

Written testimony of

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“Charting the Unknown: America’s Arctic Seafloor”

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Good morning Chairwoman Bordallo, Ranking Member Brown, and Members of the Subcommittee. Thank you for inviting me to speak about H.R. 2864, a bill to amend the Hydrographic Services Improvement Act of 1998 by authorizing funds to enhance NOAA’s hydrographic efforts in the Arctic.

My name is John Farrell, and I am the Executive Director of the U.S. Arctic Research Commission (USARC), an independent advisory body to the Executive Branch and Congress. I testify today on behalf of Commission Chairman Mead Treadwell and the six other presidentially appointed Commissioners.

As the Executive Director of the Commission, my principle duty is to work with the Commissioners to develop and recommend an integrated national Arctic research policy. I also assist the Interagency Arctic Research and Policy Committee (IARPC), created by the Arctic Research and Policy Act (ARPA) of 1984, in establishing a national Arctic research program plan to implement the policy.

On a more personal note, the subject of this bill, seafloor mapping, is of particular interest and importance, because I am a marine geologist who helped plan and execute the first major international scientific ocean drilling expedition in the high Arctic in 2004, near where the Russians planted a flag on the sea floor, three years later. Our expedition, conducted under the auspices of the international Integrated Ocean Drilling Program, revealed the 60-million-year geological history of the Arctic Ocean basin, since the time of the dinosaurs, which would have been impossible without seafloor maps.

The Commission fully supports the intent of H.R. 2864 because charting the Arctic Ocean floor is the first step for much of the science we must do. This mission fits our mission. In addition, the Commission has three other compelling reasons to support

mapping in America's Arctic, both onshore and off. First, it protects the economy, by improving the safety and reliability of marine transportation and international trade. Second, it protects U.S. strategic and sovereign interests. Third, it helps to identify and protect natural resources and the environment.

Before expanding upon the USARC's support for this bill, I will respond directly to the four questions posed by Chairwoman Bordallo in her letter of invitation to testify.

Four questions from the Subcommittee

First, is it *“necessary for the Congress to amend the Hydrographic Services Improvement Act to specifically authorize NOAA to gather hydrographic data and provide hydrographic services in the Arctic?”*

My understanding is that it's not necessary to amend the Act, but the importance of this bill is rooted in its goal, which is to bring attention to an underserved area, America's Arctic Ocean and surrounding seas. This region is becoming increasingly accessible due to changes in climate, technology, and the demand for resources. By speaking on this issue, Congress sets a priority. For some time now, the Commission has urged better mapping, onshore and off, but the Executive Branch-through several administrations-has often let this priority lag behind.

Second, *“What operational challenges and costs [might] NOAA expect to encounter for Arctic survey work compared to other regions of the country?”*

My colleague from the NOAA Office of Coast Survey, Capt. John Lowell, is best positioned to address this question. Nevertheless, my response is that it's a significant and costly challenge to collect hydrographic data in the Arctic, which is probably among the most remote, and difficult of NOAA's operating areas, if not the most. During much of the year, Arctic waters are ice covered or ice infested, requiring the use of special vessels, such as icebreakers, which are expensive to build, operate, and maintain.

An underlying concern, in this regard, is that our nation's icebreaker fleet, operated by the U.S. Coast Guard (USCG), and used by NOAA to map the Arctic seafloor, needs new vessels, as has been called for by many, including the Commission, and by three other representative stakeholder groups: (1) the National Academy of Sciences (The 2006 National Research Council's study “Polar Icebreakers in a Changing World: An Assessment of U.S. Needs,” http://www.nap.edu/catalog.php?recrod_id=11753); (2) the Governor of Alaska (March 18, 2008 letter from Governor Palin to President Bush and testimony of Governor Parnell before a U.S. Senate Appropriations Subcommittee on Homeland Security, August 20, 2009); and (3) the Department of Defense, specifically the “12 star” memo to the Chairman of the Joint Chiefs of Staff from the Commanders of the U.S. Pacific Command (Timothy Keating, Admiral, USN), the U.S. Transportation Command (Norton Schwartz, General, USAF), and the U.S. Northern Command (Victor Renuart, General, USAF). All but Governor Parnell's testimony are available on the

Commission's website (<http://www.arctic.gov/testimony/treadwell-07-16-08.pdf>).

