

Hydrographic Services Review Panel Federal Advisory Committee

Recommendations to NOAA to Develop
the Implementation Plan for the

National Strategy for Ocean Mapping,
Exploring, and Characterizing the United
States Exclusive Economic Zone

Prepared by the
NOAA Hydrographic Services Review Panel Federal Advisory Committee
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**Hydrographic Survey Research Panel (HSRP) Recommendations to NOAA on the
Implementation Plan for the
National Strategy for Ocean Mapping, Exploring, and Characterizing the
U.S. Exclusive Economic Zone**

EXECUTIVE SUMMARY

This position paper provides the HSRP recommendations to the National Oceanic Atmospheric Administration Administrator (NOAA) on the development of the implementation plan for the National Strategy for Ocean Mapping, Exploring and Characterizing the U.S. Exclusive Economic Zone (NOMECE). The HSRP members have considered the whole document and focused recommendations in areas appropriate to their experience and expertise. This is primarily related to Goal 2: Map the United States Exclusive Economic Zone (EEZ), with other comments and recommendations about other goals and objectives that relate to the mapping, including the coordination of efforts of Goal 1, the use of new technologies of Goal 3 and the building of public and private partnerships of Goal 5.

This paper was discussed at the HSRP public meeting on September 23-24, 2020, along with public comments received regarding the implementation plans for NOMECE and the Alaska Coastal Mapping Strategy. Appendix A has the public comments and additional oral comments and can be found in the meeting report and transcripts posted online at: <https://www.nauticalcharts.noaa.gov/hsrp/meeting-webinar-september-2020.html>.

In light of the importance of the NOMECE mapping strategy to our national economic and environmental future, we recommend the following:

1. Continual engagement strategies for the non-government entities be pursued and that you ask to carve out a formal role for stakeholders during the planning and development as well as the implementation and future updating of the plans.
2. The formation of a special interagency group that includes public/private participation with NOAA in the leadership role. Interagency coordination is an imperative part of the future and the HSRP believes NOAA should help lead this effort with their natural connections to all things oceanic and existing leadership as part of the Interagency Working Group on Ocean and Coastal Mapping.
3. HSRP believes the successful achievement of the goals of such a critical and extensive strategy will require the leadership of a dedicated individual with a broad view of national capabilities and a perspective that can serve the full range of needs of a national mapping program, and serve as a central point of contact for the commercial, nongovernmental organizations, technology, and national security communities.
4. The federal investment in mapping technology for the U.S. Academic Research Fleet, and associated investments in developing a coordinated approach for best practices, calibration and operations, a fleet-wide solution for data management, and data synthesis efforts, have resulted in the creation of high-quality mapping data for vast areas of the global ocean. These resources and programs should be fully leveraged in the implementation of the strategy, particularly in the deep-water areas of the EEZ.

5. The HSRP and members of the public expressed concerns that as the NOMECE effort is undertaken, funding from already established yet underfunded critical programs (such as those that support marine navigation), will be diverted. The HSRP hopes that the magnitude of the Presidential Directive will be honored and recommends specific and sufficient new funding be requested and allocated to advance any new mapping missions that support the implementation plans for NOAA, and in particular focus National Ocean Service efforts in shallow water areas of the EEZ. NOS should also continue the current mission to advance the general mapping mission of NOAA.

BACKGROUND

In November 2019, the Presidential Memorandum on *Ocean Mapping of the United States Exclusive Economic Zone and Shoreline and Nearshore of Alaska* was issued. Section 2 called for an ocean mapping, exploration and characterization strategy. Section 3 of that memorandum directed the NOAA Administrator, in coordination with the State of Alaska and the Alaska Mapping Executive Committee (AMEC), co-chaired by NOAA and the U.S. Geological Survey (USGS), to develop a proposed strategy within 180 days to map the shoreline and nearshore of Alaska and inform actions of the Ocean Policy Committee and relevant agencies. NOAA subsequently developed two strategies – one for the NOMECE and another for the Alaska Coastal Mapping Strategy (ACMS).

In June of 2020, the White House released the National Strategy for Mapping, Exploring, and Characterizing the United States Exclusive Economic Zone. The Executive Summary of the NOMECE outlines the importance of exploration of the ocean and Great Lakes to support national security and prosperity. It states: “A comprehensive understanding of our oceans is fundamental to advancing science, building ocean-related industries, informing decisions that balance ocean use and conservation, and enhancing the Nation’s prosperity and security.” It further provides “a call to action for Federal agencies and non-Federal partners to build a national enterprise to map, explore, and characterize the United States EEZ. Meeting this challenge will require coordinated action and collaborative efforts that join scientific inquiry, entrepreneurial enterprise, philanthropic endeavor and public and private investment.”

HSRP RECOMMENDATIONS

The HSRP supports the following key elements and steps related to this important initiative, and further includes recommendations for the NOMECE implementation related to the goals in the sections below.

1. Everything starts with a map. However, the successful completion of the strategy will require the clear definition of what is meant by “mapping,” i.e., what data sets will be required while mapping the EEZ. Defining these data sets will be particularly important for non-governmental partners aiding in the effort.
2. Maps of high-resolution and accuracy be presented as both the first step and the keystone to comprehensive understanding and creating good policy.
3. Success will depend on dedicated leadership and management that is driven by the best interests of the nation.

4. Emphasis should be placed on public/private partnerships partnering with private industry, academia, and non-governmental organizations, with mechanisms established to allow early, open and full engagement in planning and implementation.
5. The federal investment in mapping technology for the U.S. Academic Research Fleet, and associated investments in developing a coordinated approach for best practices, calibration and operations, a fleet-wide solution for data management, and data synthesis efforts, have resulted in the creation of high quality mapping data for vast areas of the global ocean. These assets and resources should be leveraged in the implementation of the strategy.
6. Development of the Standard Ocean Mapping Protocol (SOMP) should establish suitable performance and data standards, in full collaboration with non-government organizations.
7. Use of remote and autonomous systems (uncrewed systems, artificial intelligence and cloud) and strategies for application now and in the future should be supported and encouraged.

NOMECE Goal 1: Coordinate Interagency Efforts and Resources to Map, Explore, and Characterize the United States EEZ

Objectives 1.1. Establish a National Ocean Mapping, Exploration, and Characterization Council, and 1.2 Develop an Implementation Plan for the National Strategy.

The HSRP acknowledges the National Strategy Coordination Structure and membership of the Council and Interagency Working Groups. *However, it believes that the successful achievement of the goals of such a critical and extensive strategy will require the leadership of a dedicated individual with a broad view of national capabilities and a perspective that can serve the full range of needs of a national mapping program, and serve as a central point of contact for the commercial, NGO, technology, and national security communities. It is recommended that this responsibility reside within NOAA and that the leader of this effort report directly to the Deputy Administrator.*

HSRP also recommends that NOAA and its federal partners establish a steering group to include representatives from academia and industry and non-government groups, to work in coordination with the Interagency Groups to provide non-governmental insight for the strategy implementation development.

Further comments and recommendations regarding building public and private partnerships, and engaging with industry, academic and non-government groups are addressed under Goal 5.

In addition, HSRP members are available to support the implementation team in any way we can.

NOMECE Goal 2: Map the United States EEZ

It is the policy of the United States to act boldly to safeguard our future prosperity, health and national security through ocean mapping, exploration, and characterization. This fundamental

statement directly applies to the benefits of the NOMECE strategy in support of the Blue Economy's goals and drivers, thus warranting the support of "Everything starts with a map". However, the successful completion of the strategy will require the clear definition of what is meant by "mapping," i.e., what data sets will be required while mapping the EEZ.

Once defined, this base map will be critical to make informed policy, legislative, regulatory and management decisions. Existing and developing technologies have allowed us to expand on the definition of a map. Mapping and characterization of the ocean now includes more than just the shape and depth of the seafloor. We now can provide a multi-disciplinary first look at an unknown or poorly understood area of the ocean such as obtaining properties from the sub-bottom, physical, chemical, and biological characteristics of the water column. All these characteristics are obtained from a single platform and a single pass.

