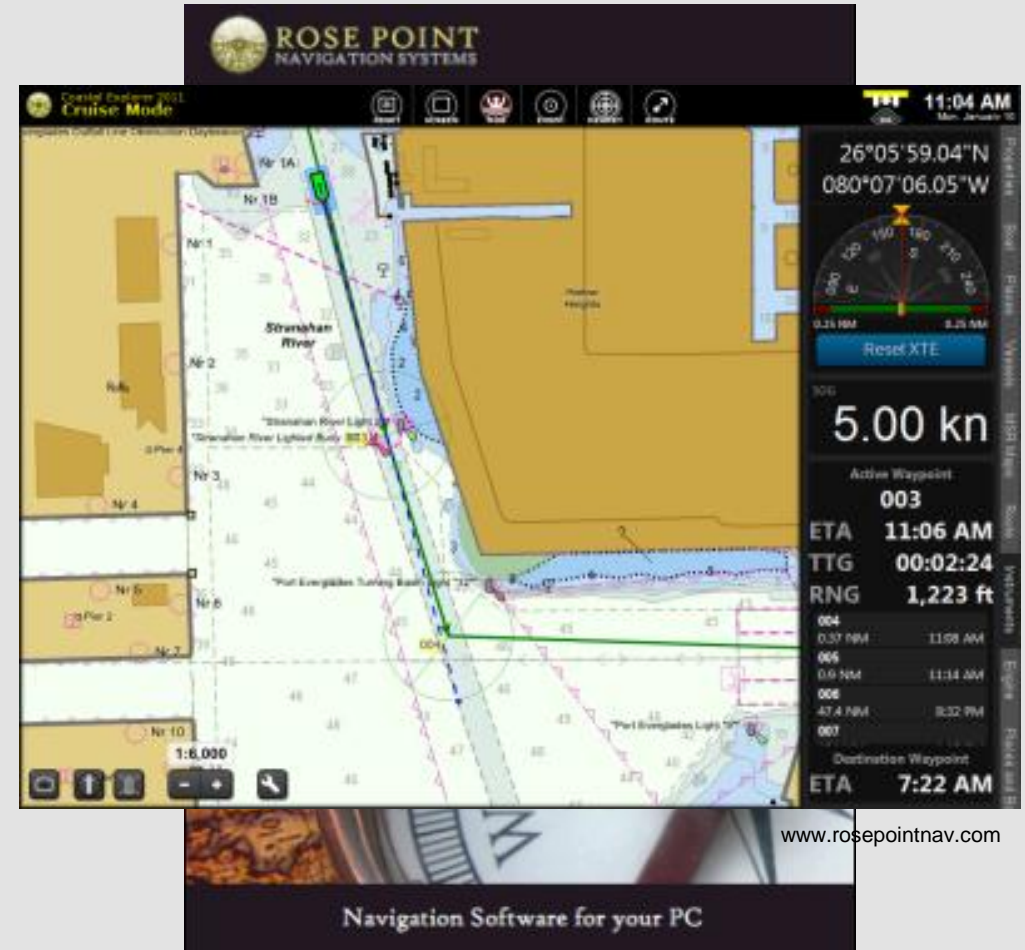
# Individual Contributor Model





# Rose Point Pilot Project

- NOAA and the DCDB have teamed with Rose Point Navigation Systems
- Mariners given option to participate
- Participants can be anonymous or choose to submit metadata about vessel and equipment
- A modified log file gets submitted via HTTP post that contains a JSON metadata string



www.rosepointnav.com

Navigation Software for your PC

# Data formats

- XYZT from ECS
- JSON metadata string
- Converted to GeoJSON

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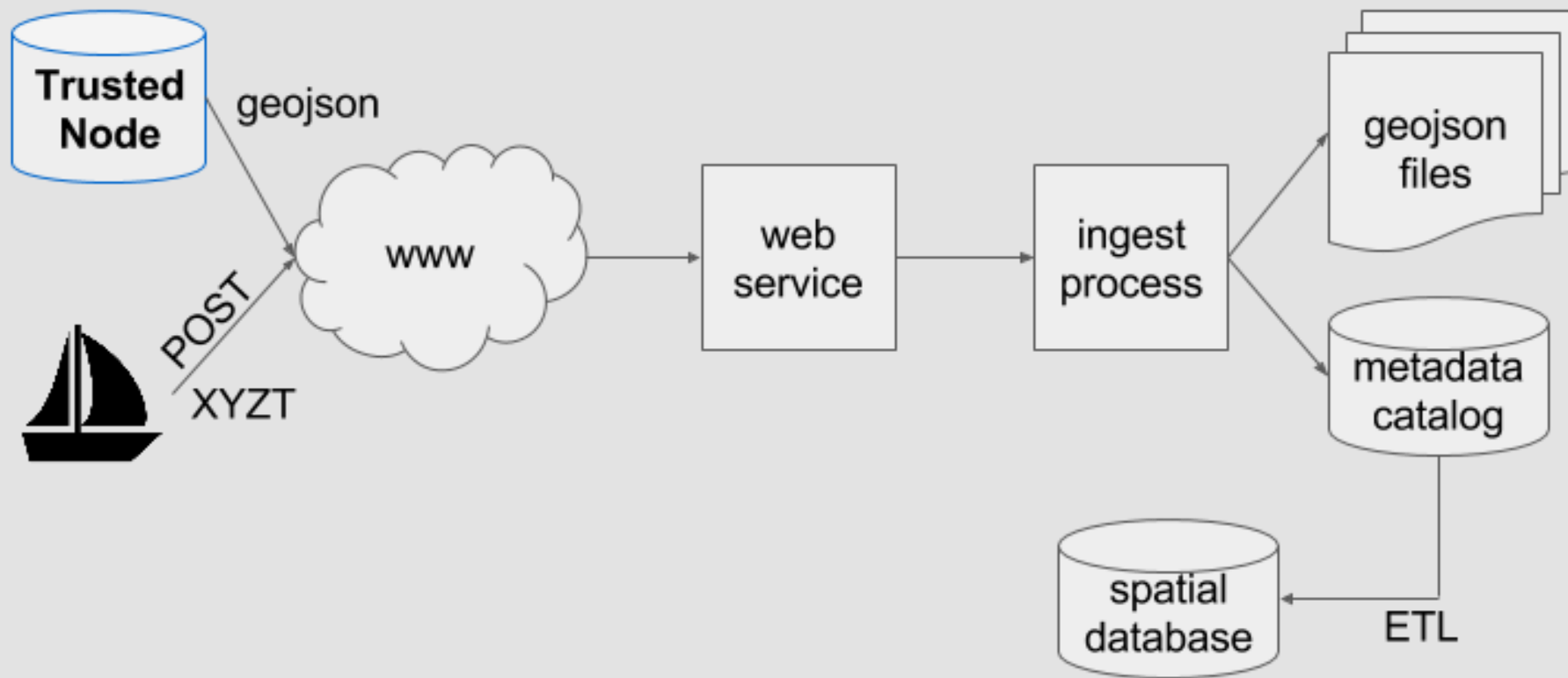
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# Project Flow





