INTERNATIONAL HYDROGRAPHIC ORGANIZATION

NATIONAL REPORT FROM UNITED STATES TO THE

USCHC-41

MARCH 26, 2018

Final V.2 March 20

Submitted by:

National Oceanographic & Atmospheric Administration
http://www.nauticalcharts.noaa.gov

National Geospatial-Intelligence Agency
http://msi.nga.mil/NGAPortal/MSI.portal

United States Navy
http://www.navmetoccom.navy.mil

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[1] Based on "Structure for National Reports to Regional Hydrographic Commissions." See http://iho.int/mtg_docs/rhc/templates/Struct_NationalReports_Eng.pdf

1. HYDROGRAPHIC OFFICE/SERVICE

This National Report provides specific information pertaining to individual U.S. products and services of primary interest to the United States/Canada Hydrographic Commission (USCHC). Three government agencies are primarily responsible for the management of U.S. domestic and international hydrographic (marine) products and services.

1.1 U.S. Government Agencies with hydrographic responsibilities in the US-Canada Region (IHO Region "A")

1.1.1 National Oceanic and Atmospheric Administration's (NOAA)[2] conducts hydrographic surveys and produces nautical charts and related hydrographic information within the nation's Exclusive Economic Zone (EEZ).

1.1.2 National Geospatial-Intelligence Agency (NGA)[3] provides nautical charts and related hydrographic information *outside* of the U.S. EEZ . NGS is also the mapping and charting authority for the US Department of Defense and commercial mariners in areas outside the US where the US is the designated charting authority.

1.1.3 The U.S. Navy[4] conducts oceanographic, bathymetric, and hydrographic surveys worldwide to satisfy US Navy requirements.

1.2 United States Open Data Policy – Managing Information as an Asset

Information is a valuable national and global resource. The U.S. considers information a strategic asset to the U.S. Federal Government, its partners and the public. In order to ensure the U.S. Federal Government is taking full advantage of its information resources, agencies are working to increase operational efficiencies, reduce costs, improve services, support mission needs, and increase public access to valuable government information. The access to data and services, usable to the public, can help fuel entrepreneurship, innovation, and scientific discovery – all of which improve lives and contribute significantly to job creation.[5]

Many hydrographic data, products, and services produced by U.S. Hydrographic Offices (HO's) are available for download at no cost. NOAA provides nautical products, services, and web deliveries of digital versions of most data, which are available free to the public.

For access to survey data: http://www.nauticalcharts.noaa.gov/hsd/hydrog.htm
For access to charting data: http://www.nauticalcharts.noaa.gov/staff/chartspubs.html

[2] Primarily the Office of Coast Survey.
[3] Primarily Source Operations and Management Directorate, Foundation Group, Maritime Safety Office (MSO)
[4] Primarily, Commander, Naval Meteorology and Oceanography Command (COMNAVMETOCCOM) and the Hydrographer of the Navy
[5] Open Data Policy-Managing Information as an Asset. (2013). Retrieved from https://project-open-data.cio.gov/policy-memo/

In addition to Safety of Navigation products and services, the U.S. is committed to making the Safety of Navigation data available in a variety of formats for as many users as possible. ENC data (S-57) is available in GIS friendly format for non-traditional users, opening up HO data to a host of new customers and users. The U.S. has implemented new map services to allow others simple access to real-time access to data and created opportunities for near real-time coastal intelligence via interactive map viewers.

The NOAA ENC Direct to GIS website[6] allows users to display, query and download all available NOAA ENC data in a variety of GIS/CAD formats, using Internet mapping technology. The NOAA NowCOAST web site[7] exemplifies the possibilities created by delivering data for broad customer use.

NGA fully supports the U.S. Open Data Policy and is a regular supporter of making data available to support crises such earthquakes, tsunamis, as well as Arctic Support and Wildlife Tracking. This data supports not only the U.S. agencies that are responding to crises but also the many responding partners as well. Access to the NGA data portal is available at https://nga.maps.arcgis.com/home/.

Open Government Partnership (OGP)

In addition to navigation safety products and services, the U.S. is committed to making data available in a variety of formats to as many users as possible. To achieve this commitment, the U.S. united with OGP when the multilateral initiative launched in 2011. OGP provides an international platform committed to making governments more open, accountable, and responsive to citizens. Since then, OGP has grown from eight countries to the 75 participating countries. In all of these countries, government and civil society are working together to develop and implement action plans for topics ranging from open data to open government reforms. Additional information regarding the OGP can be found at http://www.opengovpartnership.org/

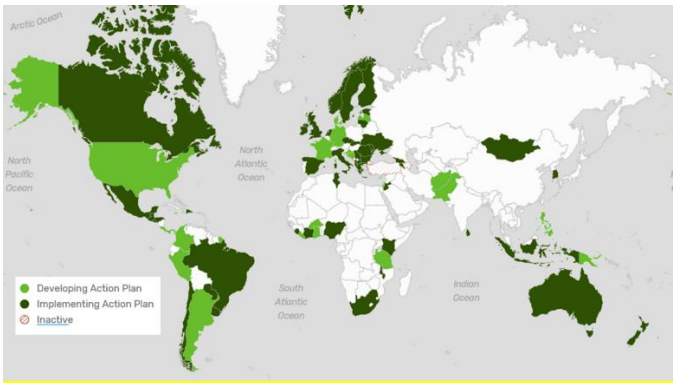


Figure 1: Member states within the OGP include U.S. and Canada.

[6] http://www.nauticalcharts.noaa.gov/csdl/ctp/encdirect_new.htm
[7] http://Nowcoast.noaa.gov

2. SURVEYS

2.1 Surveys in U.S. Waters

NOAA provides nautical charts and related hydrographic information for the safe and efficient navigation of maritime commerce as well as providing basic data for engineering, scientific, and other commercial and industrial activities within the nation's 3.4 million square nautical mile EEZ and along its 95,000 miles of shoreline (Figure 2).