Defining the data sets required will be particularly important for non-governmental partners aiding in the effort. It is recommended that the outcomes from the Workshop held on September 21-22 to Identify National Ocean Exploration Priorities in the Pacific convened by NOAA's Office of Ocean Exploration and Research (OER), and the Consortium for Ocean Leadership should be used in establishing those data requirements.

Objective 2.1 Establish a Standard Ocean Mapping Protocol.

It is noted that the Interagency Working Group on Ocean and Coastal Mapping held a symposium in October 2020 to "enable non-federal stakeholders to learn about the SOMP protocol and provide an opportunity for comment on it." NOAA should strive to ensure that the standards compiled under the protocol identify and utilize appropriate existing standards currently in use by the ocean mapping community, and develop those that are missing or inadequate. *The appropriate guidelines and standards should establish what is required to meet the intended purpose, and support decision making for the exploration and characterization, identified in Goal 4.*

The use of the federal investment in mapping technology for the University-National Oceanographic Laboratory System (UNOLS) fleet is noted in Objective 5.1. *However, this investment has been coupled with a number of parallel investments that are recommended to be leveraged in implementing the NOMECE in various objectives including the SOMP.* The Multibeam Advisory Committee (MAC) developed a coordinated approach for best practices, calibration and operations, and the Rolling Deck to Repository (R2R) program provides a fleet-wide management of underway data to ensure preservation of, and access to, the U.S. national oceanographic research assets.

It will not be possible to have a one size fits all approach to planning, programs and associated protocols. The HSRP recommends that protocols will need to be extensive and flexible enough to address different regions and applications. There is a significant difference between multibeam sonar data that are acquired in shallow water that must be used for navigation products and are useful for fine scale habitat mapping, versus mapping of deepwater oceanic regions. In deepwater the primary purpose of the mapping is likely to be for identifying and analyzing geological structures for further exploration and characterization. *Therefore, protocols and standards should be based on defining the sensors, data acquisition and processing in those*

regions and marine provinces to ensure they are fit for the various intended purposes. Establishing mapping data standards is a critical process for defining data quality and positional accuracy and for bringing data into a common format that streamlines application for collaborative research, large-scale analytics, and the sharing of sophisticated tools and methodologies.

It is also recommended that NOAA review current non-government and international standards and guidelines across the ocean mapping sectors in addition to the International Hydrographic Organization (IHO) standards. Two examples include the International Marine Contractors Association (IMCA) Guidelines for the Use of Multibeam Echo sounders for Offshore Surveys and the Multibeam sonar backscatter data acquisition and processing: Guidelines and Recommendations from the Marine Geological and Biological Habitat Mapping (GEOHAB) Backscatter Working Group.

As noted in Goal 5, it is recommended that a steering group be established to include representatives from academia and industry and non-government groups. The HSRP further recommends that a similar group be established for the SOMP development, to work in coordination with the Working Group to provide non-governmental insight for the development of protocols and standards.

If needed, the HSRP can assist in the design and/or the development of such data standards.

Objective 2.2. Coordinate and Execute Campaigns to Map the United States EEZ.

The HSRP notes that executing this objective will require “cataloging and analyzing existing ocean data” and this will rely on requirements defined in Goal 3 for what is required in the “map” to identify priorities and support planning of exploration and characterization. The NOAA Bathymetric Gap Analysis utilizes the raw data held at National Centers for Environmental Information (NCEI) but has no quality assessment, and also does not provide any indication of completeness of other parameters such as backscatter, water-column, and sub-bottom.

The HSRP recommends that the description and definition of mapping be expanded to clearly define the baseline data parameters that must be included in the strategy to complete the mapping to meet the 2030 and 2040 goals. In addition, it is recommended that the gap analysis be updated to provide an assessment of quality to allow improved coordination and analysis of mapping of bathymetry that is required. Similarly, the gap analysis should be extended to other parameters of the multibeam sonar data (backscatter and water column), and other geophysical and oceanographic parameters.

The federal investment in mapping technology for the University-National Oceanographic Laboratory System (UNOLS) fleet included the development of a coordinated approach for best practices, calibration and operations (MAC), a fleet-wide solution for data management (R2R), and data synthesis efforts that have resulted in high quality deepwater mapping data for significant areas of the U.S. EEZ and global oceans, and a managed path for ensuring data are available from the NCEI archive. *HSRP recommends that for mapping in deepwater, the NOMEAC leverage both the use of the UNOLS vessels for mapping, and these associated programs to ensure a high quality of data and a managed solution to archive the data.*

Creative and flexible arrangements need to be established to maximize the efficiency of mapping in the U.S. EEZ, and as noted in Goal 1 comments, will require a focused leadership coordinating the mapping. This will vary in different regions because of the current mapping, ease of access to areas for vessels/platforms, and priorities for the exploration. It will be particularly important in the remote areas of the Pacific where the primary cost is mobilizing the platforms to the area. *It is recommended that processes allow supplemental funding to programs to optimize coverage in these areas. See also objective 5.2.*

Objective 2.3 Make Data Usable and Available.

The HSRP supports the collection and archive of data in standardized formats to ensure the widest availability and access to ocean mapping data. As noted in the previous section, the Bathymetric Gap Analysis is primarily based on raw sonar mapping data that has not had any quality assessment which lowers the usefulness of the analysis for assessing the usability of the archived data. *The quality assessment of mapping data is being partly addressed by the National Bathymetry Source project, and it is recommended that this be extended to provide an assessment parameter for the gap analysis. Likewise, the Global Multi-Resolution Topography (GMRT) program assesses the data quality before including in the synthesis. It is recommended that this also be leveraged in providing assessment of deepwater mapping data to identify gaps.*

Modern sensors and software, available in industry and research, provide a significant challenge for archive and distribution with the increasing volume and types of data. However, the data density and the rapid parallel development of computer capabilities and software development of visualization systems now allows the intuitive and quantitative exploration of the data. These software and systems allow users to better and more accurately get a comprehensive understanding of the high density and multi types of data. This results in better data discovery and usability of the data. *The HSRP recommends that the latest web-based visualization applications be included in the implementation of the data archive to provide users with a better view of the data from these complex scientific observations.*

NOMECS Goal 3: Explore and Characterize Priority Areas of the United States EEZ

Objective 3.1 Identify Strategic Priorities.

It is acknowledged that the outcomes from the September 2020 Workshop to Identify National Ocean Exploration Priorities in the Pacific convened by NOAA's Office of OER, and the Consortium for Ocean Leadership will be used to establish strategic priorities for exploration and characterization.

Objective 3.2 Establish Exploration and Characterization Standards and Protocols.

The HSRP recognizes the existence of several coastal mapping specifications and protocols developed over the years by NOAA and other members of the Interagency Working Group on Ocean and Coastal Mapping (IWG-OCM). Among such specifications are the following:

- 1- NOAA Integrated Ocean and Coastal Mapping Seafloor Mapping Standards October 2011

- 2- Hydrographic Surveys Specifications and Deliverables - May 2020
- 3- IWG-OCM National Coastal Mapping Strategy 1.0: Coastal LIDAR Elevation for a 3D Nation

However, none of the above listed specifications rise to the level of a true data standard. Therefore, HSRP recommends for NOAA and the proposed steering committee to develop the “National Standards for Coastal Mapping and Hydrographic Survey” before starting the execution of the strategy. Such standards can be used by all agencies who are involved in the coastal and ocean mapping. HSRP can assist in the design and/or the development of such data standards.

NOMEC Goal 4: Develop and Mature New and Emerging Science and Technologies to Map, Explore, and Characterize the United States EEZ

The HSRP recognizes the importance of remote and autonomous systems (including uncrewed systems, artificial intelligence and cloud) and strategies for present and future mapping applications, and believes these methods should be emphasized, and encouraged. Remote and autonomous surface and sub-surface platforms, airborne platforms, autonomous data processing, information extraction and management are just a few of the relevant systems that are already being applied successfully. The industry response to the current and ongoing restrictions generated in response to the pandemic crisis has stimulated rapid development of and an expanding number of remote, autonomous systems and methods successfully being applied across ocean mapping programs and sectors.