**Layers**

☒ Crowdsourced Bathymetry

☐ Search Surveys

**NOAA/NCEI Bathymetric Surveys**

☐ Multibeam Bathymetric Surveys

☐ Single-Beam (Trackline) Bathymetric Surveys

☐ NOS Hydrographic Surveys

☐ BAG Color Shaded Relief Imagery

**EMODNet Bathymetric Surveys**

☐ [EMODNet Multibeam](#)

☐ [EMODNet Single-Beam](#)

**NOAA/NCEI Digital Elevation Models (DEMs)**

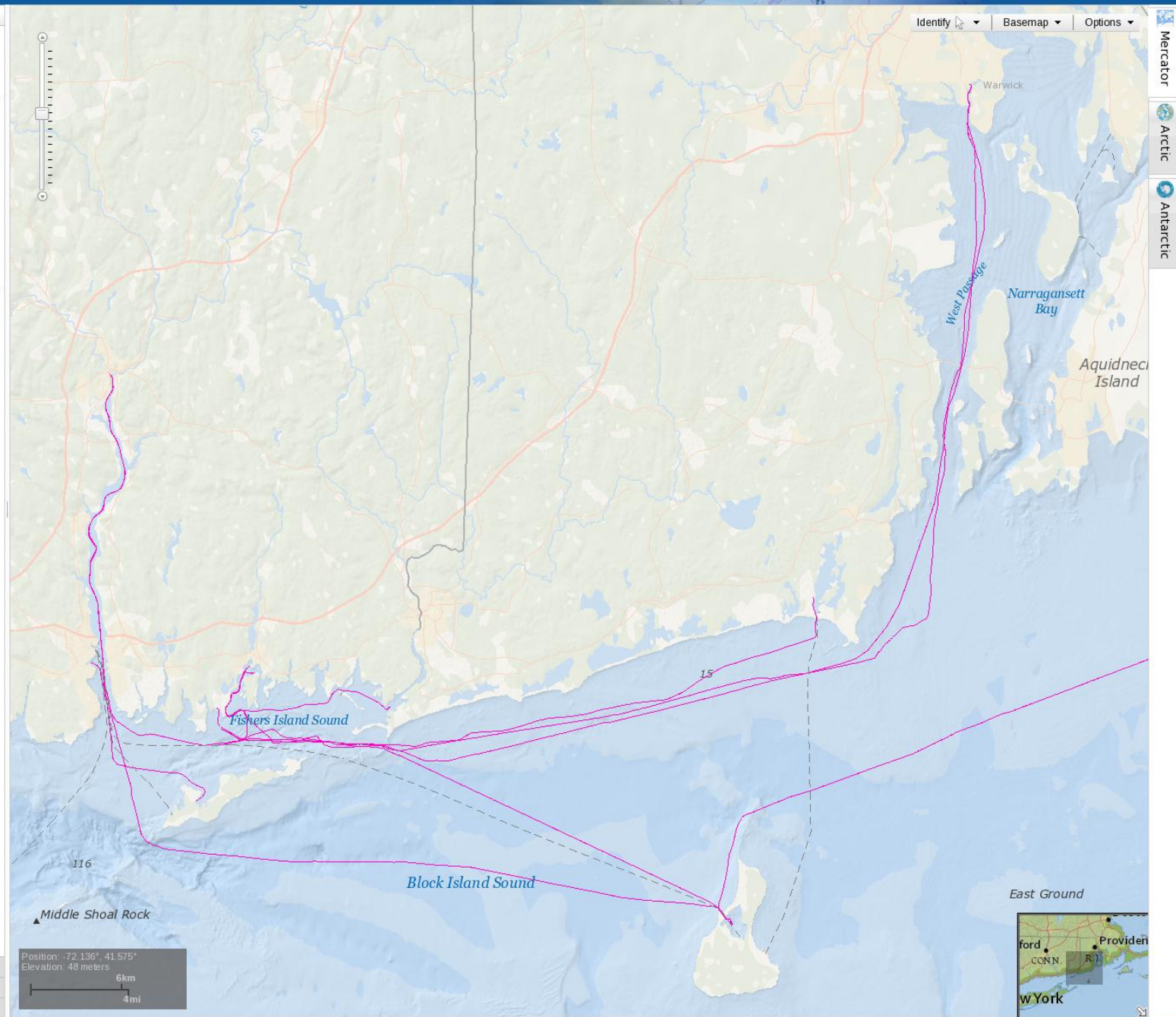
☐ DEM Footprints

☐ DEM Color Shaded Relief Imagery

**Legend**

[More Information](#)

[Help](#)



Layers

- ☒ Crowdsourced Bathymetry
- ☒ Search Surveys
- ☐ Reset

NOAA/NCEI Bathymetric Surveys

- ☐ Multibeam Bathymetric Surveys
- ☐ Single-Beam (Trackline) Bathymetric Surveys
- ☐ NOS Hydrographic Surveys
- ☐ BAG Color Shaded Relief Imagery

EMODNet Bathymetric Surveys

- ☐ EMODNet Multibeam
- ☐ EMODNet Single-Beam

NOAA/NCEI Digital Elevation Models (DEMs)