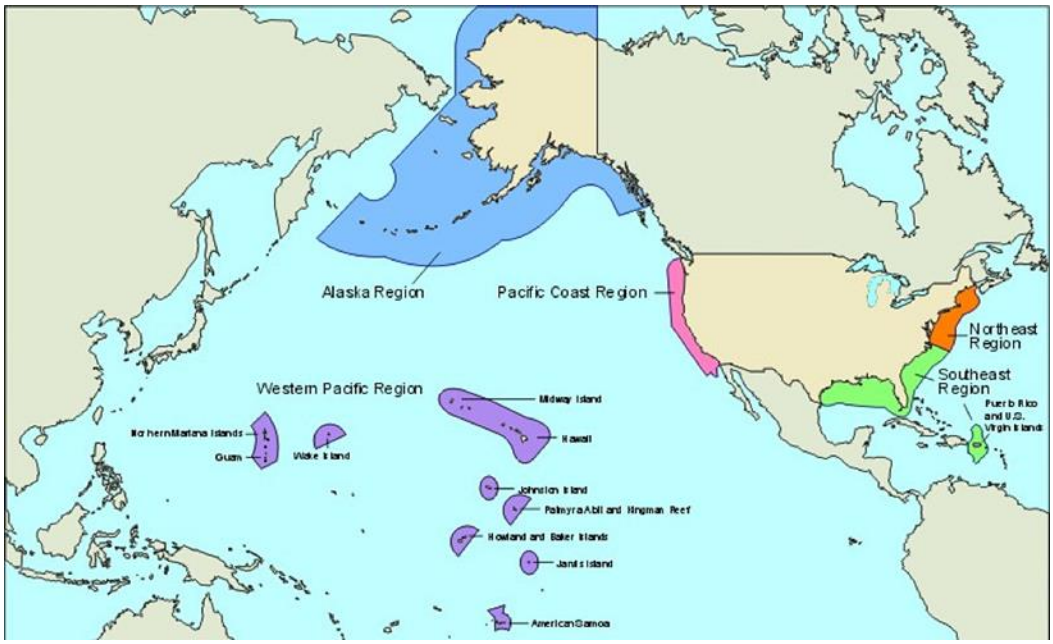


Figure 2: U.S EEZ

In the past, areas were prioritized for hydrographic survey using NOAA's hydrographic survey priorities (NHSP) model, which was last updated in 2012. Currently, Coast Survey is in the process of implementing an updated survey prioritization model - *the hydrographic health model*. NOAA has new data inputs and a more precise knowledge of weather and ocean processes than before. Moving forward, NOAA will define hydrographic survey plans based on this model which defines the methodology NOAA uses to identify survey priorities across the U.S. EEZ. NOAA hydrographic in-house field units or external contractors then conduct surveys to meet these priorities. Data acquired from these surveys must meet the NOS Hydrographic Surveys Specifications and Deliverables,[8] an annually updated data specification guide.

The hydrographic health model is a risk-based model that takes into account navigational risks, including both the likelihood of a risk (e.g. traffic density, known hazards to navigation, reported ship groundings, etc.) and the consequence of a risk (proximity to search and rescue stations, proximity to reefs or marine sanctuaries, etc.). The model also considers the necessary quality of

[8] http://www.nauticalcharts.noaa.gov/hsd/specs/specs.htm

data to support modern traffic relative to what is currently available, given the seafloor changes over time. Seafloor changeability takes into account the frequency of storms, current speed, and accumulation of marine debris, where the quality of data in highly changeable areas decreases faster than the quality of data in less changeable areas. Using historic knowledge of seafloor changeability, the model can also approximate the future quality of survey data and assess how often an area needs resurveying. .

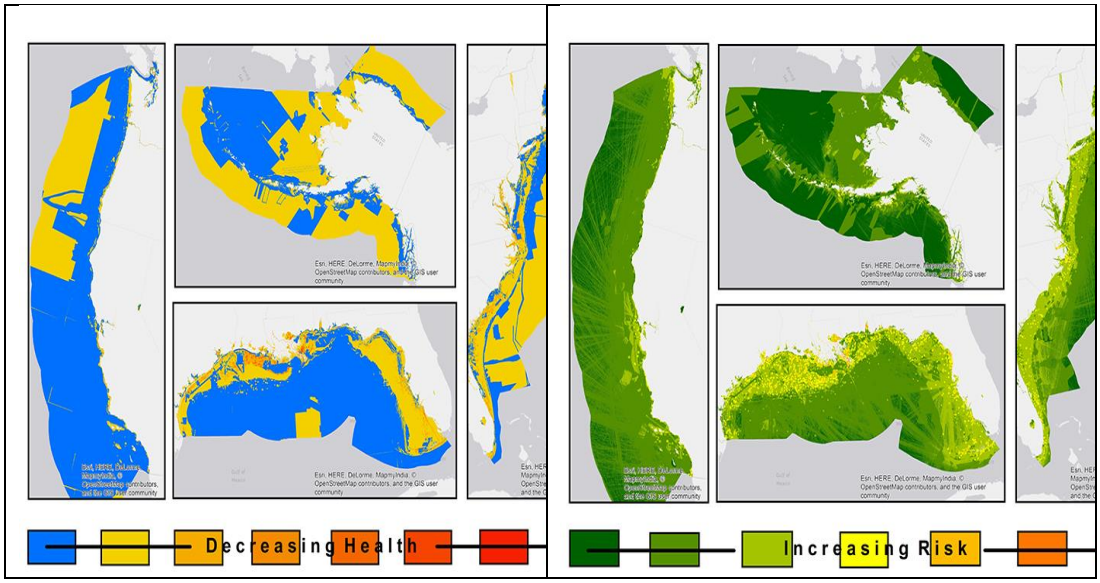


Figure 3: Hydrographic Health and Risk conceptualization

The results of this model will be available online in a geographic information system (GIS) interface and summarized in an annual report made available on the internet when it is completed in FY18. Current information about the model and survey prioritization can be found at: https://nauticalcharts.noaa.gov/publications/national-hydrographic-survey-priorities.html

FY 18 Survey Plan Highlights for USCHC region

- *Pacific Coast and Puget Sound Hydrographic Survey Projects 2018 (Figure 4)*

This Project addresses areas of Puget Sound that are inadequately charted based on NOAA's preliminary risk-assessment model. 50% of the planned survey area consists of partial bottom coverage, while the other 50% consists of lesser coverage. AIS data indicate moderate-to-high traffic density in portions of the planned survey area, including around several ferry routes.

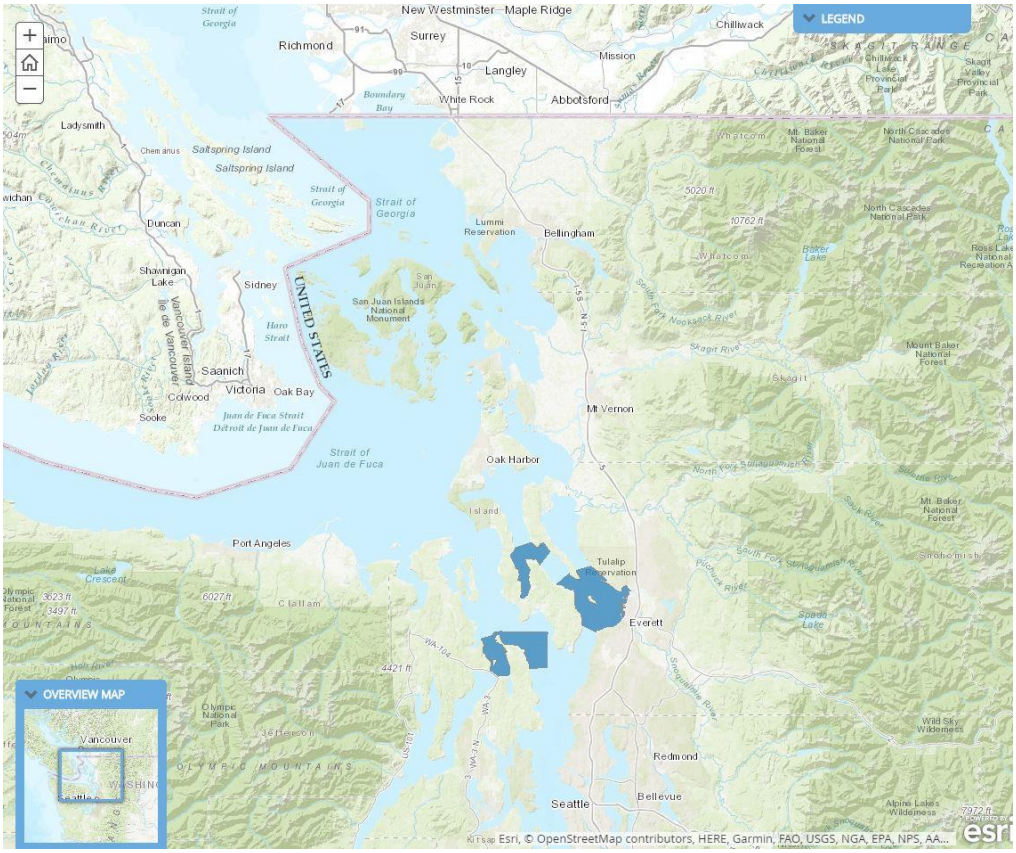


Figure 4 Pacific Coast and Puget Sound Hydrographic Survey Projects 2018

- *Alaska Hydrographic Survey Projects 2018 (Figure 5)*

Planned project dates: April- June 2018
Planned days at sea: 52
Area: approx. 900 square nautical miles
The area surrounding Prince of Wales Island is navigationally complex and home to communities that are inaccessible by land, relying instead on the sea as their primary means of travel. Survey vintage in this area dates back to 1916. Waterways along the western side of Prince of Wales Island are marked by pinnacles, rocks, islets, and complex tidal currents. Based on experience from recent surveys in the region, it is suspected that dangerous and uncharted pinnacles may be present in this survey area. These hazards would not have been identified during prior surveys due to limitations of the technologies and techniques used at the time. These waterways are critical to the economic success of local coastal communities on Prince of Wales Island, as they are actively used for fishing and are the primary means for transporting goods throughout the region. Data from this survey will update National Ocean Service (NOS) nautical charting products.