Third, “*How this mission might complement ongoing or planned research conducted through the Commission and other governmental and non-governmental organizations?*”

The Commission publishes a biennial report to the President and to Congress and our 2009-2010 report which is available online (http://www.arctic.gov/publications/usarc_goals_2010.pdf). In this report, and in response to this question, the Commission has either recommended or supported scientific research, in the following areas, that are complementary to NOAA's hydrographic mission.

- a. Mapping offshore, undersea lands as integral to our nation's efforts to delimit our sovereign territory. This project (www.continentalshelf.gov) is being conducted by the U.S. Extended Continental Shelf Task Force, an interagency body that is chaired by the Department of State (DOS), with co-vice chairs from NOAA and the Department of the Interior (DOI). The U.S. must successfully complete this effort in a timely manner, as we have potential negotiations with Russia and Canada in this regard.
- b. Addressing the recommendations in the *Arctic Marine Shipping Assessment* (AMSA, www.arctic.gov/publications/AMSA_2009_Report_2nd_print.pdf), a report co-authored by the Commission's former Deputy Director, Captain Lawson Brigham (USCG retired), and approved by the eight-nation Arctic Council in 2009. The 17 recommendations are in three categories: (1) enhancing Arctic marine safety; (2) protecting Arctic people and the environment; and (3) building the Arctic marine infrastructure.
- c. Supporting the interagency Committee on the Marine Transportation System (CMTS) that has made coordinated improvements to Arctic marine navigation a priority in its *National Strategy for the Marine Transportation System: A Framework for Action* (July 2008). CMTS recognizes that supporting environmentally safe and sound maritime commerce in U.S. Arctic waters will require enhancements to existing infrastructure, services and technologies, such as short-and long-range aids to navigation, charts, ice warnings, and other oceanographic, meteorological and sea ice information. Recently, the CMTS, which is chaired by the Secretary of Transportation, created a subcommittee, the U.S. Arctic Marine Transportation Integrated Action Team, to facilitate cross-Federal agency coordination to strengthen the marine transportation system in the U.S. Arctic region, in the areas of safety, security, reliability, economic and environmental sustainability of the system.
- d. Supporting the release of declassified bathymetric data collected by the U.S. Navy. In 1997, 2003, 2006, and 2010 the USARC requested and received approval from the Navy's Chief of Naval Operations to declassify and release bathymetry data collected in the Arctic Ocean by U.S. Navy and U.K. nuclear

submarines during “ice exercise” and “scientific ice exercise” cruises conducted over the past 50 years. These data, consisting of over 250,000 discrete points, have been instrumental in creating and refining the first accurate International Bathymetric Chart of the Arctic Ocean (<http://www.ngdc.noaa.gov/mgg/bathymetry/arctic/>). The broader science community has also used the information in many other important analyses, advancing our heretofore-limited understanding of this remote region.

- e. Inviting other nations, with similar interests, to help. In this regard, Japan’s icebreaker, the new *Shirase II*, has bathymetric mapping capabilities. Similarly, other nations sailing in this region including China, Korea, Russia, Sweden, and Canada, have additional means. Bathymetric data collected by these vessels can be contributed towards improving the International Bathymetric Chart of the Arctic Ocean.

Fourth, *“How this legislation might fit within the broader development of Federal integrated ocean and coastal mapping and observation programs.”*

In addition to the aforementioned federal and observational programs, this legislation is a critical component of state and federal programs to enhance climate change adaptation and community resilience, to revise ocean policy, and to coordinate Arctic research.

The Alaska Governor’s Climate Change Sub-Cabinet (<http://climatechange.alaska.gov/>) was formed in 2007 to advise the Governor on preparing for and implementing an Alaska climate change strategy to adapt to warming and to realistically mitigate the causes of climate change. Hydrographic surveying is an integral component of the near-shore and coastal resource management efforts. The protective seawalls (revetments) in Kivalina, Shismaref, and Unalakleet, Alaska cost the Army Corps of Engineers up to \$27,500 per linear foot to build, adding up to millions of dollars to protect these remote villages. Surveys of the near-shore environments, to better understand sediment transport and coastal erosion, will improve the planning and construction of such adaptive structures.

The Obama Administration is considering a new national ocean policy, which includes the concept of marine spatial planning, that will be predicated on baseline hydrographic survey data. The administration has also stood up an Interagency Climate Change Adaptation Task Force, which is developing a national strategy on climate change adaptation. The federal components that support this strategy include climate science and global change research, a national assessment, and specific federal programs, such as the proposed NOAA Climate Service and the DOI’s network of regional Climate Science Centers and Landscape Conservation Cooperatives.