The HSRP strongly urges support to continue and to expand these technologies, both for the nearshore and deepwater, leveraging innovation and development that is already occurring in the public/private, and academic sector. Robust and inclusive frameworks to identify and test via pilot projects potentially strong, emerging science and technology must be established.

Objective 4.1 Identify Science and Technology Needs in Mapping, Exploration, and Characterization.

The complete mapping of the U.S. EEZ by 2030/2040 will require many levels of technological innovation in order to increase the efficiency and effectiveness of mapping approaches. As noted above, autonomous platforms used in conjunction with crewed vessels offer a “force-multiplier” capability while uncrewed vehicles capable of long-term deployments offer a cost-effective means of mapping remote areas. The effective use of autonomous vehicles will require further research on the development of truly autonomous (fully-aware of surroundings and able to dynamically react) systems, the development of on-board processing and data management systems, enhanced high-bandwidth communications all aided by machine learning/artificial intelligence algorithms.

Beyond initial mapping, characterization will involve a new focus on acoustic backscatter data (both seafloor and water column) to identify areas of high interest for detailed characterization (e.g., cold water corals, critical habitat areas, regions of potential mineral gas and mineral resources). The inversion of backscatter data for seafloor or water column properties is still in its infancy. The identification of the technologies needed to address the challenges of mapping

exploring and characterizing the EEZ will require input from disparate fields and sectors. *To better understand the current state-of-the-art as well as potential new directions, the HSRP recommends that a series of workshops, involving domain experts from government labs, academia and the private sector be planned to focus on key aspects of technological innovation.*

Objective 4.2 Support Development, Testing, Deployment, and Use of New Technologies.

Modern, next-generation sensors and software give us the ability to generate maps and information products that are easy for non-scientists and non-engineers to understand. Visualization products are simple yet detailed enough to allow the general public to understand the features being displayed, and also draw conclusions about the relevancy and value of the map's derived information. In turn, the acceptance and application of the products produced from high quality maps will provide the first step and the keystone to comprehensive understanding, which in-turn will lead to the development of informed policy, legislation, regulation and management decisions. This process will make it easier to demonstrate to the public and to justify funding based upon the importance and need for the benefits of the NOMECS strategy. *The HSRP recommends that NOAA continue to support the development of new hydrographic sensors and procedures and the visualization applications in the implementation of applications for data discovery to provide users with a better view of the data from these complex scientific observations.*

NOMECS Goal 5: Build Public and Private Partnerships to Map, Explore, and Characterize the United States EEZ

Objective 5.1 Maximize Opportunities for Non-Federal Participation.

The conclusion of the NOMECS states that "it is critical that Federal agencies and non-Federal partners prioritize the development of new and emerging technologies to accelerate data collection and pursue partnerships to achieve the Strategy's objectives. The successful implementation of this Strategy requires coordination and collaboration among mapping, exploration, and characterization efforts across federal agencies and among private industry, academia, and non-governmental organizations." *The HSRP strongly supports this conclusion and recommends that a suitable structure be established to allow participants from industry, academia and other non-government organizations to sit alongside the inter-agency working groups to participate throughout the development and implementation of the NOMECS Strategy.*

The emphasis on private/public and academic partnerships also provides multiple layers of benefits. There are numerous examples of successful mapping projects that were driven by the support of partnerships throughout all portions of the programs. In the initial stages, these partnerships allow for awareness and discussions on what are the desired goals of the study, geographic priorities, data standards and protocol, relative importance and multi-uses of maps. Importantly, academic and private participation also stimulates innovation and scientific focus for future developments, including sensor development which is important to mapping capabilities and products in the future. These same benefits are also relevant and shared throughout the course of the mapping and generation of information products, and it promotes continuous improvement and expansion of ideas and direction. The final products will then be made available to a very wide array of interested and diverse parties, ultimately expanding on the

success of the program, including a variety of willing participants and enthusiastic users of the end results. Early and equal participation develops ownership of initiatives and enhances the chances of success.

While NOAA should maintain its role as the lead agency, it is critical to assure that partners are fully participating at all phases. Several mechanisms should be explored as to the feasibility of establishing these partnerships:

- a. NOAA, Integrated Ocean Observing System (IOOS), Regional Associations.
- b. NOAA, Cooperative Units (Such as the Cooperative Ecosystem Studies Units CESU) <http://www.cesu.psu.edu/>.
- c. NOAA, Cooperative Institutes (<https://ci.noaa.gov/>)

If these do not provide a suitable mechanism to fully involve non-government participation in the implementation working groups, it is strongly recommended that an alternative structure be established to directly include representatives from academia and industry and non-government groups to provide non-governmental insight to the NOMECE implementation. An international example of another national seabed mapping program is the Australian Seabed Program (AUSEABED). This program has established a Steering Committee with standing members from the government groups together with others from the private sector, academic and other as general committee members. (<http://www.ausseabed.gov.au/about/governance>). This type of structure should be investigated to see if it could be used under government regulations.

In addition, HSRP members are available to support the development of the NOMECE implementation plan.

Objective 5.2 Foster Cross-Sector Engagement.

The HSRP supports this objective to encourage and support cross-sector engagement, and notes again that this requires a suitable structure/s for non-government engagement noted in the previous sections.

The HSRP also supports collaboration built on “the strengths of the respective agencies and or organizations” and considers this will require flexible and varying approaches across the regions of the U.S. EEZ. NOAA needs to work closely with other governmental agencies and organizations, like the Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBCTX), and others involved in coastal mapping through a unified and well-defined data acquisition strategy to minimize or eliminate duplication in the national coastal data acquisition efforts. *It is expensive to mobilize assets to the remote areas of the Pacific U.S. EEZ, and it is essential that when in the region, there are flexible funding and collaboration agreements established in the NOMECE implementation to support optimal use of the platforms. It will also require a suitable ongoing operational coordination recommended in Goal 1 above.*

Objective 5.3 Inspire and Involve the Public.

The HSRP supports the public involvement in the implementation strategy. *However, public involvement through public hearings and public comments should not replace the needs for establishing the more formal private/public and academic partnerships we discussed in a few of the previous sections.*

**Public Comments for the NOAA HSRP meeting on the
NOMEAC and ACMS implementation plans
NOAA HSRP public meeting, September 23-24, 2020 v27Oct2020**

Number of comments: 21

1 Name: Clint Edrington, PhD Date: 9/14/2020
Organization: NOAA National Centers for Environmental Information
NOMEAC/ACMS/Both: Both Goal#: 2.1 SOMP
Comments: My comment for the HSRP is in regard to ground-truthing the acoustic data to be acquired from NOMEAC (and ACMS). Under Goal #2, NOMEAC establishes a Standard Ocean Mapping Protocol (SOMP) for mapping the EEZ, but it appears to be entirely focused on the specifications for acquiring and managing acoustic data. From what I can see from the public "Strategy", there is no mention of ground-truthing the acoustic data as a standard or best practice in the SOMP. (NOMEAC does mention ground-truthing in its Goal #3, but it is in the context of after-the-fact detailed characterizations of identified priority areas.) My belief/comment is it would be good to see some level of ground-truthing included as an integral component of the SOMP. My concern is that if ground-truthing is not done in parallel with acoustic acquisition, then some areas or regions of the EEZ, as you know is quite large, may never receive adequate ground-truthing, if anything at all, and I think the resulting "first-order maps" would be less for it. With limited resources, perhaps the existing SOMP (i.e., no ground-truthing) is the most pragmatic approach. But if possible, I believe most end users of the data would appreciate ground-truthing being integrated into the SOMP.

2 Name: William Nye Date: 9/14/2020
Organization:
NOMEAC/ACMS/Both: Both Goal#:
Comments: This responds to the NOAA/HSRP request for public comments, published in the Federal Register (85 FR 52956). You are requesting public comments for the development of the implementation plan for an ocean mapping strategy*, and the development of an implementation plan for the Alaska coastal mapping strategy**. Each strategy is published in a separate PDF document, as referenced in the Federal Register. The Alaska coastal mapping strategy states the "Coastal Mapping Subcommittee" is responsible for the "coordination and development of an implementation plan" (Alaska strategy, pg. 6). It therefore appears the subject of the Alaska implementation plan is before the wrong body. I may be overlooking something, so it would be helpful if NOAA/HSRP could clarify its role vs my observation.