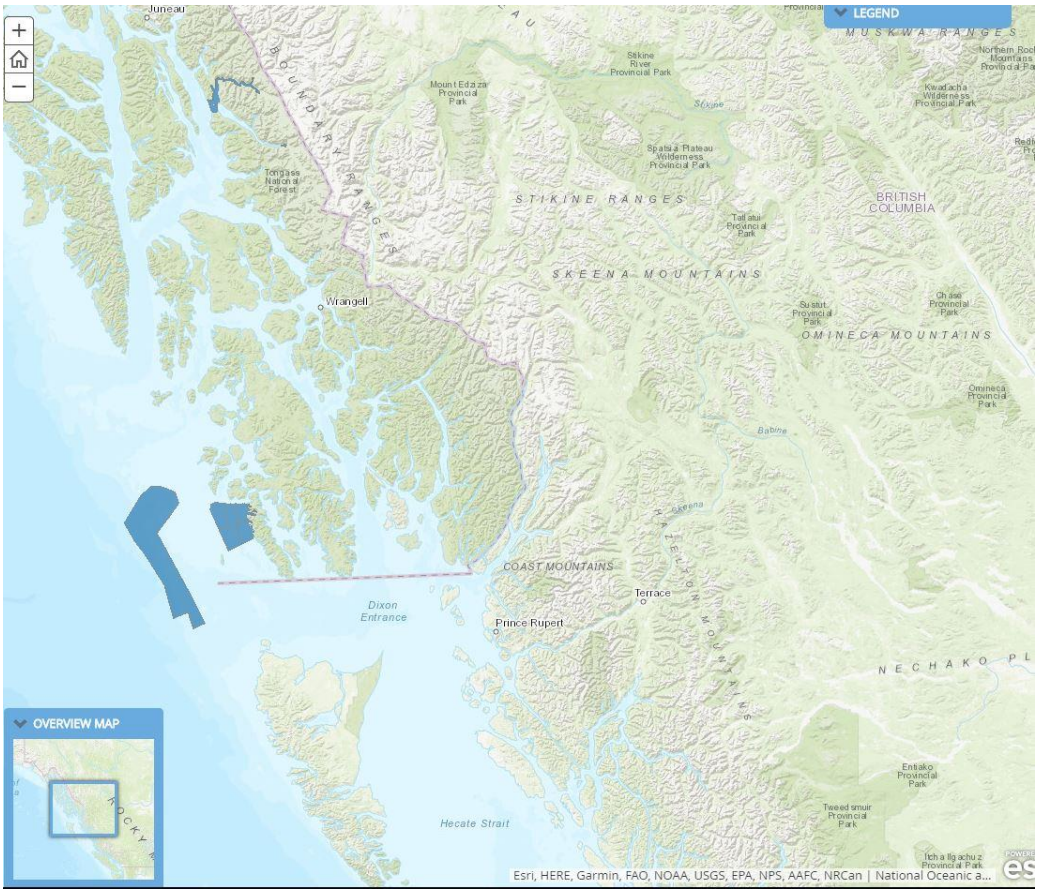


Figure 5 Alaska Hydrographic Survey Projects 2018

- *OPR-O375-FA-18, Lisianski Strait and Inlet (NOAA) (Figure 6)*

Planned project dates: April - June 2018
Planned days at sea: TBD
Area: approx. 34 square nautical miles
The navigationally complex Lisianski Strait and Inlet are heavily trafficked by recreational boaters, yachts, and smaller tug and tow traffic, as well as being an important route of the Alaska Marine Highway ferry system. Despite the volume of marine traffic in the region, the vast majority of Lisianski Inlet was last surveyed in 1917, when data were acquired using lead line instrumentation. This 34 SNM project will provide contemporary surveys to update National Ocean Service (NOS) nautical charting products.

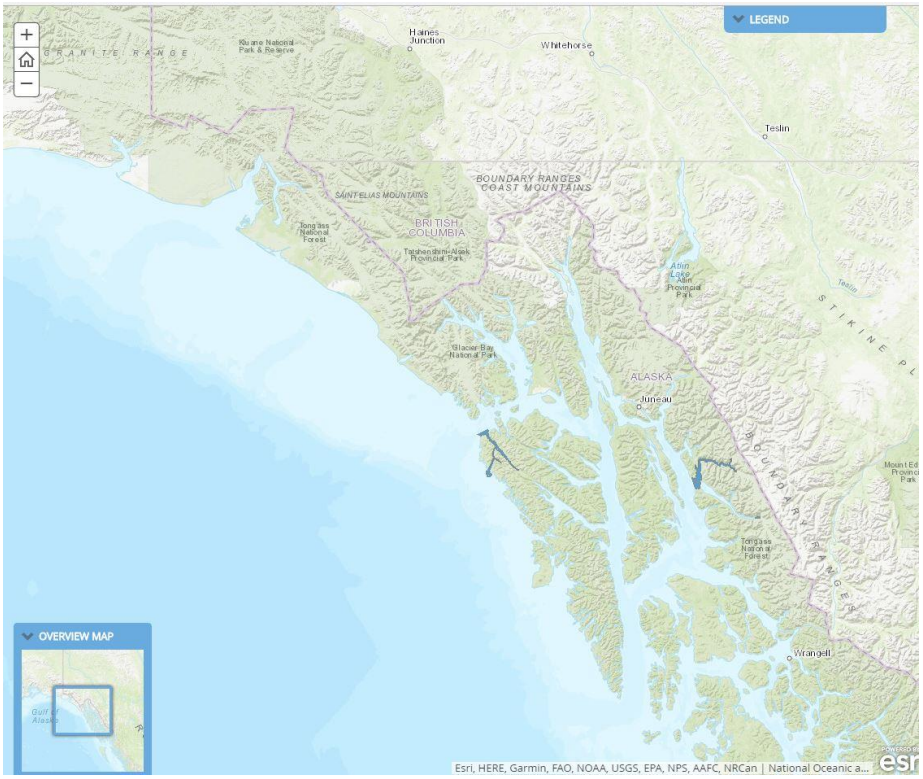


Figure 6 Lisianski Strait and Inlet

2.2 Surveys outside U.S. Waters

The U.S. Navy surveys waters outside the United States and in the territorial waters of other nations through diplomatic channels and international agreements. Hydrographic data and information from surveys conducted in territorial waters are survey by collaboration between the US and the Host Nation.

2.3 U.S Hydrographic Survey Vessels

2.3.1 National Oceanic and Atmospheric Administration (NOAA)

Using four NOAA ships, six 28-foot survey boats, a research vessel, a LIDAR-capable aircraft, and private contractors, NOAA acquires hydrographic data that can update the nation's nautical charts with the accuracy and precision that is essential to maintain the public trust in navigational products.