Finally, and specific to the Arctic, this legislation is linked to the efforts of the Interagency Arctic Research and Policy Committee (IARPC). The ARPA created IARPC, which consults with the USARC. IARPC, which includes representatives from the 14 federal agencies that conduct Arctic scientific research, is best poised to help coordinate federal Arctic research initiatives with the NOAA hydrographic mission. Such

coordination might include review of a budget crosscut on this particular initiative, or a report on international oceanographic and hydrographic efforts in the Arctic, and connections to our nation's domestic program.

The Arctic Ocean: *mare incognitum*

The Arctic Ocean is the least understood of all the oceans on Earth. This isolated, far-north, ice-covered body of water, in the cold and often dark, has, until recently, existed as a virtual *mare incognitum*. My colleague, Dr. Larry Mayer, claims that only 6% of the Arctic Ocean seafloor has been mapped to modern standards. As the Director of the Center for Coastal Ocean Mapping, a center of excellence at the University of New Hampshire, he knows what he's talking about. As one of our nation's leading marine scientists, he's been instrumental in our nation's efforts to collection hydrographic and bathymetric data, and as Chief Scientist, he's personally led all of our country's Arctic Ocean mapping expeditions since 2003.

NASA provides us with better maps of the Moon, and now maybe even Mars, than we have of the Arctic Ocean. We must do better in our own sovereign waters.

Recent Arctic Ocean mapping efforts in 2003 and in 2007 revealed large underwater mountains, called "seamounts," in locations where previous charts indicated uniformly deep water. Such features may be hazardous. You may recall the U.S. Navy submarine *USS San Francisco*, which tragically hit an unmapped seamount in 2005, while cruising the Pacific, near Guam, resulting in the loss of a life, and injuries to many.

In addition to identifying seamounts, Arctic Ocean mapping provides critically important information about other subjects, such as fundamental aspects of ocean basin structure and morphology, plate tectonics, geological history, potential for oil and gas resources, and even habitats for fish stocks, which is also of importance to NOAA.

Maps also serve as the basis upon which the U.S. will delineate our offshore lands, referred to as our "extended continental shelf." Should the U.S. accede to the United Nations Convention on the Law of the Sea, as recommended by the Commission and many others, estimates, by Dr. Mayer, suggest that the U.S. stands to gain sovereign rights over seafloor resources in the Arctic Ocean in an area at least the size of California.

Closer to shore, mapping in shallow waters would obviously help improve vessel transportation, but would also be critically important to three other initiatives.

First, is an effort to bring high speed internet to rural Alaska, and to use Arctic subsea routes to connect the continents of Asia, North America and Europe by fiber optic cable. Second, is hydrographic surveying as part of a study to assess the feasibility and potential of establishing a deepwater sea port in the Arctic to protect and advance strategic U.S. interests, the subject of outstanding bills in both the Senate and the House. Third is a

scientific effort to better understand how sea ice, and land-fast ice scour the near-shore environments, which has significant implications for installing civil infrastructure.

With regard to the, first, the broadband effort, the American Recovery and Reinvestment Act (ARRA) provided \$7.2 billion and directed The Department of Agriculture's Rural Utilities Service and The Department of Commerce's National Telecommunications Information Administration to expand broadband access to unserved and underserved communities in the U.S., such as rural Alaska, and to increase jobs, spur investments in technology and infrastructure, and provide long-term economic benefits.

Some have proposed laying fiber optic cable in the waters around Alaska and to bring connections ashore to rural communities. Commercial entities will also benefit. For example, the Kodiak-Kenai Cable Company recently announced plans to finance, design, and build a 10,000-mile long undersea fiber optic cable connecting Asia and Europe through the Arctic. Detailed hydrographic data will be needed to identify the best locations to lay the cables, and at water depths sufficiently deep, to avoid destructive scouring by sea ice and land-fast ice. The data will also be used to locate the best places for landing station sites, where the cables would come aground.

With regard to the third initiative, near-shore marine processes, there are few hydrographic data to link observations of ice motion and deformation with impacts on the seabed. Barrow, Alaska provides an excellent example. The seafloor off Barrow is extensively gouged by ice. Although ice scour recurrence rates are well known in several areas of the Arctic Ocean coastal zone, the ages of the gouges offshore Barrow are not known. Some may be ancient, relict gouges, from deep draft icebergs during the last ice age, or from sea ice action during times of lower sea level. Hydrographic survey data, combined with results from sediment-penetrating sonar system (e.g., a “chirp” system), will enable scientists to distinguish old gouges from the effects of recent sea ice action and from land-fast ice. This information will do two things. First, it will help in the design and installation of structures (pipelines, cabled seafloor observatories, communication cables) and moorings. Second, it will help the local community understand the process by which beach sand is being eroded and transported along shore and to deeper waters. Complementary datasets on sea ice movement, from a shore-based radar system, would also be used to better understand the near-shore and seabed processes. This information is important as the nation conducts oil and gas leasing offshore, and-as other in the North, include those developing oil in Newfoundland have found-pipelines must be designed to be impervious to scour from pack ice or icebergs.