Regarding the implementation plan for the ocean mapping strategy, it is stated "the Council and subordinate bodies will develop an Implementation Plan" (ocean mapping strategy, pg 7), and "The Council will solicit public comment on the components of a draft Implementation Plan . . ." (pg 8), where "council" refers to "National Ocean Mapping, Exploration, and Characterization Council". Again, it appears the subject is before the wrong body. I may be overlooking something, so it would be helpful if NOAA/HSRP could clarify its role vs my observation. This issue is not a minor procedural detail. It should be more obvious that all public comments are reaching the right people, as directly as possible, and the right panels or subcommittees are involved.

The Federal Register notice also asked for comments on any other topics. In that regard, the Exclusive Economic Zones (EEZ), which is a subject of the ocean mapping strategy, are charted as shown in NOAA's electronic navigational charts (ENCs). NOAA has a web page where the ENC files can be downloaded, but once downloaded, the question becomes what to do with, or how to view, these specially-formatted files. It would be helpful if NOAA provided this information. Several years ago NOAA did provide a list of third party viewers, but then deleted it (see <http://web.archive.org/web/20150503053021/http://www.nauticalcharts.noaa.gov/mcd/enc/resource.htm>) The URL is an archive of NOAA's web page, for May 2015, and shows a list of free ENC viewers and other software. I am not clear why NOAA deleted this, and discontinued such references. NOAA talks about building public/private partnerships, but deletions like this, without any apparent reason or replacement, seems counter productive to that cause.

3 Name: Joyce Miller Date: 9/14/2020
Organization: Former HSRP Member and Chair, University of Hawaii (ret.)
NOMEAC/ACMS/Both: both Goal#:
Comments: Since the early 2000's NOAA, USGS, USACE, and other governmental agencies have held at least yearly meetings to discuss Integrated Coastal and Ocean Mapping (IOCM). Major foci early-on were to develop an application that would help to coordinate mapping missions and to create a national mapping plan. While these IOCM discussions were on-going, NOAA's Coral Reef Conservation program funded mapping of shallow (0-100m) and medium depth (100-3000 m) areas in the Pacific and the Caribbean US EEZ starting in 2001. No direct funding or input was provided by IOCM, but all data collected were provided to NOAA's Office of Coast Survey and submitted to the National Geophysical Data Center, now part of the National Center for Environmental Data (NCEI).

In 2009 the Integrated Coastal and Ocean Mapping Act (OCMIA) was passed into U.S. Law and some funds have been used to support data centers and (again) provide a national mapping plan. While collaborative IOCM projects were undertaken to provide shallow water lidar and radar mapping; very little direct IOCM funding has been provided to actually map the seafloor deeper than 100 m. Many academic research ships with functional shallow and deep-water mapping capabilities have had relatively few dedicated mapping missions in the past decade, since the OCMIA was passed, because there has been no funding.

Two NOAA groups, the Office of Coast Survey and the Ocean Exploration program, have continued their missions for charting and exploration, and the U.S. Dept. of State funded the Extended Continental Shelf program; these programs have provided invaluable publicly accessible data sets to the growing U.S. and world bathymetry maps. All of these groups have worked closely with the University of New Hampshire's Center for Coastal and Ocean Mapping/Joint Hydrographic Center (CCOM/JHC), which is, I believe, the best example of what IOCM has actually accomplished.

In the past decade groups such as the Schmidt Ocean Institute, the Nautilus Live Ocean Exploration Trust, Calladan Oceanic LLC, and Fugro have privately provided millions of dollars in free ship time and have made public access to privately collected data a high priority. The data sets collected by these groups have significantly added to the world's bathymetric data base. These programs have been highly productive and should be recognized for their significant contributions. They prove what can be accomplished if funding is made available. When the Seabed 2030 program was announced in 2017, the first phase of the program that was funded was to collect and organize data and produce an international mapping plan, while few, if any, funds have been allocated to actual seafloor mapping to date.

And now in 2020 A National Strategy for Mapping, Exploring, and Characterizing the U.S. Exclusive Economic Zone, June 2020, has been developed and published, eleven years after the OCMIA was passed. In reviewing this document, yet again I see a plan to develop a plan for mapping our EEZ, but no action or funding for actual mapping. Obviously, the point is that if there is no funding for actual mapping, we can plan for another two decades and not really accomplish that much.

There is a significant opportunity in this year of the pandemic. Many multibeam-equipped NOAA and academic ships are sitting idle or are significantly underutilized; some maintain a full ship's crew, including experienced mapping technicians. A few continue to conduct research cruises in areas that are not too distant from medical facilities, after rigorous testing and quarantine of crew and scientists for COVID-19 contamination. The National Science Foundation, the Office of Naval Research, and the University-National Oceanographic Laboratory System have worked to develop safety protocols for continuing operations on a limited basis. Looking at NOAA's U.S. Bathymetry Coverage and Gap Analysis web site, there are areas within a day or two's travel from medical facilities in the U.S. EEZ around Hawaii, Alaska, Oregon, the Gulf of Mexico, and the Caribbean that could be mapped if funding were made available.

Comments, Sept 24: There are two existing NOAA documents about mapping standards dating to 2011 and 2012 that I have sent to Lynne. Please post them for the panel. Also, HSRP asked NOAA about interagency mapping standards several years ago. Ask RDML Smith whether anything has happened. Correction. HSRP asked NOAA about interagency funding mechanisms.

4 Name: Guy Noll Date: 9/15/2020
Organization: ESRI
NOMECA/ACMS/Both: NOMECA Goal#:
Comments: WRT the IOCM coast mapping strategy, we are actively working to create machine learning routines to automatically flag shoreline changes (change detection) and ideally extract new shoreline vectors from imagery. Combining that with the work of TCarta in SDB (Satellite Derived Bathymetry) extraction should provide a means to automate near-coastal mapping for remote areas such as the Arctic as well as improving timeliness of updates in man-made features near ports. NOAA should continue to leverage the initiative of private industry to harness the technology and provide government-wide access of these data and patterns of usage by following the Geospatial Data Act to ensure broad participation among partner agencies. Avoiding duplication of effort is critical for the value to the public as well as alignment among agencies as using authoritative sources for resolving conflict is key.

Comment, Sept 23, 2020: A few more thoughts on SOMP strategy. I think the underlying challenge is defining "observation or measurement" strategies for specific use cases. A map is a product from such measurements. As with statistics, maps can mislead or even lie about their truth.

If the objective of the mapping strategy is a set of procedures through which meaningful observations are acquired, similar to what Coast Survey had to do to create effective multibeam echosounder usage, or similar to the definition of Navigational Area Limit Line (NALL) that we did after the 2002 death of AB Koss, then the map product can use those measurements to (ideally automatically) conflate the measurements to meet product specifications. For the relatively simple use case of achieving a given bathymetric resolution, the IHO has spent decades refining S-44 standard to classify observations per specific Orders of quality. I submit that their result was ‘good enough’ but that the underlying assumptions may need to be examined to be an effective model for the deep water corollary. In short, the chemical/physical/biological oceanographic properties of the deep water ocean are of sufficient variance that standard error analysis may be insufficient for determining uncertainty of measurement within the desired resolution.

A simple test - can a repeatable measurement be made within the requisite accuracy and resolution, and that measurement confirmed by another means at that depth? If not, then the products created by the conflated observations may not be robust enough to match the desired criteria of resolution after all error sources are considered. Another approach may be to consider the original ‘Patch Test’ criterion of detecting change. If no change can be determined, how do we know the measurement is correct? If we assume that the repeatable observation OVER TIME has been corrected for the aforementioned oceanic properties as well as any variance in the measurement system itself, then we have assumed a ‘baseline’ has been conducted. Once a baseline is achieved, then any change will be attributable to either differences in the measurement system or in differences in the environment. The latter would be of interest to the community invested in the production of the ‘map’, while the former would be of interest to the engineers trying to achieve a robust observation.