The NOAA ship *Fairweather* is a survey vessel designed and outfitted primarily for conducting hydrographic surveys to support nautical charting however, the ship is capable of many other missions in support of NOAA programs. The ship is equipped with the latest in hydrographic survey technology –: multi-beam survey systems; high-speed, high-resolution side-scan sonar; position and orientation systems, hydrographic survey launches, and an on-board data-processing server. With increased mission space and deck machinery, the *Fairweather* can be tasked with

anything from buoy operations to fisheries research cruises. The *Fairweather* primarily operates in Alaskan coastal waters.

NOAA Ship *Rainier* is one of the most modern and productive hydrographic survey platforms of its type in the world. The ship is a survey vessel designed and outfitted for conducting coastal hydrographic surveys in support of NOAA's nautical charting program. The ship supports high-precision near-shore surveys. The ship operates off the U.S. Pacific Coast, and in Alaskan coastal waters.

Homeported in Norfolk, Virginia, NOAA Ship *Thomas Jefferson* is a hydrographic survey vessel that maps the ocean to aid maritime commerce, improve coastal resilience, and understand the marine environment.

Homeported in New Castle, New Hampshire, NOAA Ship *Ferdinand R. Hassler* is one of the newest ships in NOAA's fleet of research and survey vessels that map the ocean to aid maritime commerce, improve coastal resilience, and understand the marine environment.

Additional information on NOAA's hydrographic vessels can be found online at: https://www.nauticalcharts.noaa.gov/hsd/surveyplatforms.html.

2.3.2 U.S. NAVY

The Naval Oceanographic Office (NAVOCEANO), a subordinate command of COMNAVMETOCCOM, currently has six Pathfinder Class 100-meter multi-purpose survey ships to conduct oceanographic, bathymetric, and hydrographic surveys in deep-ocean and coastal waters. These ships are USNS *Pathfinder* (T-AGS 60), USNS *Mary Sears* (T-AGS 65), USNS *Bowditch* (T-AGS 62), USNS *Henson* (T-AGS 63), USNS *Bruce C. Heezen* (T-AGS 64), and the USNS *Maury* (T-AGS 66). USNS *Bowditch, Henson, and Heezen* each carry two 10-meter hydrographic survey launches (HSLs).

The new ship, USNS *Maury* (T-AGS 66), is eight meters longer than previous ships of the class to accommodate a moon pool for operating unmanned underwater vehicles (UUV).

NAVOCEANO also maintains the Airborne Coastal Survey (ACS) capability with the Optech, Inc., Coastal Zone Mapping and Imaging LIDAR (CZMIL) system. The system is flown on a Basler BT-67, a refurbished DC-3.

Fleet Survey Team (FST), a subordinate command of NAVOCEANO is comprised of approximately 65 military and civilian surveyors. FST employs various small craft for survey including two 9 meter Workskiff with amidships transducer moon pools and two Sea Arks, fitted with multi-beam and rapid littoral survey vehicles (RLSVs) which are personal water crafts fitted with a single beam echo sounder and side scan sonar. All FST craft can be transported

aboard C-130 aircraft for rapid deployment. FST also maintains a year round stand by Fly-Away Team consisting of four personnel and survey gear to outfit boats of opportunity. This capability is used to address standard Navy survey requirements, but has also been employed to ensure clear approach corridors in support of humanitarian aid and disaster relief.

NAVOCEANO's survey ships, ACS aircraft, and FST have all been utilized in the past to conduct cooperative hydrographic surveys through Memoranda of Agreements (MOA) with countries in the region

3. NEW CHARTS AND UPDATES

3.1 National Charting Plan (NCP)[9] Released

On November 1, 2017, NOAA released the National Charting Plan, a strategy to improve NOAA nautical chart coverage, products, and distribution. It describes the evolving state of marine navigation and nautical chart production, and outlines actions that will provide the customer with a suite of products that are more useful, up-to-date, and safer to navigate with. It is not a plan for the maintenance of individual charts, but a strategy to improve all charts.

The NCP briefly describes the evolving state of marine navigation, data collection, and chart compilation and explains how changes in technology will affect both the raster and vector NOAA marine chart suites. The plan also describes some of the steps that NOAA will be taking to improve our chart products in the short term, including changes to chart formats, scales, data compilation, as well as some considerations on the future of NOAA navigational products beyond the short term. The goal of NOAA's Office of Coast Survey is to deliver products that are more useful, more up-to-date, and safer to navigate with, and at the same time optimize the use of the government resources employed to maintain the navigational products and services that are increasingly required to support higher levels of precision and timeliness.

3.2 Electronic Nautical Charts (ENC)

The NOAA ENC is a vector database of chart features built to the International Hydrographic Organization's (IHO) S-57 standard. NOAA's Office of Coast Survey, as the U.S. national hydrographic office, is exclusively responsible for production and authorization of NOAA ENC data in U.S. waters. New map services are in place to allow others simple access to real-time data streams, creating opportunities for operational coastal intelligence via interactive map viewers.
NOAA ENC Direct to GIS website (http://www.nauticalcharts.noaa.gov/csdl/ctp/encdirect_new.htm) allows users to display, query and download all available U.S. ENC data in a variety of GIS/CAD formats, using Internet mapping technology. The NOAA NowCOAST web site

[9] https://nauticalcharts.noaa.gov/news/final-national-charting-plan.html

(http://nowcoast.noaa.gov) is an example of the possibilities created by delivering real-time data for broad customer use.

3.3 Raster Navigational Charts (RNC) & Electronic Navigational Charts (ENC) Distribution

NOAA produces 51 RNC and ENC charts in the area of Atlantic Ocean and Great Lakes. NOAA also produces several other charts in the Pacific Ocean and the Arctic that lie within the USCHC region. As of April 2014, NOAA no longer produces lithographic paper charts with traditional print cycles for new editions. All paper charts are fully updated and available for download as Print-on-Demand (POD) products, or in paper form from one of 17 NOAA-certified chart printing agents. (see Annex A for NOAA certified chart printing agents).

U.S. ENCs are available as free downloads from the internet. Mariners who wish to download NOAA ENCs directly and use the data to fuel ECDIS or ECS may do so. ENCs, including newly created NGA ENCs, are distributed directly from NOAA on the web at www.nauticalcharts.noaa.gov. They are also available through the International Center for ENC's Distributors, http://www.ic-enc.org/Pages/Current%20IC-ENC%20VARs.aspx.

3.3.1 ENCs in the Great Lakes

Traditionally, Raster Nautical Charts (RNCs) were maintained before for the production of ENCs. These charts also offered more coverage than the ENCs. With technological advances, it has become operationally advantageous to maintain ENC databases and update RNCs thereafter. NOAA now maintains the NOAA ENC suite as the premiere product. The Great Lakes ENC suite has equivalent coverage to the RNCs.

3.4 Digital Nautical Chart (DNC)

The U.S. produces many DNCs in the USCHC waters. The DNC, produced by the National Geospatial-Intelligence Agency (NGA), is an unclassified, vector-based, digital database containing maritime significant features essential for safe marine navigation.

The DNC uses the Vector Product Format, which is a NATO standard for digital military map and chart data. Additional details can be located at: http://msi.nga.mil/NGAPortal/DNC.portal.

DNC consists of libraries in a variety of scales for complete worldwide coverage.