- ☐ DEM Footprints
- ☐ DEM Color Shaded Relief Imagery

Crowdsourced Bathymetry Search

Date of Survey:  
Start:  End:

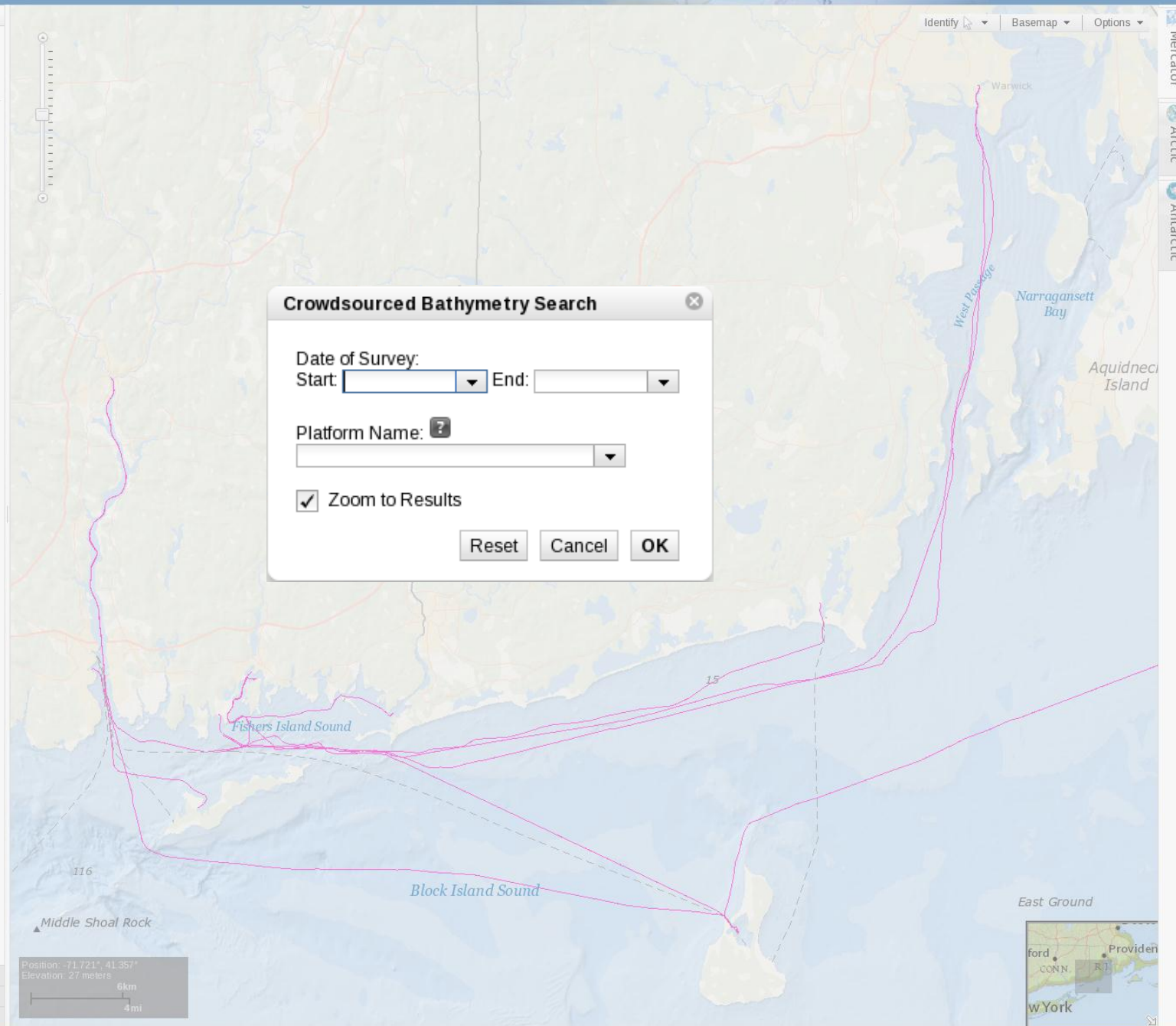
Platform Name:

☒ Zoom to Results

Reset

Cancel

OK





Layers

☒ Crowdsourced Bathymetry

NOAA/NCEI Bathymetric Surveys

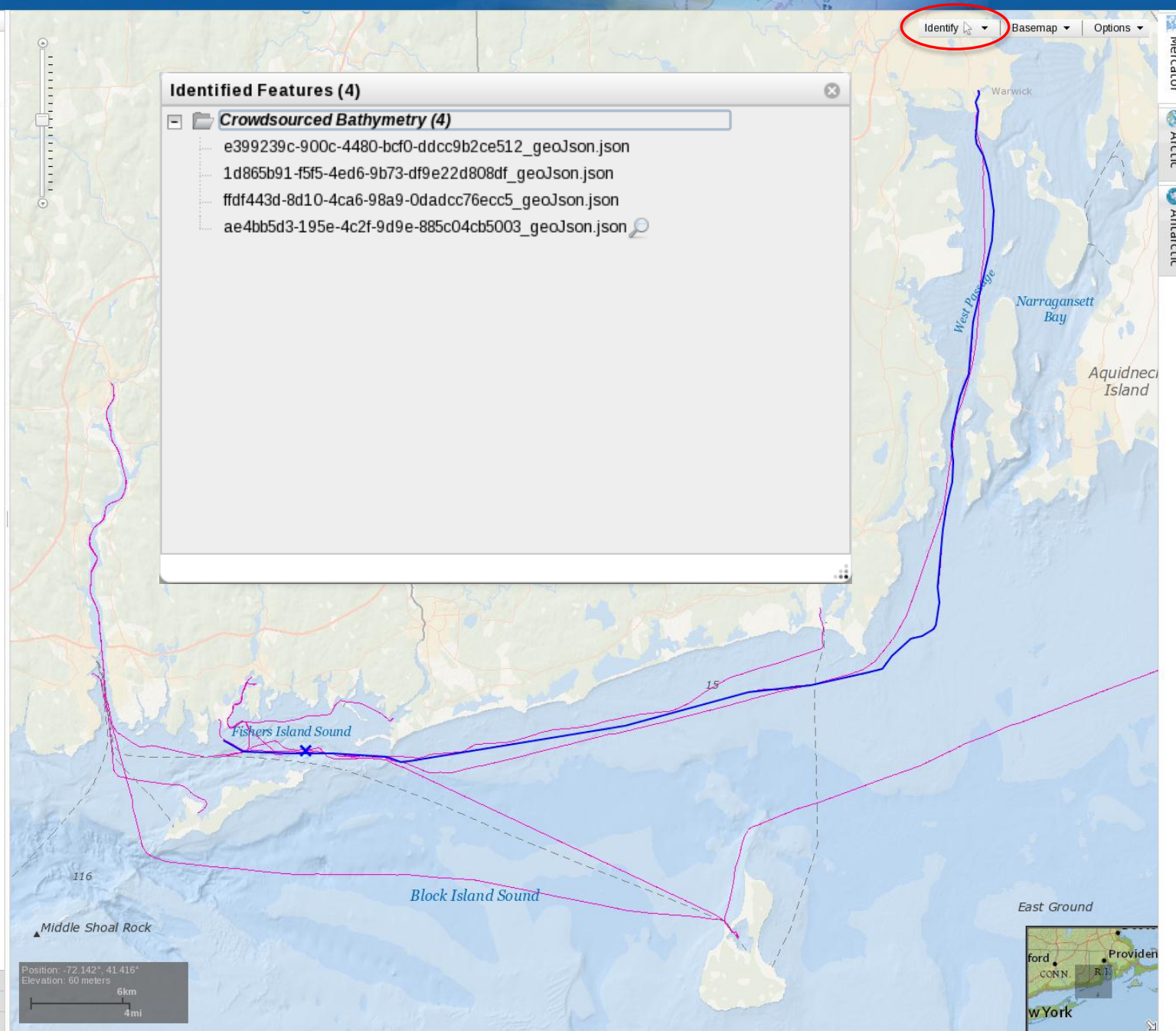
☐ Multibeam Bathymetric Surveys  
☐ Single-Beam (Trackline) Bathymetric Surveys  
☐ NOS Hydrographic Surveys  
☐ BAG Color Shaded Relief Imagery

EMODNet Bathymetric Surveys

☐ [EMODNet Multibeam](#)  
☐ [EMODNet Single-Beam](#)

NOAA/NCEI Digital Elevation Models (DEMs)

☐ DEM Footprints  
☐ DEM Color Shaded Relief Imagery



Identify Basemap Options

Mercator  
Arctic  
Antarctic

Layers

☒ Crowdsourced Bathymetry  
  

NOAA/NCEI Bathymetric Surveys

- ☐ Multibeam Bathymetric Surveys  
☐ Single-Beam (Trackline) Bathymetric Surveys  
☐ NOS Hydrographic Surveys  
☐ BAG Color Shaded Relief Imagery

EMODNet Bathymetric Surveys

- ☐ [EMODNet Multibeam](#)  
☐ [EMODNet Single-Beam](#)

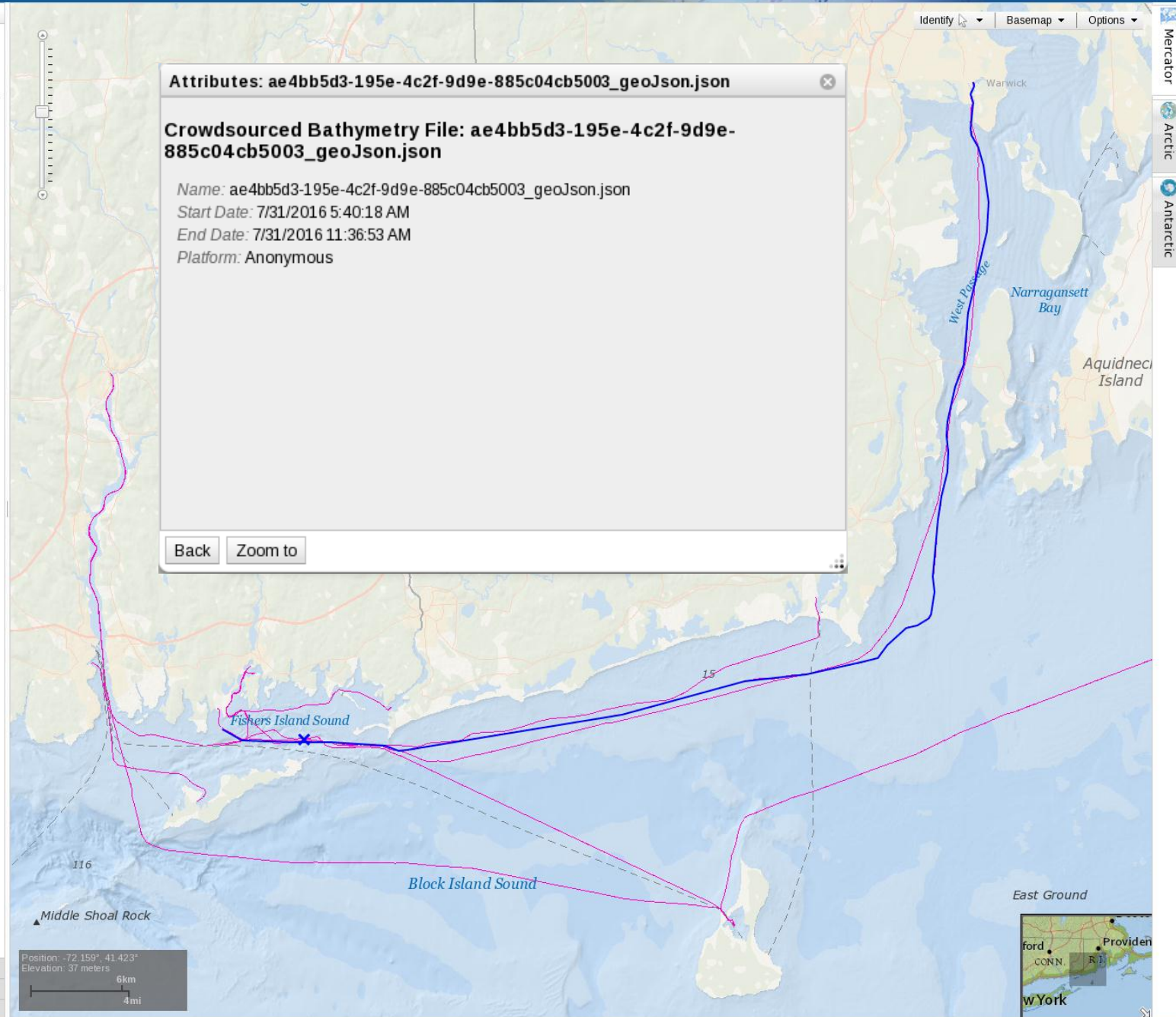
NOAA/NCEI Digital Elevation Models (DEMs)