Comment, Sept 24, 2020: Perhaps the Geospatial Data Act can be leveraged by the HSRP to bring NOMEC some clarity in terms of coordination among agencies, private industry outlays, and meaningful collaboration with value identified?

5 Name: David Miller Date: 9/15/2020

Organization: Fugro

NOMEAC/ACMS/Both: NOMEAC Goal#:

Comments: In response to the “notice for open public meeting, and request for public comments” related to NOAA’s Hydrographic Services Review Panel that was published in the Federal Register – Volume 85 – Number 167, published on 27 August 2020, I am pleased to provide the following comment on the development of the implementation plan for the “National Strategy for Mapping, Exploring, and Characterizing the United States Exclusive Economic Zone” (NOMEAC):

The NOMEAC strategy that was published in June describes itself as a strategy to map the United States EEZ, identify priority areas within the United States EEZ, explore and characterize these priority areas, leveraging the expertise and resources of multi-sector partnerships. It further states that deploying new and emerging science and technologies at scale, and doing so in partnership with private industry, academia and non-governmental organizations, are essential components of the strategy. Clearly, the NOMEAC strategy is a bold and ambitious initiative that will require a “whole of nation” response. Despite this, the administration and governance that has been established by the NOMEAC strategy, in part to support collaboration with non-government partners and stakeholders, does not include non-government partners and stakeholders. Membership in the new “National Ocean Mapping, Exploration, and Characterization Council” and its subordinate bodies, the new “Interagency Working Group on Ocean Exploration and Characterization” and the existing “Interagency Working Group on Ocean and Coastal Mapping” represents Federal agencies that have programmatic responsibilities and resources needed to implement the strategy.

Furthermore, these bodies are tasked with developing an Implementation Plan for the NOMECE strategy within 180-days. So, the bodies that are responsible for developing an implementation plan for a strategy that must include the deployment of new and emerging science and technologies at scale in partnership with private industry, academia and non-governmental organizations do not include these non-government stakeholders nor is it clear and obvious from the NOMECE strategy how these non-government stakeholders will be consulted or contribute to the process.

The private sector is already mapping, exploring and characterizing portions of the US EEZ on privately funded projects and the private sector is already developing and deploying new and emerging science and technologies in support of these activities. To fully leverage the resources, expertise, data, innovation and partnership opportunities that are available within the private sector to support the NOMECE strategy, there must be clear, meaningful and transparent mechanisms for engagement and collaboration in the development of the implementation. Ideally, the private sector should be a co-developer of the implementation plan and not just a provider of public comments when it is complete.

6 Name: George Dellas Date: 9/15/2020
Organization: US Power Squadron
NOMECE/ACMS/Both: Other Goal#: N/A
Comments: I'm a member of the US Power Squadron in Naples, Florida. NOAA's mapping is commendable and most accurate for those areas with commercial shipping. Can groups like ours help out more in the areas of non-commercial shipping like Naples. Particularly in depth surveys. Can you help train and/or provide equipment for our pleasure craft so that we may take and document depths?

7 Name: Sean Murphy Date: 9/15/2020
Organization: Business Unit Manager, Subsurface Applications, MARTAC
NOMECE/ACMS/Both: Both Goal#:
Comments: Coverage area is determined by water depth. The only thing that we can try to control is the speed in which we collect data and how many sensors are on the water. I personally believe in swarm bathymetry utilizing unmanned surface vessels. If unmanned systems are not utilized, then you still need more sensors on the water. I would try to create smaller contracts close to shore and use federal resources further out to sea. Coverage area is determined by water depth. The only thing that we can try to control is the speed in which we collect data and how many sensors are on the water. I personally believe in swarm bathymetry utilizing unmanned surface vessels. If unmanned systems are not utilized, then you still need more sensors on the water. I would try to create smaller contracts close to shore and use federal resources further out to sea.

8 Name: Irv Leveson Date: 9/17/2020
Organization: Irv Leveson Consulting
NOMECE/ACMS/Both: Both Goal#:
Comments: The two reports are excellent but could go a little further. NOMECE could provide preliminary priorities like the Alaska report does. Both reports could use more on timetables. To what extent will some aspects of implementation in Alaska have to wait for completion of the new NSRS? Should the islands strategically closest to China be done first and quickly in view of China's territorial expansionism? Is that already covered in confidential DoD documents and is it accepted federal policy? Does its immediacy outweigh the importance of moving quickly on Alaska?

There may be a need for immediate action on a “Plan to Make a Plan” which sits between the strategy and a detailed plan and says more about responsibilities. There is a risk that what’s everyone’s business is no one’s business or that because of inertia nothing happens until the next Administration and/or Congress gets around to it.

Comment, Sept 24, 2020:

The U.S. may get a large scale infrastructure program in as little as 6 months. While NOAA appropriately take a long view, especially in view of program implementation times and technology lead times, enough work should be done early on phasing so infrastructure funds can be utilized. NOAA should be ready to articulate the benefits of the early phases in terms of higher paying jobs, safety and the environment. It also should make clear that such efforts bring longer term environmental benefits closer. The role of the two programs in relation to each other should also be addressed. NOAA wouldn't want to be blindsided by emphasizing Alaska while a nations security decision targets the Pacific. Regarding technology, I agree that most of the information about what is coming can be obtained from industry, what else can be learned from efforts of other nations' agencies and what mechanisms can be employed for that?

9 Name: Helen Brohl Date: 9/21/2020
Organization: Chair, CMTS
NOMECA/ACMS/Both: Both Goal#:
Comments: Mr. Chairman and members of the HSRP:

Thank you for the opportunity to provide brief comments during the Fall 2020 Hydrographic Services Review Panel (HSRP) meeting at which you will discuss, among other items, recommendations on the development of the implementation plans for the two ocean and coastal mapping strategies.

CMTS members have been directly engaged in the development of these plans for which the Committee is very supportive. In particular, the September 2019 report by the CMTS entitled, “Ten Year Projection of Vessel Activity in the U.S. Arctic Region: 2020-2030,” noted that, in the last decade, the number of vessels operating in waters north of the Bering Strait around the Chukchi and Beaufort Seas has increased by 128% and is now 2.3 times larger than the number of ships passing through the region in 2008. Further, despite limited growth in the total number of ships using these waters during the 2015–2017 period [after Shell Oil discontinued oil exploration], the length of the navigation season has been growing by as much as 7–10 days each year. Extrapolated out over the next decade, the navigation season in and around the Bering Strait may extend 2.5 months longer than present, potentially upending the region’s highly seasonal navigation. The CMTS recognizes the value of enhancing coastal mapping in Alaska, particularly to support this growing vessel traffic.

[\[https://www.cmts.gov/downloads/CMTS_2019_Arctic_Vessel_Projection_Report.pdf\]](https://www.cmts.gov/downloads/CMTS_2019_Arctic_Vessel_Projection_Report.pdf).

As a Federal interdepartmental maritime policy coordinating committee, the CMTS is directed to improve the Nation’s marine transportation system (MTS) through interagency engagement. RDML Timothy Gallaudet, Commerce Assistant Secretary for Oceans and Atmosphere and Deputy Administrator of the National Oceanic and Atmospheric Administration (NOAA) is the most recent past chair of the CMTS Coordinating Board and emphasized the importance of the Blue Economy and the role of marine transportation into the CMTS work plan. Much of the subject matter expertise to the CMTS from NOAA resides within the National Ocean Service, including in the Office of Coast Survey and Center for Operational Oceanographic Products. We recognize the complementary nature of the National Ocean Mapping, Exploration, and Characterizing the U.S. Economic Zone (NOMECA) and the Alaska Coastal Mapping Strategy (ACMS) to the existing NOS programs and simply ask that these new initiatives not overshadow the reliance of the MTS on the foundational mapping, charting, observing programs.