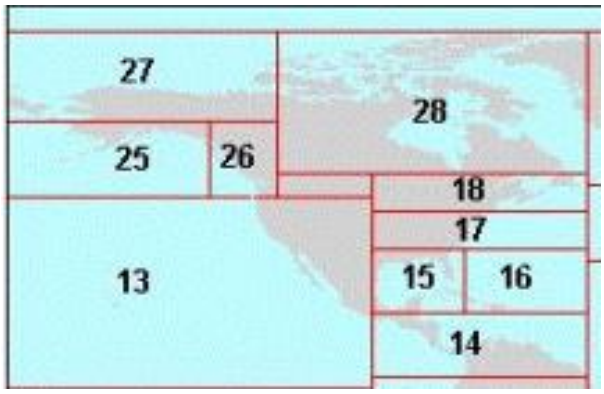


Figure 7: DNC Region A Coverage

DNCs consist of libraries in a variety of scales for complete worldwide coverage. These libraries are maintained with new source information from the U.S. and primary charting authorities (host nations). DNC libraries are considered Limited Distribution products and are not available for public sale or download except for those that are within U.S. territorial waters or in areas where source data restrictions allow them to be released. However, DNC data is shared with host nations for coverage in their territorial waters through formal bilateral exchange agreements

Within USCHC waters, the Canadian Department of National Defense is a co-producer of DNC across regions 18, 26, 27, and 28 (see table 2) where they maintain approximately 78% of the total coverage. This arrangement has been in place since 2004 and is covered under a formal co-production Memorandum of Understanding (MOU). NGA DNC's® 018, 026, 027, and 028 are produced in partnership with Canadian Forces Mapping and Charting Establishment Hydrographic Services Office (Esquimalt). Initial data collection of the database is from a portfolio of approximately 5,000 nautical charts that will ultimately provide global marine navigation between 84° North latitude and 81° South latitude and supports a variety of Geographic Information System applications.

The Digital Nautical Chart® database consist of 29 Digital Nautical Chart® geographic regions providing a complete worldwide footprint containing over 5,000 charts of varying scales between 84° North latitude and 81° South latitude and supports a variety of Geographic Information System applications. DNC's® 18, 26, 27, and 28 are produced in partnership with Canadian Forces Mapping and Charting Establishment Hydrographic Services Office (Esquimalt). Current portfolio of DNC libraries originating from the Canadian Forces mapping and Charting Establishment Hydrographic Services Offices (Esquimalt) are maintained with Canadian Notice to Mariners and applied on a four week cycle. Digital Nautical Chart® portrays selected significant navigational features in a format suitable for computerized navigation and Geographic Information System (GIS) applications. Digital Nautical Chart® is produced in the standard Vector Product Format

(VPF) allowing for modeling real world features in digital geographic databases. The database uses a table based geo-relational data model and supports GIS applications such as mission planning, command and control, and situational awareness. Future plans are to transition DNC data to ENC brokered partner data in Canadian and U.S. waters.

DNC Geo. Region	Total Library Coverage	Libraries maintained by DND
18	240	218
26	113	68
27	27	11
28	65	53
TOTAL	445	350

Table 2: DNCs produced in partnership with Canadian Forces Mapping and Charting Establishment Hydrographic Services Office

3.5 Raster Navigational Charts (RNC)

The NOAA RNC® are geo-referenced, digital images of NOAA navigational charts. Because the images are geo-referenced, the end user can display a vessel's position on the chart image if a computer-based navigation system is connected to a global positioning system (GPS). RNCs, developed under the IHO S-61 product specification, are unique to NOAA. NGA does not produce RNCs.

3.6 International (INT) Charts

The U.S. does not produce INT charts but does offer "INT Chart Equivalents." NOAA and NGA share INT chart responsibilities within USCHC region. The U.S. is responsible for eight (8) INT chart equivalents within region A. The listing is included in the table below.

INT Region	INT Chart Number	Producer	National Chart Number	INT TITLE	Scale	New Edition Year
A	403	US	108	South East Coast of North America including the Bahamas and Greater Antilles	3,500,000	1994
A	801	US	501	West Coast of North America (Mexican Border to Dixon Entrance)	3,500,000	2009
A	802	US	502	West Coast of North America (United States to Mexico)	3,500,000	1983
A	809	US	504	Hawaiian Islands	3,500,000	1983

A	810	US	500	West Coast of North America (Dixon Entrance to Unimak Pass)	3,500,000	2015
A	811	US	503	Mexico to Ecuador	3,500,000	1996
A	814	US	514	Bering Sea (Northern Part)	3,500,000	2015
A	813	US	513	Bering Sea (Southern Part)	3,500,000	2015

Table 3: INT Chart Equivalents in the USCHC Region

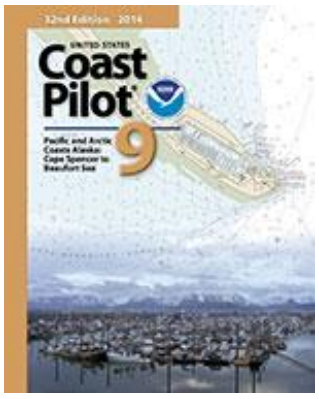
4. NEW PUBLICATIONS AND UPDATES

New Publications

The American Practical Navigator, first published in 1802 describes in detail the principles and factors of navigation, including piloting, electronic navigation, celestial navigation, mathematics, safety, oceanography and meteorology. It also contains various tables used in typical navigational calculations and solutions, including the formulas used to derive the tabular data. The 2017 edition of the American Practical Navigator returns to a two-volume format, which can be downloaded as complete PDF documents from the following website: https://msi.nga.mil/NGAPortal/MSI.portal?_nfpb=true&_pageLabel=msi_portal_page_62&pubCode=0002

Updated Publications

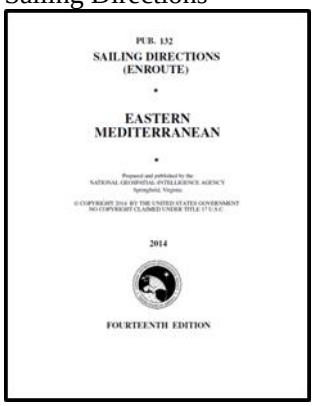
United States Coast Pilot



The *United States Coast Pilot*® consists of a series of nine regionally-focused nautical books that cover a variety of useful information important to navigators for coastal and intra-coastal waters and the U.S. Great Lakes. Coast Pilots 6, 7, 8, and 9 provide information for the USCHC region. U.S. Coast Pilot now offers completely updated publications every week. U.S. Coast Pilots can be downloaded at: https://nauticalcharts.noaa.gov/publications/coast-pilot/index.html.

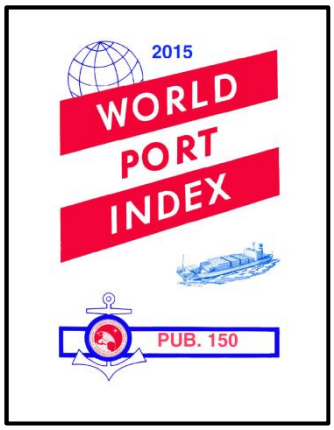
Coast Pilot	*Coverage*	*Current Year (Edition)*
#1	Atlantic Coast: Eastport ME to Cape Cod, MA	2017 (47th)
#6	Great Lakes	2018 (48th)
#7	Pacific Coast	2018 (50th)
#8	Alaska: Dixon Entrance to Cape Spencer	2017 (39th)
#9	Alaska: Cape Spencer to Beaufort Sea	2017 (35th)

Sailing Directions



Produced and maintained by NGA, Sailing Directions consists of useful information important to navigators of coastal waters. Information for the USCHC region is contained in Publications 140- North Atlantic Ocean and Adjacent Seas, 145 – Nova Scotia and the St. Lawrence, 146 – Newfoundland, Labrador, and Hudson Bay, and 154 – British Columbia.
Digital updates can be downloaded from NGA at http://msi.nga.mil/NGAPortal/MSI.portal .