- ☐ DEM Footprints  
☐ DEM Color Shaded Relief Imagery

Legend

[More Information](#)

[Help](#)



Attributes: ae4bb5d3-195e-4c2f-9d9e-885c04cb5003\_geoJson.json

**Crowdsourced Bathymetry File: ae4bb5d3-195e-4c2f-9d9e-885c04cb5003\_geoJson.json**

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Start Date: 7/31/2016 5:40:18 AM  
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Platform: Anonymous

[Back](#)

[Zoom to](#)

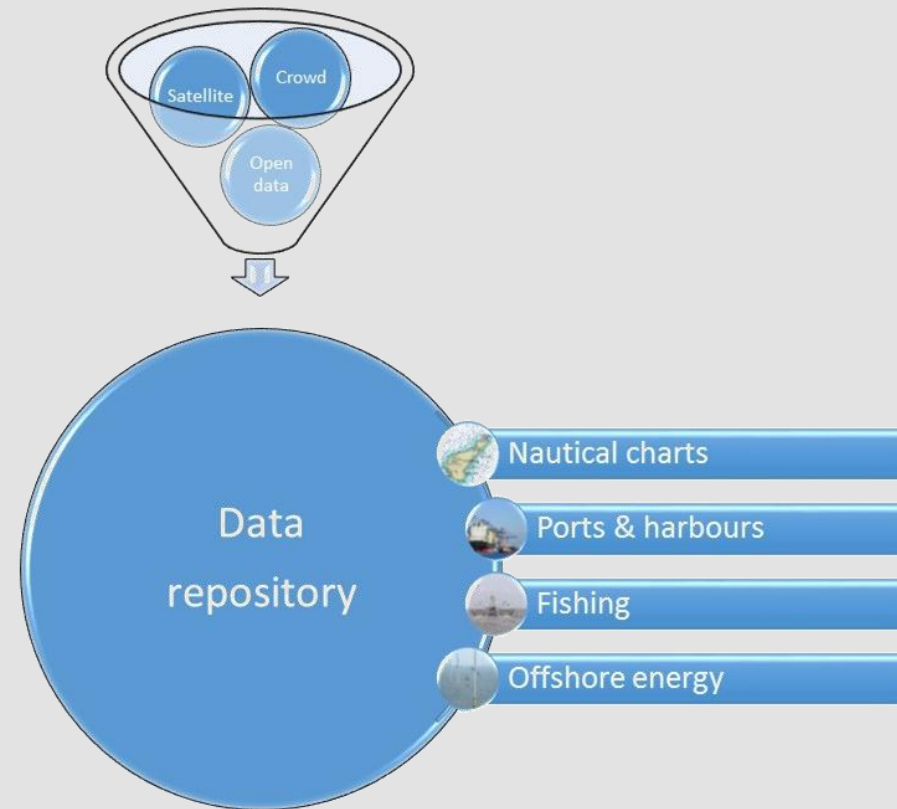


# Uses for Crowdsourced Bathymetry

How might these data benefit you?

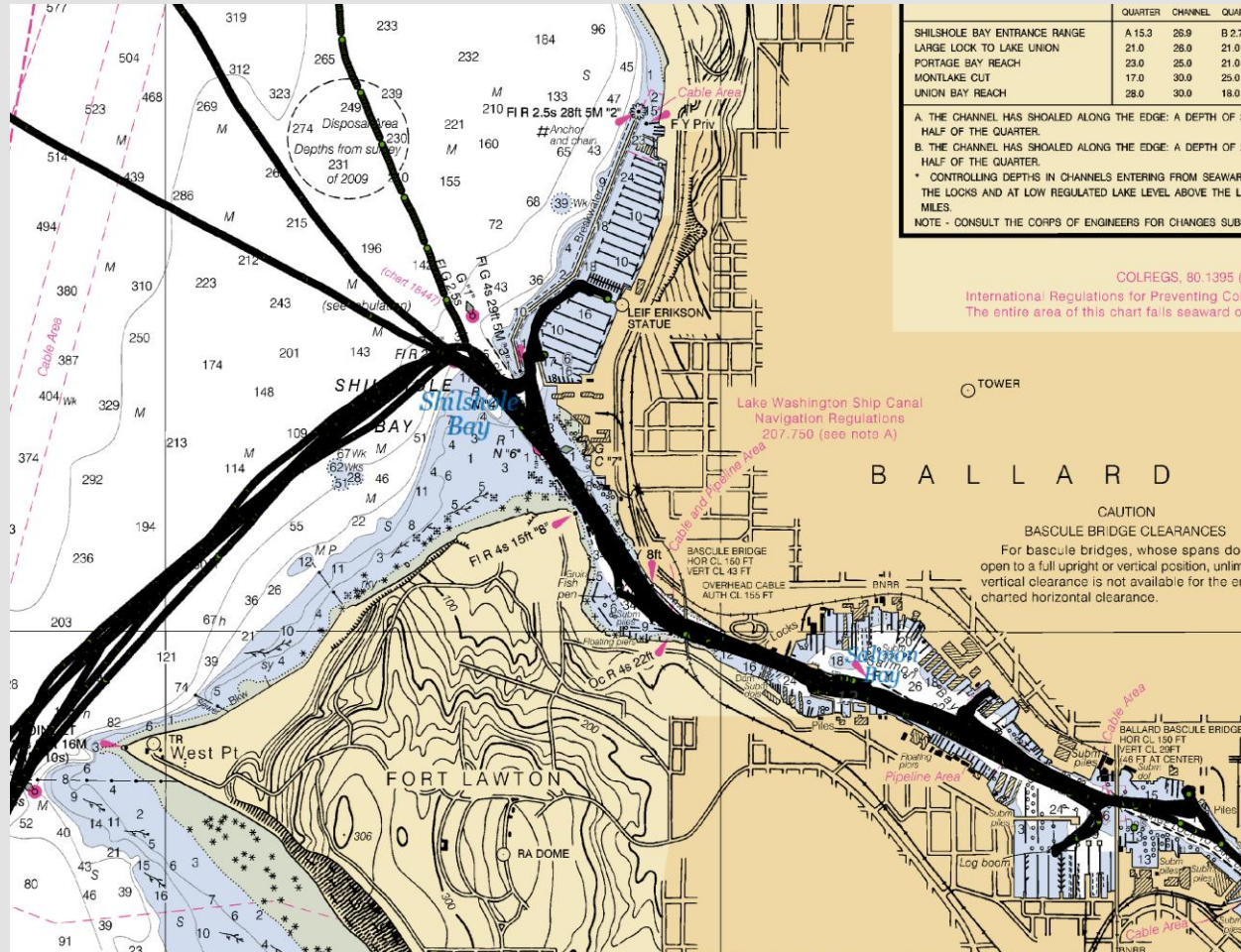
NOAA's Office of Coast Survey is using it for:

- Examining vessel traffic
- Determining Survey Priorities
- Determining Chart Adequacy



<https://artes-apps.esa.int/>

# Steady Supply of Recent Data

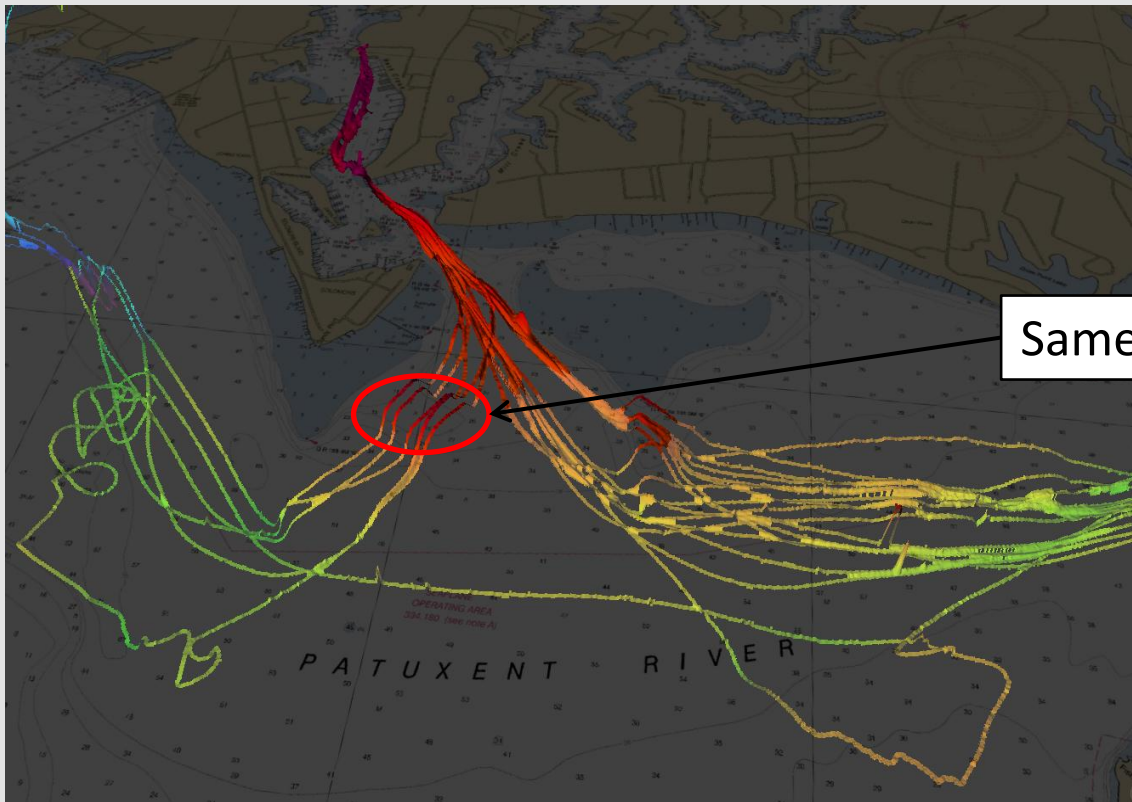


- Provides a stream of recent data
- High traffic areas provide constant data
- Data can show when charted bathymetry becomes out of date
- Shows where traffic transit that may not have AIS (Automatic Identification System)