NOAA NOS programs are but one of the Federal agencies providing real-time navigation services to the MTS. For example, the CMTS Future of Navigation Integrated Action Team (FutureNav IAT) which is co-led by NOAA, the U.S. Coast Guard, and U.S. Army Corps of Engineers, is engaged in very exciting and forward thinking work to advance navigation safety and security. The team recently held a navigation data interoperability roundtable with agency information and data officers in order to further the efficiency to share data amongst agencies in a manner that will, ultimately, make it more available and discoverable to stakeholders. In particular, the CMTS members are enthusiastic about the future of NOAA's Precision Navigation, while supporting all of the routine survey, charting, observing, and response programs of the navigation service agencies. It is a very successful and interdependent partnership within the Federal government.

In summary, we are very pleased and supportive of the progress made to develop implementation plans for the NOMECS and ACMS and suggest that the HSRP may want to also recognize the foundational navigation service programs in support of a safer and stronger marine transportation system. Please let me know if I can provide additional information. Helen Brohl, Executive Director

10 Name: Joseph Zhang Date: 9/21/2020

Organization: Virginia Institute of Marine Science

NOMECS/ACMS/Both: Both Goal#:

Comments: Summary of my research and advisory work:

We have been working with multiple agencies in this country (NOAA, EPA, DOE, state governments) and overseas (e.g. Central Weather Bureau, Taiwan; Helmholtz-Zentrum Geesthacht, Germany) in various studies of coastal ocean, estuaries, rivers/lakes and watersheds around the world. Bathymetry and topography information is fundamental in all of our work and we have been actively using various DEM (digital elevation model) sources from OCS, e.g. CUDEM, NCEI's lidar data etc. Since most of our work focuses on seamless cross-scale ('basin to creek') studies that cover both nearshore (0-40m) and offshore (40-200 m and beyond), we are in constant need of seamless bathy-topo DEMs that are built on consistent vertical datums. We are heartened to see multiple agencies actively supporting this important effort to close the knowledge gap by seamlessly mapping the sea floor from shoreline to deep ocean, e.g., as part of "a National Strategy for Mapping, Exploring, and Characterizing the U.S. Exclusive Economic Zone" as mentioned in NOMECS.

Why is bathymetry so important? While the information for topography has been greatly improved over the past decades due to the emergence of advanced aerial survey technology, the same cannot be said of the bathymetry, especially at nearshore locations. For example, we have been working on the Chesapeake Bay system for the past 20 years, and even today we are still badly in need of updated and more accurate bathymetry in parts of the main Bay and most tributaries. On the other hand, our studies strongly demonstrated the critical need for very accurate bathymetry, a view echoed by many participants of a NSF sponsored workshop (Fringer et al. 2019). For example, Ye et al. (2019), Nunez et al. (2020) and Cai et al. (2020) convincingly demonstrated that the bathymetry is the first order and perhaps the most important forcing in nearshore processes and small uncertainties in it can result in system-wide responses for major physical and biological variables, including the surface elevation and 3D currents. Our estimate suggests a smaller tolerance on the order of 1cm or less for the bathymetry errors is required in depths of 0-10m. The recent advances in the modeling technology have further underscored this need: in particular, we are at the stage where the next-generation models are now capable of very faithfully resolving the nearshore bathymetry with little compromise (Zhang et al. 2016). In summary, a full coverage of bathymetry from shoreline to deep ocean, with higher accuracy nearshore will greatly reduce the uncertainties in many coastal studies.

11 Name: Molly McCammon Date: 9/22/2020

Organization: Alaska Ocean Observing System

NOMECA/ACMS/Both: ACMS Goal#:

Comments: First, I appreciate the opportunity to provide comments and apologize for the delay in submitting these comments to you. Second, I want to congratulate you on your thoughtful review of Alaska’s Coastal Mapping Strategy and recommendations for development of the strategy’s Implementation Plan. AOOS is pleased to have participated in development of the Strategy, as well as more than a year’s effort with NOAA and the Alaska Department of Natural Resources in working with stakeholders to prioritize and identify priorities for mapping needs in advance. With a consortium of funders, we are currently supporting the Alaska Coastal Mapping Strategist position.

Coastal mapping is one of the key components of an overall strategy to respond to Coastal Hazards in Alaska, and in particular coastal storms, flooding, and erosion. AOOS hopes in the next two years to collaborate with our federal, state, and tribal partners to revisit the recommendations developed in a 2012 coastal hazard workshop. In the meantime, AOOS is continuing to prioritize increased collection of water level data, especially for western and northern Alaska, and pilot alternative means of collecting coastal bathymetry.

We appreciate the recognition of the Alaska Water Level Watch, a collaborative working group co-founded by AOOS with state and federal partners in your recommendations under Objective 2.2. The AWLW annually reviews gaps and priorities. The latest draft guidance document that you reference will soon be reviewed by the AWLW Steering Committee for final action and available on the AWLW website: <https://aoos.org/alaska-water-level-watch/>. The document identifies the need for both water level data for flood risk assessments and modeling, as well as for establishing tidal datums.

AOOS has been piloting the use of GNSS reflectometry, largely funded by the National Weather Service Alaska Region, for the past four years with sites operating at St. Michael, Alaska (AT01), and a new site planned at Utqiagvik (delayed one year due to covid-19 travel restrictions). Your recognition of the value of this technology is welcome and could be enhanced by referencing its current use at AT01 as an example. AOOS was chosen by NWS to develop these pilot efforts because of our ability to pool funds from multiple sources (federal, state, private, etc.) over multiple fiscal years. Non-governmental entities such as AOOS should be looked to as key partners in development and execution of future implementation activities related to Alaska’s coastal strategy.

Regarding use of single-beam sonar systems for collection of nearshore bathymetry, we note your recommendations regarding the use of unmanned systems to complement traditional hydrographic surveys. However, your recommendations should also note the piloting by AOOS and the Alaska Department of Natural Resources, and NOAA’s Office of Coast Survey of the Hydroball, a small (28 pounds), fully autonomous buoy that includes a single beam echosounder, a GNSS receiver, and a digital compass, and can be either moored, towed, or drifted. Testing of this technology was expected to occur in summer 2020 but has been delayed due to covid-19 travel restrictions. However, based on its usage in Canada, we are optimistic that it holds promise for meeting needs of nearshore bathymetry, especially at the mouths of frequently-changing rivers, while also leveraging the capacity of local workforces in Alaska. Again, AOOS – along with our state and federal partners - is being used to help pilot this technology because of our ability to pool funds over multiple fiscal years.

12 Name: Denis Hains Date: 9/23/2020

Organization: H2i

NOMEAC/ACMS/Both: NOMEAC Goal#:

Comments: Thank you to NOAA for this open and transparent process, allowing public comments & suggestions via the “Hydrographic Services Review Panel (HSRP)” on September 23-24, 2020 Webinar. All this, in order to complement, clarify and improve the important “National Strategy for Mapping, Exploring, and Characterizing the United States Exclusive Economic Zone (NOMEAC)”. Here 2 suggested changes to integrate to the NOMEAC plans to represent the scope of “Hydrospatial” challenges: In the NOMEAC Summary, it is mentioned for the implementation plans: ...” two ocean and Coastal strategy”... It is suggested to reframe and modify this high level statement to be more open and inclusive by stating specifically as: ...”three ocean, the Great Lakes and Coastal strategy”... where the third ocean is the challenging Arctic ocean...

Due to the multinational impacts of NOMEAC implementation plans; it is suggested as being very important to name specifically the essential international collaborations needed with neighbouring countries to NOMEAC by identifying and naming all of them: Canada, Mexico, Russia, Caribbeans countries, and others...

Comment, Sept 24, 2020: Public Comments on NOMEAC:

(1) If it has not been clarified in writing in the Presidential Memorandum on NOMEAC yet; it shall be stressed and written down officially that NOAA-NOS has the LEAD role and the ACCOUNTABILITY for funds distribution and the delivery of outcomes and outputs of the whole NOMEAC program, through US Federal Agencies and Departments;

(2) It is important to make sure that Capacity Building Strategy be developed through means such as: Crowd-Sourced Bathymetry; and by transfer of traditional knowledge take place with aboriginal communities of the Alaska Coast and remote communities everywhere in US to mobilize and engage all in strategic alliances.