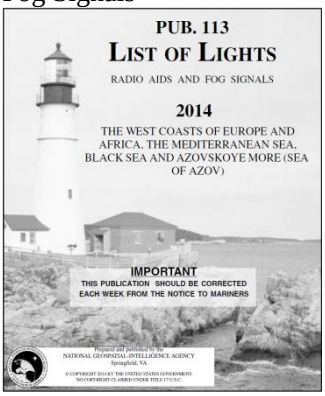
World Port Index



World Port Index (Pub150) is a publication maintained by NGA. It contains the location and physical characteristics as well as the facilities and services offered by major ports and terminals worldwide.

Digital updates are available to the public and posted at the NGA Maritime Safety website, at http://msi.nga.mil/NGAPortal/MSI.portal

List of Lights, Radio Aids and Fog Signals



The NGA *List of Lights, Radio Aids and Fog Signals* and their digital updates are available to the public and posted at the NGA Maritime Safety website, at http://msi.nga.mil/NGAPortal/MSI.portal . Each volume corresponds to a defined geographic region, and contains more complete information about the navigational aids than can be conveniently shown on nautical charts. New editions are published annually for every volume. The uncorrected publications can be viewed or downloaded in their entirety as PDF files. Corrections to the List of Lights are published in the Notice to Mariners.
Publications 110 – Greenland, the East Coasts of North and South America and 111 – The West Coasts of North and South America.

5. MARITIME SAFETY INFORMATION (MSI)

5.1 Existing infrastructure for transmission

Maritime Safety Information (MSI) is described as navigational and meteorological warnings, meteorological forecasts and other urgent safety-related messages broadcast to ships in accordance with the International Convention for the Safety of Life at Sea, 1974, as amended. The U.S. Coast Guard issues Notices to Mariners for NOAA charts, while NGA issues Notices to Mariners for NGA charts in the USCHC region.

Notice to Mariners

No. 38
17 SEPTEMBER 2011
UNITED STATES OF AMERICA

NOTICE TO MARINERS

Published Weekly by the National Geospatial-Intelligence Agency

Prepared Jointly with the National Ocean Service and U.S. Coast Guard

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Marine Information III-2.1

Visit the Maritime Safety Web site at http://msi.nga.mil/NGAPortal/MSI.portal

The U.S. Notice to Mariners provides timely Marine Safety Information (MSI) for the correction of all U.S. Government navigation charts and publications from a wide variety of sources, both foreign and domestic. Information published in Notice to Mariners provide for the correction of unclassified nautical charts, the unclassified NGA/DLIS Catalog of Hydrographic Products, United States Coast Pilots, NGA List of Lights, U.S. Coast Guard (USCG) Light Lists, and other related nautical publications produced by NGA, National Ocean Service (NOS), and the USCG. The U.S. Notice to Mariners corrects NGA and NOS charts using information collected from many sources, among them the Local Notice to Mariners published by the nine U.S. Coast Guard Districts.
The U.S. Notice to Mariners are posted at the NGA Maritime Safety website at
http://msi.nga.mil/NGAPortal/MSI.portal .

5.2 Navigation Warnings

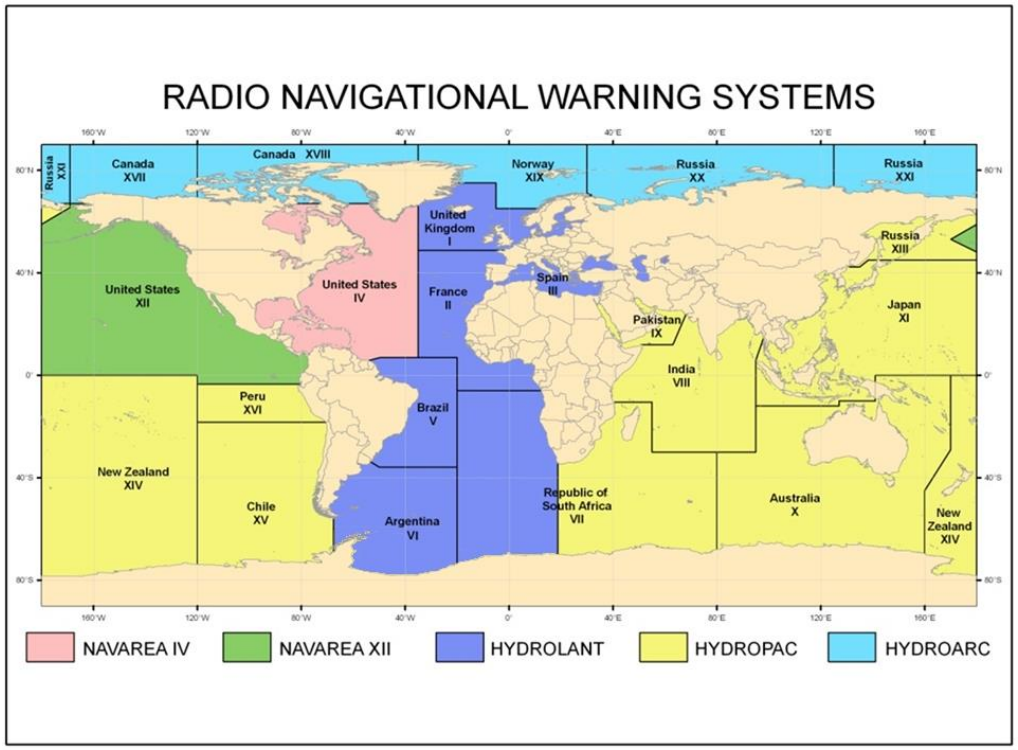

Figure 5: Radio Navigational Warning Systems

As the NAVAREA IV and XII Coordinator, NGA issues the navigational warnings for these areas and are broadcast and uploaded to http://msi.nga.mil/NGAPortal/MSI.portal. NGA requests the assistance of all member states within the these two NAVAREA regions to relay pertinent maritime safety information for promulgation to navsafety@nga.mil .

The International Maritime Organization has designated NAVTEX as the primary means for transmitting coastal urgent marine safety for instantly distributing maritime navigational warnings, weather forecasts and warnings, search and rescue notices and similar information to ships worldwide. Eleven NAVTEX stations are operational in NAVAREA IV and XII and is broadcasted from Coast Guard facilities in Cape Cod, Chesapeake VA, Savannah GA, Miami FL, New Orleans LA, San Juan PR, Cambria CA, Pt. Reyes CA, Astoria OR, Kodiak AK, Honolulu HI, and Guam. The broadcast coverage area for NAVTEX stations vary between 200 and 500 nautical miles from shore.

The NAVAREA coordinator is the authority charged with coordinating, collating and issuing navigational warnings for a designated NAVAREA within the IMO/IHO World-Wide Navigational Warning Service (WWNWS) (see figure below).