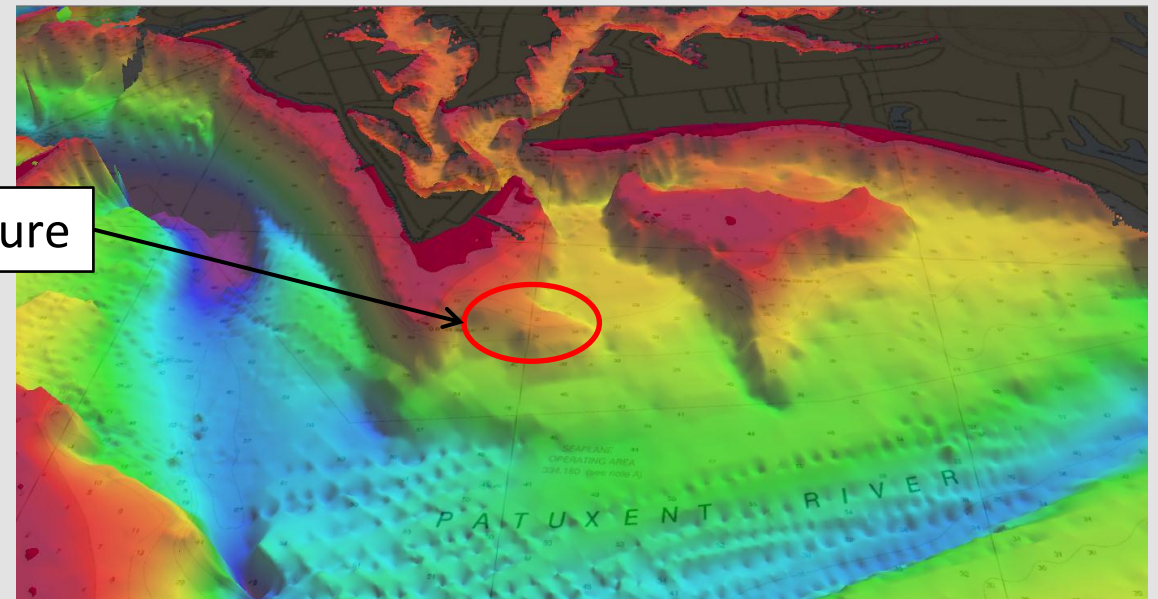


# Shoaling Depiction

DEM created from Crowdsourced  
Bathymetry



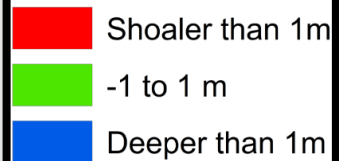
DEM from charted depths



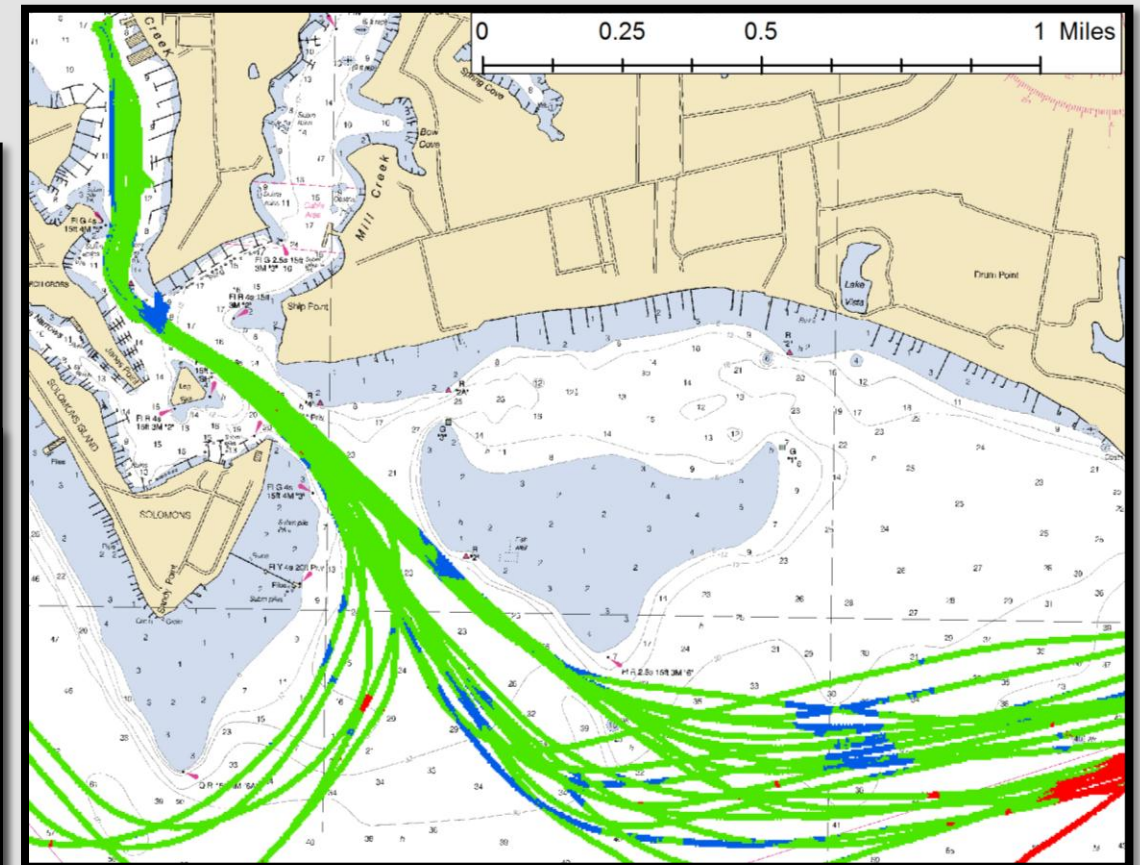
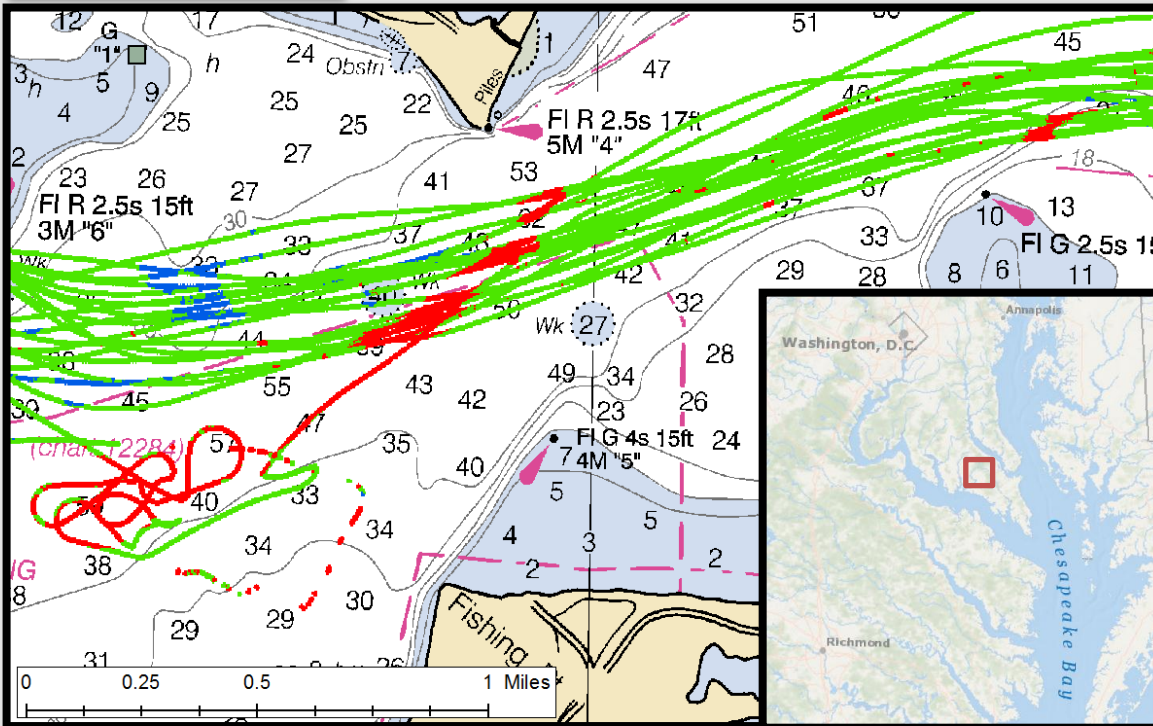
Same feature