13 Name: Robert A. McConnaughey Date: 9/23/2020

Organization: Research Fishery Biologist, Alaska Fisheries Science Center, NOAA Fisheries

NOMEAC/ACMS/Both: Both Goal#:

Comments: There are multiple and dissimilar societal needs for NOMEAC mapping. How will these different needs be prioritized, and translated into an operational sequence? Thank you.

I am a fishery biologist with the NMFS Alaska Fisheries Science Center. My specialty is habitat science. Earlier discussion has addressed the regional prioritization challenge – with my question, I would like to take the conversation one level higher. I led the NMFS team that identified and prioritized areas for mapping under NOMEAC. To do this, we surveyed all our scientists and managers and, as you can imagine, the result was a complicated mix of requirements and justifications ("just" for AK fisheries).

My question: The Presidential Memorandum identifies multiple societal needs (security, minerals, navigation, fisheries, etc.) from a national perspective. How will these different needs (not regions/sites) be prioritized and translated into an operational sequence (considering Security vs Minerals vs Navigation vs Fish etc.)?

14 Name: Eric Fischer Date: 9/23/2020

Organization: Oceanering

NOMEAC/ACMS/Both: Both Goal#:

Comments:

I am really enjoying this webinar and have a few questions:

Will NOAA be looking to additional industry contractors to meet the mapping goals for the National Mapping Plan? If so would those work through IDIQ type contracting vehicles?

Will NOAA be integrating bathymetry data collected from BOEM permitted survey activities to add to this? With the increase in surveys for Offshore Wind farms on the US Atlantic coast, and potentially Pacific as well, this could be a large addition to the data set.

With new offshore wind farm development, is NOAA and NGS looking to have operators required to install some CO-OPS and CORS stations on offshore structures to provide additional coverage out to 60m water depths? These can also be used to increase accuracy of weather reporting (GPS Meteorology), provide a network of improved positioning for hydrographic and geophysical surveys (Network RTK), and to monitor any seafloor movement of structures over time.

How do any NMFS permitting requirements affect national mapping plans? This may impact the ability of opportunistic mapping (from UNOLS vessels in transit for example).

Comment, Sept 24, 2020: Would NOAA consider leading a Joint Chiefs of Staff type organization? With leaders from NOAA OCS, NGS, USGS, BOEM, USCG, Navy, etc to share information, data, funding and priorities. With each organization still maintaining its own operations, public/private and academic relationships.

15 Name: Vicki Ferrini Date: 9/23/2020

Organization: Lamont Doherty / SEABED 2030

NOMECA/ACMS/Both: Both Goal#:

Comments: The federal investment in mapping technology for the US Academic Research Fleet, coupled with investments in developing a coordinated approach for best practices, calibration and operations (MAC, <http://mac.unols.org>), a fleet-wide solution for data management (R2R, <http://www.rvdata.us>), and data synthesis efforts (GMRT, <https://www.gmrt.org>), have resulted in the creation of high quality bathymetry data for vast areas of the global ocean. These data are the bulk of publicly available data in the NOAA/NCEI multibeam archive and contribute significantly to the Gap Analysis. These investments have positioned the academic community well for contributing to the goals of mapping and characterizing the US EEZ - particularly in deep water.

Increasing coordination will ensure that we leverage assets, experience, knowledge and technical solutions that can help us accelerate toward mapping and characterizing the US EEZ. The GMRT (Global Multi-Resolution Topography) is a global data synthesis, an architecture for storing and managing data, an infrastructure for data access, and an approach for QA/QC of data. Recognizing the need to accelerate toward the goal of global ocean mapping, we are currently working to adapt our tools and workflows so we can increase the rate of data ingestion and product creation. We anticipate that these tools can be used by other mapping specialists and hopefully can be integrated into training programs to engage students in the process of creating data products for deep water environments. These tools offer a common solution for (1) baseline gridding, visualizing and assessing data to ensure that data acquired, even during transits, meet data quality standards based on existing high quality data, (2) accelerating the rate of data integration into a publicly available bathymetry data compilation while (3) minimizing the need for reprocessing and versioning of processed swath data files made available through the NOAA/NCEI archive.

16 Name: Rada Khadjinova Date: 9/24/2020

Organization: Fugro USA, Inc., Area Manager-Alaska

NOMEAC/ACMS/Both: ACMS

Goal#:

Comments: In response to the “notice for open public meeting, and request for public comments,” related to NOAA’s Hydrographic Services Review Panel published in the Federal Register, I am pleased to provide the following comment related to Strategy to Map the Coast of Alaska. Fugro has been performing project work in Alaska since the 1970s. We know firsthand the geospatial data deficiencies that exist in the state, particularly on the coast where activities of public, commercial, recreational, and indigenous users intersect. That’s why Fugro has advocated for the creation of an Alaska coastal mapping program for the last eight years. We are encouraged to see progress on this issue since the release of the November 2019 Presidential Memorandum and appreciate the HSRP’s work feeding into the Alaska Coastal Mapping strategy and its future implementation.

The current focus of the Alaska Coastal Mapping Strategy is on those areas that can be mapped with airborne and satellite remote sensing technologies. This is a sensible first step. In areas where airborne and satellite methods prove unfeasible due to water clarity, shallow-water acoustic bathymetry techniques will need to be used. This work, which mirrors NOAA OCS hydrographic surveys, could amount to two-thirds of the state by current predictions.

Since the Alaska Coastal Mapping Strategy does not yet account for these areas, which fall under the purview of the National Strategy for Mapping, Exploring, and Characterizing the US EEZ, the effort may be managed through two separate coastal mapping programs. From our experience in the US and abroad, this approach is inefficient. Moreover, because water clarity changes spatially and temporally, it is difficult to predict in advance with (with a high degree of certainty) when and where airborne and remote sensing methods will work.

That’s why we believe a highly integrated and flexible approach that combines airborne and satellite remote sensing with shallow water acoustic bathymetry will prove more efficient and cost effective than two separately executed and managed strategies. The Alaska Coastal Mapping strategy also calls for collaboration and coordination with the private sector and leveraging partnerships to ensure program success. Of particular importance is the incorporation of new technologies to achieve acquisition efficiencies.

The private sector, including Fugro, is already mapping coastal areas of other states. Fugro is also developing and using new, cutting-edge technologies in the realm of communication, sensors, platforms, and data processing to support these activities. To fully leverage the resources, expertise, innovation and partnership potential that is available through the private sector, there must be clear, meaningful, and transparent mechanisms for engagement and collaboration during the remaining development of future implementation of the Alaska Coastal Mapping Strategy. The private sector appreciates having a larger role beyond providing comments.

17 Name: Alice Doyle

Date: 9/24/2020

Organization: UNOLS Deputy Executive Secretary

NOMEAC/ACMS/Both: Both

Goal#:

Comments: The federal agencies have invested significant funding to the US Academic Research Fleet's (ARF) deep water mapping capabilities making them exceeding capable platforms. They are managed within a proven framework that optimizes multi-agency collaboration for everything from vessel scheduling to instrumentation and data management to technical support. As Vicki Ferrini mentioned yesterday, successful data-focused ARF programs like Rolling Deck to Repository (R2R) and the Multibeam Advisory Committee (MAC) have proven the fleet-approach can greatly improve the quality and accessibility of the data. Due to these programs and capabilities, the ARF vessels have collected the majority of the publicly accessible multibeam data that currently reside in the NOAA/NCEI archive.

As Larry Mayer mentioned yesterday, the coordination of the NOMECE initiative is an intimidating task. UNOLS and the ARF look forward to working closely with NOAA to find synergies, with both the data quality/management aspects and the mapping/characterizing aspects, to leverage the ARF's expertise to assist in this initiative."