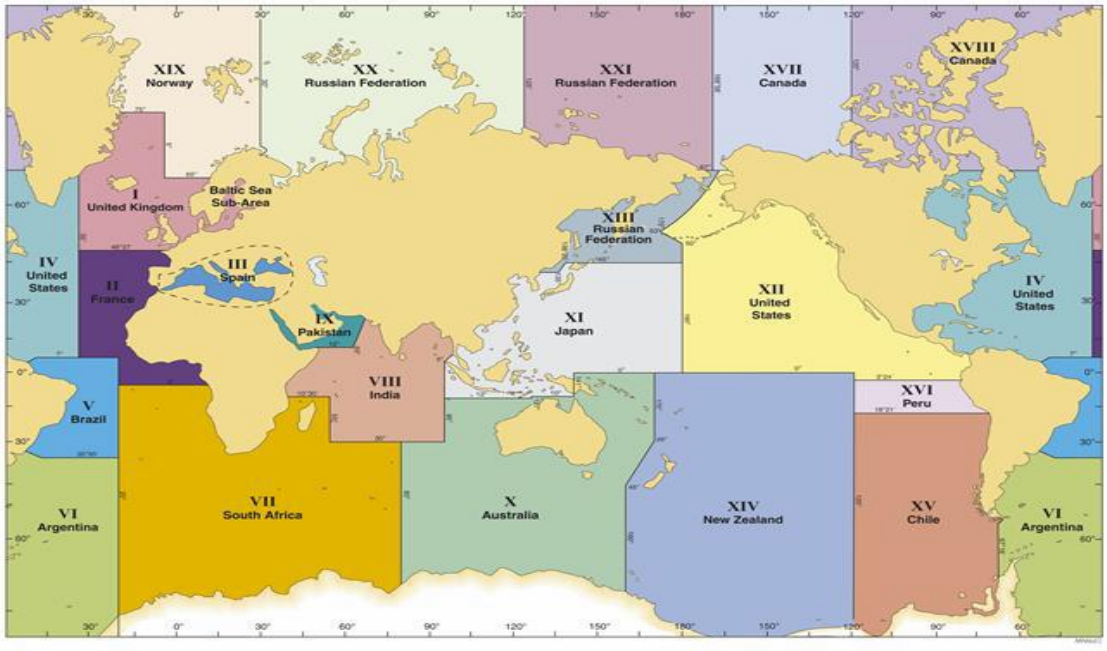

Figure 9: NAVAREAS for coordinating and promulgating navigational warnings under the World-Wide Navigational Warning Service

6. C-55[10]

The aim of IHO Publication C-55 is to present a clear picture of the worldwide coverage of surveys and nautical charts and of the extent of effective organizations for the timely promulgation of navigational safety information. The following tables outline the survey and nautical chart coverage in the U.S.

6.1 Hydrographic Coverage Available:

Area: USCHC Region (A)[11]

	A ("Adequately surveyed")	B ("Resurvey required")	C ("Never systematically surveyed")
Depths < 200m	11%	39%	50%
Depths > 200m	16%	4%	80%

Table 4: Hydrographic Coverage, Area USCHC Region (A)

6.2 Nautical Chart Coverage Available:

USCHC Region (A)[12]

	A*	B*	C*
Offshore Passage	100%	100%	95%
Landfall and Coastal Passage	100%	100%	100%
Approaches and Ports	100%	100%	80%

Table 5: Nautical Chart Coverage, USCHC Region (A)

*Where A = charting coverage by INT or other paper charts meeting S-4, B = charting covered by RNC meeting S-61, and C = charting covered by ENC meeting S-57

7. CAPACITY BUILDING

7.1 Offer of and/or Demand for Capacity Building

The United States is an active participant in the IHO Capacity Building Sub-Committee (CBSC). The US (NGA) directly supports the IHO Maritime Safety Information (MSI) training course as well as

[10] Source: February 2018 IHO U.S. C-55 submission. https://www.iho.int/iho_pubs/CB/C-55/c55.pdf
[11] Ibid. page 488. Area is defined by the total hydrographic survey coverage available where A = adequately surveyed, B = Re-survey required, and C = never systematically surveyed.
[12] Ibid. page 489.

provide support to nations through on site and remote guidance and advice as they grow their hydrographic capacity.

7.2 Training offered

Training opportunities are available at various institutions in the United States. Two Category A certified hydrographic programs are available through:

- The University of Southern Mississippi (USM)[13]
- The University of New Hampshire (UNH)[14]
- NGA

  Category-B Competence Training for Nautical Cartography - The National Geospatial-Intelligence Agency (NGA) commenced training with an IHO/ICA/FIG IBSC approved portable S-8 Category B Nautical Cartography class in 2017. NGA teamed up with IIC Technologies to provide training to analysts with a comprehensive 20-week instructor led course and a six-week final project. Each session will run for one to three weeks at a time over the course of two years. The pilot session started in June 2017 in Springfield, VA and consists of 10 students. The second session started in St. Louis, MO in January 2018, also with 10 students. A combination of lectures, hands-on compilation techniques, and homework assignments will prepare the students for the final project, the creation of a finished ENC product for NGA users. NGA plans on adding several additional sessions throughout the next several years.
- NOAA

  Category-B Competence Training for Nautical Cartography - In March, 2017 the IBSC approved the NOAA program for Category B in Cartography. The first class started the end of August 2017 and has 11 NOAA cartographers as the first class. In late 2018, the first foreign national student is scheduled to begin receiving this one year competence training program.

  Capt. Andrew Armstrong, NOAA (ret.), NOAA co-director of the Joint Hydrographic Center at UNH, is a member of the FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers. As a member of the board, Capt. Armstrong is available to advise institutions on establishing hydrographic training curricula and preparing submissions to the International Board for Category A or Category B recognition. (andy.armstrong@noaa.gov).

- NAVY

  COMNAVMETOCCOM and USM are partners in their Category A program and NOAA has a similar arrangement with UNH for their Category A program. COMNAVMETOCCOM also offers a six-month category B International Hydrographic Management and Engineering Program and mobile training via its Naval Meteorology and Oceanography Professional Development

[13] https://www.usm.edu/marine/hydrographic-science
[14] https://marine.unh.edu/program/center-coastal-and-ocean-mappingjoint-hydrographic-center

Center in Gulfport, Mississippi. COMNAVMETOCCOM's Category A and B programs and mobile training also qualify for Security Cooperation assistance.

Chart Adequacy Workshop

NOAA's Office of Coast Survey hosts an annual week-long workshop on nautical chart adequacy assessment for approximately one dozen students from around the world. The participants receive training in techniques to evaluate the suitability of nautical chart products using chart quality assessment techniques with publicly available information. The fourth annual workshop is scheduled to take place in mid-2018 in Silver Spring, MD. For more information, please contact Dr. Shachak Peeri (shachak.peeri@noaa.gov).

8. OCEANOGRAPHIC ACTIVITIES

8.1 General Bathymetric Chart of the Oceans and Seabed 2030

The United States participates on the IOC-IHO Guiding Committee for GEBCO, and hosts the IHO Data Centre for Digital Bathymetry at NOAA's National Centers for Environmental Information (NCEI) (formerly the National Geophysical Data Center, NGDC).

In the opening address of the Future of Ocean Floor Mapping (FFOFM) in Monaco in June 2016, Mr. Sasakawa, Chairman of The Nippon Foundation, set forth an initiative to partner with GEBCO to cooperatively work towards mapping 100% of the World Ocean bathymetry by 2030. This initiative led to the formulation of Seabed 2030, a global project within the framework of the General Bathymetric Chart of the Oceans (GEBCO) with the focused goal of leaving no features of the World Ocean floor larger than 100 m unmapped by the year 2030. At the 33rd meeting of the GEBCO Guiding Committee, the Seabed 2030 Project was approved. Seabed 2030 sets the goal of collecting, using and sharing, data of the world's oceans. The project seeks to encourage the data collectors and data managers of governmental, academic and private interests to work together to improve the quality of publicly available grids of the ocean floor. This project is focused on the goal of compiling a high-resolution, openly available, Digital Bathymetric Model (DBM). This DBM should efficiently provide bathymetric information to end users and leave no features of the World Ocean floor smaller than 100 m unmapped by the completion of the program. The Seabed 2030 project has great potential to create partnerships and cooperation between interested parties, significantly improving our understanding of the sea floor and empower sustainable ocean management in the coming century.