# Comparing with Charted Bathymetry

## Legend



- Areas with shoaling can be easily identified





# Wrap Up

- Crowdsourcing is emerging as a viable and inexpensive way of acquiring bathymetric data for uses far beyond mapping
- CSB pilot project is proving successful at attaining its goal of easy, hands-free participation from mariners

## Continued work

- IHO DCDB project is working toward download access
- Generate reporting – stats on contributions, downloads
- Scale up number of contributors/trusted nodes



# Thank you

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[adam.reed@noaa.gov](mailto:adam.reed@noaa.gov)  
*NOAA OCS*

[jennifer.jencks@noaa.gov](mailto:jennifer.jencks@noaa.gov)  
*IHO DCDB Director*



Thank you to our partners:

International Hydrographic Organization  
NOAA National Centers for Environmental Information  
NOAA Office of Coast Survey  
National Geospatial Intelligence Agency  
Rose Point Navigation Systems  
Sea ID  
Professional Yachting Association  
General Bathymetric Chart of the Oceans (GEBCO)

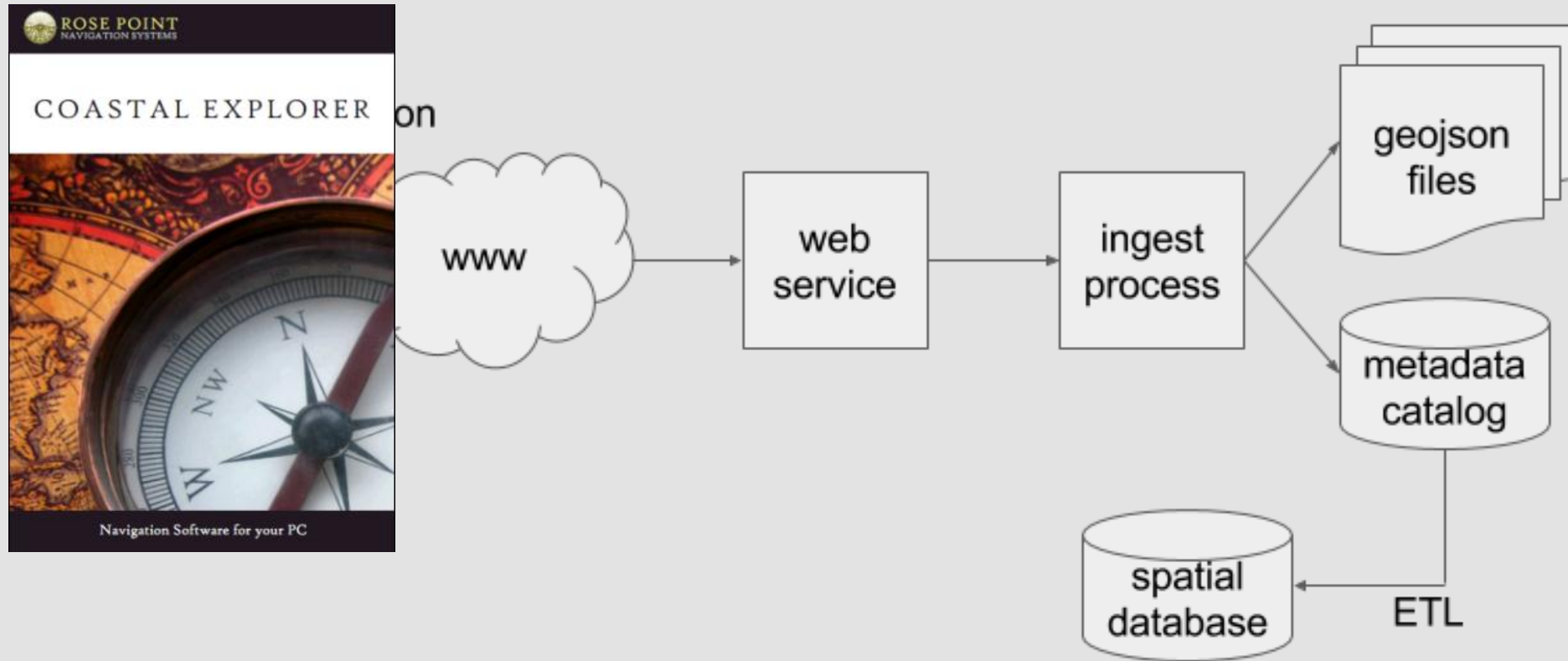


# Current Status and Next Steps

- Ingest ✓
- Document ✓
- Display ✓
- Archive
- Disseminate

- submission handling on non-Rose Point data (not XYZT) like XYZ point data, gridded data, various data formats from new trusted nodes
- build more robust metadata handling and encourage Rose Point to submit additional metadata
- pass all metadata to the map viewer (currently vessel names are getting dropped)
- build better algorithms for
  - flagging bad positions
  - fixing time sequence issues
  - generating appropriate tracklines
- determine the point storage technology that will allow for the growth of the dataset
- subsetting files for extracting data within specific geographic areas

# Pilot Project Overview







# Template

*caption*