18 Name: Kyle Goodrich Date: 9/24/2020

Organization: President & Founder TCarta Marine LLC

NOMECE/ACMS/Both: Both, other

Goal#:

Comments: TCarta Marine is a 15-person small business based in Denver, CO specializing in marine remote sensing and Satellite Derived Bathymetry, awardees of a Phase 2 National Science Foundation SBIR grant; we are seen as global innovators in the field. We are a WOSB, HUBZone certified and on several US Gov IDIQ geoservices contracts as a subcontractor, yet still we face an utter struggle working with the US government.

In order to work with the agencies on the contractual side, we have had to work as a subcontractor to a Prime. This then prevents direct and efficient communication and specification discussion between TCarta and the US government. All the while time, technology and payroll march on. TCarta has had an easier time working with the British and other international governments, not due to contractual vehicles but due to the U.S government's non-pragmatic approach when it comes to utilization of our satellite based remote sensing product, often relegating it to a research product or at the bottom of the priority pile.

TCarta has invested considerably in technology development, business relationships with vital imagery suppliers and countless hours forging into the US federal government with nascent technologies as a small business over the past 5 years. We have made inroads and gained technical approval at NOAA, NGA, and US Navy and on many levels we see and hear of a tremendous need and interest in utilizing our capabilities. Yet, in each case, we encounter obstacles that take months, even years to overcome, including lack of access to these entities, government SMEs who will not engage with TCarta, and pointing to other agencies as the true technical gatekeepers of this technology.

Each of the Federal agencies with hydrography in their remit, NOAA, NGA, USACE and US Navy, have all evaluated our data, requested proposals, run pilot projects, received countless technical briefings, yet will not make a pragmatic decision to use industry to produce these data and seem to maintain a "developed-only-by-the government" approach, contrary to all things we hear at conferences and committee meetings TCarta attends. From TCarta's experience, this message of partnering with small business and fostering industry partnership is stated at the high level but not evidenced on the ground level.

Since 2018, the NSF has awarded TCarta nearly \$1M in grant funding to pursue these hydrographic technologies; international governments and hydrographic organizations have taken up the resulting products, all while we wait for the various US agencies to evaluate our data and work through legacy in-house government technology or perspectives. Commercial, high resolution satellite imagery providers, which are vital for the success of this technology, will not continue to support Satellite Derived Bathymetry if the US government continues to drag its feet in how - or if - they will use it beyond an esoteric research topic.

TCarta has developed technologies, workflows and experience required to do the work. We can contribute to the national bathymetric surveying effort and complete vast areas of essential coverage. There is no Covid in space, satellites are still operating and TCarta can contribute significantly to the national bathymetry mapping effort while other technologies are idled. I am sitting here in front of the first use of SDB on a NOAA nautical chart, published in 2012. This map has been a target, an ambition for TCarta - to be a supplier for NOAA. This map is evidence that the POC was established by NOAA years ago to use SDB, and this should have paved the way for establishing protocols for commercial providers. Technology has evolved by orders of magnitude since 2012, yet NOAA's acceptance and implementation of this technology from commercial providers has not progressed.

In order to foster small business relationships, government must work faster to meet both the pace of technology development and the operational cadence of small business which, by their nature, must be nimble and quick to solutions and end product delivery. Small business and emerging marine technologies: this is the place where pragmatic, fit-for-purpose solutions are designed and engineered. Government research should be focused on how to work with these solutions, not prevent them through indecision and inaction.

19 Name: Geoff Douglass; John Houston Date: 9/24/2020
Organization: Founder & CEO, Mythos-AI; Founder & CTO
NOMECA/ACMS/Both: Both, other Goal#:
Comments: The founders of Mythos AI have managed autonomous surface vehicle (ASV) programs and the self-driving car autonomy development for Uber, Lyft, and Argo-AI (Ford and Volkswagen). Mythos AI's developers apply state-of-the-art self-driving car technologies to create robust, scalable autonomous solutions for the maritime sector. At Mythos AI we are developing a next generation autonomy framework we believe will revolutionize the hydrographic industry by enabling the adoption of advanced machine learning and true automation in the sector.

Our ambition is to create the first autonomy framework vertically integrated from the ground up focusing on hydrography and coastal survey. We have confidence our technology will solve many of the challenges associated with hydrographic workflow. Our plan is to use this technology to gather and provide data more efficiently than current technologies allow. Given this business model the government is one of our largest customers. As a tech start up we find it difficult to obtain and leverage government funding in the hydrographic technologies and services space. The contracting process is burdensome and can span over several months. We could partner with research institutions, but may have to share some of our IP. It would be very helpful for tech startups developing enabling technologies in this space, to have efficient access to funding.

20 Name: Jessica Podoski Date: 9/24/2020
Organization: USACE Honolulu District

NOMEAC/ACMS/Both: Other

Goal#:

Comments: Aloha! Jessica Podoski from USACE Honolulu District. I would like to bring the panel's attention to a specific data collection need in the US territory of American Samoa. Bathymetry data has recently been collected in other US territories of Guam/CNMI, but not American Samoa. This is a need for many reasons one of which is that subsidence of the islands is causing extreme Sea Level Rise and continued coastal inundation. Bathymetry data (LiDAR) would work well (clear water) here, and data would help to evaluate SLR vulnerability. It is a heavy lift logistics/cost wise, but perhaps there is an opportunity for USACE and NOAA to collaborate on cost/implementation. Thank you

21 Name:

Capt. Jorge Viso

Date: 9/25/2020

Organization:

President, American Pilots' Association

NOMEAC/ACMS/Both: Both

Goal#:

Comments: On behalf of the American Pilots' Association (APA), I am pleased to submit these comments in response to the NOAA's call for input on the following topics: (1) NOMEAC or "Establishing a National Strategy for Mapping, Exploring, and Characterizing the U.S. Exclusive Economic Zone, June 2020"; and (2) ACMS or "A Strategy for Mapping the Arctic and Sub-Arctic Shoreline and Near shore of Alaska, June 2020."

APA has been the national association of the piloting profession since 1884. Virtually all of the more than 1,200 state-licensed pilots working in the 24 coastal states, as well as all of the U.S. registered pilots operating in the Great Lakes system under authorization by the Coast Guard, belong to APA member pilot groups. These pilots handle well over 90 percent of large ocean-going vessels moving in international trade in the waterways of the United States. The role and official responsibility of these pilots is to protect the safety of navigation and the marine environment in the waters for which they are licensed. As a result, APA and our member pilots take a keen interest in many National Ocean Service (NOS) and Office of Coast Survey (OCS) products and services and has advocated that Congress ensure these products and services are adequately authorized and funded.

While we recognize the benefits NOMEAC and ACMS can provide and can support NOAA's efforts in these areas, our principal concern is that NOMEAC and ACMS not detract – in either focus or funding – from other important NOAA support and assist marine pilots in their vital work. Pilots rely upon and strongly support NOAA programs that provide surveys, charting and real-time data that help pilots ensure the safe, environmentally responsible and efficient transport of maritime commerce in U.S. waters. For example, OCS conducts hydrographic surveys and maintains nautical charts, including Electronic Navigational Charts (ENC), covering 95,000 miles of shoreline of U.S. coasts and the Great Lakes. In order to carry out their duties, pilots use the most modern maritime navigation technology, including their carry aboard Portable Pilot Units (PPU), and rely heavily on port and near coastal surveys and ENCs. In addition, NOS's Physical Oceanographic Real-Time System (PORTS) provides trusted inputs to PPUs on port-specific hydrographic and meteorological conditions and is therefore critically important to pilots around the country. Regardless of any new or emerging mission area, NOAA must ensure that these products and services are appropriately prioritized and budgeted.

Again, APA supports NOAA exploring strategies to better survey and map areas of the U.S. EEZ and arctic and subarctic waters, but only to the extent these priorities do not divert attention and badly needed funding away from other, more traditional products and services that directly support navigation and pilotage in ports, harbors and approaches around the U.S. If these two strategies are to be pursued, they should be adequately funded beyond the current NOAA, NOS and OCS budgets.

APA appreciates the opportunity to offer constructive comments on NOMECS and ACMS, and most importantly on NOAA's important products and services that assist APA and our member pilot groups in providing safe, efficient, modern and reliable pilotage services.