Based on GEBCO's successful experiences of working with Regional Mapping Projects, the structure of Seabed 2030 rests on the establishment of two types of new technical mapping centers, a Global Data Assembly and Coordination Center (GDACC) and Regional Data Assembly and Coordination Centers (RDACCs). The regional centers will be responsible for

championing regional mapping activities as well as assembling and synthesizing bathymetric information within their prescribed region. The global center will be responsible for producing centralized GEBCO products and centralized data management for non-regionally sourced data. In ocean regions where strong mapping initiative already are operational, Seabed 2030 will strive to avoid duplication and instead work towards fostering a close collaboration for the most efficient use of global resources.

The US joins other nations in support of improvements to the GEBCO gridded models of the world's seafloor, and note great benefit in supporting their continuing improvement. To do this, nations must make ocean depth data available to the project. One simple way is by sharing ENC soundings, and where national policy allows, sharing full resolution data sets. Several US agencies have provided data and data management resources for improvements GEBCO 30" model, and continue to support the development of crowd-sourced data sharing through the IHO Data Center for Bathymetry Digital (DBDC). These IHO projects establish the framework and encourage data sharing which benefits the global international maritime and oceanographic community.

8.2 Crowdsourced Bathymetry

Crowdsourced bathymetric data can be used to identify areas where nautical charts are inadequate and proper hydrographic surveys are needed or can be applied to nautical charts when the source and uncertainties of the data are well understood. The key to successful CSB efforts are volunteer observers who operate vessels-of-opportunity in places where charts are poor or where the seafloor is changeable and hydrographic assets are not easily available.

NOAA provides financial support for the IHO-initiated project to develop a global database for crowdsourced bathymetry hosted by the IHO Data Centre for Digital Bathymetry (IHO DCDB). The IHO DCDB, co-located with NOAA's National Centers for Environmental Information (NCEI), is building the infrastructure necessary to provide archiving, discovery, display and retrieval of global crowdsourced bathymetry data from mariners around the world. The online database can be found at https://maps.ngdc.noaa.gov/viewers/csb/ .

9. OTHER ACTIVITIES

9.1 Marine Spatial Data Infrastructures (MSDI) Progress

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. 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. Information can be obtained at https://www.ngdc.noaa.gov/iho/

The U.S. holds active roles in supporting the work of several international MSDI-focused working groups:

- IHO MSDIWG
- UN-GGIM Marine Geospatial Information Working Group (MGIWG)
- Open Geospatial Consortium Marine Domain Working Group (Marine DWG)

9.2 National Marine Spatial Data Infrastructures (MSDI) Progress

The Federal Geospatial Data Committee (FGDC) is an organized structure of federal geospatial professionals that provide executive, managerial, and advisory direction and oversight for geospatial decisions and initiatives across the United States federal government, and is responsible for the implementation of the National Spatial Data Infrastructure (NSDI). For more information: https://www.fgdc.gov/

Related to MSDI in the U.S., "MarineCadastre.gov is an integrated marine information system that provides data, tools, and technical support for ocean and Great Lakes planning." The team for MarineCadastre.gov continually works "to increase access to data through data and map services. The services are designed to deliver data without replication and directly from the source." MarineCadastre.gov supports complementary efforts: Digital Coast, Data.gov, and Geoplatform.gov (a FGDC initiative). For more information: https://marinecadastre.gov/

Additionally, several U.S.-regional initiatives exist that further develop MSDI within the country:

- Mid-Atlantic Ocean Data Portal (http://portal.midatlanticocean.org/)
- Northeast Ocean Data Portal (https://www.northeastoceandata.org/)

ANNEX A

NOAA CERTIFIED RASTER CHART (PAPER CHART) PRINTERS

Company	Phone Number	Additional Services*
The Copy Shop	770-682-6600	
Frugal Navigator	509-426-4472	FO
Weilbach A/S	+45 33 34 35 60	
Marine Press	514-866-8342	UO
Eagle Enterprises Safety Solutions	800-478-2331	
Bluewater Books & Charts	954-763-6533	WP
Richardson's Maptech (Edgewater Marine Ind., LLC)	508-990-9020	WP
East End Blueprint and Reprographics Services, LLC	631-726-2583	
Pacific Publishers	912-472-4373	WP
TrakMaps	1-877-861-8725	WP
My Nautical Chart	401-499-3842	
The Map Shop	800-532-6675	WP, BC, UO
OceanGrafix	877-562-4278	WP, UO, FO, BC
Map House	Coming Soon	
Maritime Services Ltd.	888-387-8667	
Stanfords	+44 (0)20 7836 1321	
Milwaukee Map Service, Inc. (Meacham Enterprises)	800-525-3822	
East View Geospatial	877-856-6705	BC, FO, UO, WP
William & Heintz Map Corporation	800-338-6228	FO
Captains Charts – Tiger Printing Group, LLC	215-799-0500	UO, WP
Hyannis Marina	508-790-4000 x 2	
Paradise Cay Publications	707-822-9063	WP, FO, BC
Datema Nautical Safety	+31 (0)596 63 52 52	
Granville Printing	203-254-3090	

Additional Services:
Book Chart (**BC**), Folio Charts (**FO**), User Overlays (**UO**), Waterproof Charts (**WP**)

ANNEX B

US IHO Representation (2018)

Acronym	Name	NGA Rep.	NOAA Rep.	NAVY Rep.
IRCC	Inter-Regional Coordination Committee	Keith Dominc	John Nyberg	Stanley Harvey
HSSC	Hydrographic Services and Standards Committee	Josh Clayton	Dr. Neil Weston	Rodney Ladner
S-100WG	S-100 Working Group	Josh Clayton	Julia Powell Janice Eisenberg	David Brazier
ENCWG	S-101 ENC (S-101) Working Group	Eric Lee	Megan Bartlett	
S-102 subWG	S-102 Sub Working Group	TBD	Janice Eisenberg	
ENCWG (S-101)	ENC	Scott Reeves	Megan Bartlett	
NIPWG	Nautical Information Provision	Mike Kushla	Tom Loeper	
NCWG	Nautical Cartography	Sean McGurgan	Colby Harmon	
DQWG	Data Quality	Chris Petrof	Sean Legeer	
MSDIWG	Marine Spatial Data Infrastructure	Sabatian Carisio	Patrick Keown	
TWLCWG	Tides & Water Levels and Surface Currents	Doug Roush	Kurt Hess/Peter Stone	
HDWG	Hydrographic Dictionary	TBD	NA	
ABLOS	Advisory Board on Law of the Sea	John Lowell	Leyland Snyder	
WWNWS	World Wide Navigational Warning Service	Chris Janus	NA	
CBSC	Capacity Building Sub-Committee	Capt. Connon	TBD	Calvin Martin
WEND	World Wide ENC Database	Gerry Walter	John Nyberg	
IBSC	Int'l Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers	TBD	Andy Armstrong	
GEBCO	General Bathymetric Charts of the Ocean	James Ford	Andy Armstrong	Ray Sawyer
CSBWG	Crowd Sourced Bathymetry Working Group	Whittney Anderson	Jennifer Jencks	
SCRUM	GEBCO Sub Committee on regional undersea mapping	James Ford		
SCUFN	GEBCO Sub Committee on Undersea Feature Names	James Ford		