“The Earth is Faster Now”

The Arctic Ocean is changing rapidly, more so than any other ocean on Earth. The rise in Arctic surface air temperatures has been nearly twice as large as the global average in recent decades. Indigenous observations of Arctic environmental change (as documented in, *“The Earth is Faster Now,”* a book edited by Igor Krupnik and Dyanna Jolly, and published by ARCUS in 2002), and scientific observations document unusual weather

patterns, a warmer climate, diminishing sea ice, changes in ocean currents and circulation, coastal erosion, and concomitant modifications in marine ecosystems, as evidenced by migrations of fish stocks, marine mammal haul outs, and other indicators.

These rapidly changing environments impact the depth and physical characteristics of waters and the marginal land, underscoring the importance of NOAA's efforts to collect hydrographic data and to provide hydrographic services.

Arctic shipping is happening now

Hydrographic mapping is important to the economy because 90% of non-bulk cargo worldwide moves by containers on transport ships. Arctic shipping is not a future activity. It's happening now. This is clearly demonstrated in the aforementioned *Arctic Marine Shipping Assessment*.

Results from an AMSA survey of Arctic shipping indicate that most vessel traffic is to specific destinations, into and out of the Arctic, rather than "trans-Arctic." If the Aleutian Island chain is included in the definition of the Arctic, as it is in U.S. law (U.S. Arctic Research and Policy Act of 1984, as amended), then approximately 6,000 individual vessels were reported operating in the Arctic in 2004, including many that passed through the Aleutians on the Great Circle Route between Asia and North America. When the circle route ships are excluded, the remaining vessel activities in the Arctic were primarily community re-supply, bulk cargo, tourism, and fishing operations. Less comprehensive surveys, and anecdotal evidence, suggests that vessel activity has continued to increase since 2004.

At last week's conference "U.S. Strategic Interests in the High North," at the Center for Strategic and International Studies, Mr. Stephen Carmel, Senior Vice President of Maritime Services for Maersk Line, said that a major obstacle to increased trans-Arctic marine shipping is the navigational challenge, which he described as "very difficult." He referred specifically to the extreme paucity of hydrographic, bathymetric and cartographic data, which he described as "sadly lacking" as well as inadequate charts and aids to navigation.

U.S. Arctic Policy calls for safe, secure and reliable shipping

President Bush released Arctic region policy on January 9, 2009 (National Security Presidential Directive/NSPD-66 and Homeland Security Presidential Directive/HSPD-25). The Obama Administration has reaffirmed this policy, which is currently being implemented by an Arctic Region Interagency Policy Committee chaired by the White House National Security Council. With respect to maritime transportation, this policy says that the U.S. priorities in the Arctic region are "to facilitate, safe, secure, and reliable navigation; to protect maritime commerce; and to protect the environment." The link between this policy and bill H.R. 2864, is clear; hydrographic data collection and service

provision by NOAA are central to fulfilling these U.S. priorities. For example, hydrographic and bathymetric data enable better definition and delimitation of shipping lanes for military and civilian use.

Why else do we need seafloor maps?

In addition to the aforementioned, the Commission submits the following reasons:

- a. For traditional indigenous use, such as to improve navigation for transportation and for subsistence hunting and fishing;
- b. For military navigational use, such as submarine transits in the shallow Bering Strait region. The Navy will be mapping in the Bering Sea this summer;
- c. To aid in discussions with Canada, over an unresolved maritime boundary that could result in an area the size of New Jersey;
- d. To delineate any changes in the federal-state maritime boundary, three nautical miles offshore, which have important revenue implications;
- e. To help provide baseline data for ecosystem science, such as fish habitat research;
- f. To improve ship safety, and to reduce shipping risks and hazards;
- g. To support international scientific collaboration, such as with Japan, which may choose to deploy their new icebreaker AGB-5003 *Shirase* (II) in the Arctic, where, among other activities, the vessel can use its multibeam system to collect bathymetric data contributing to charting and navigation efforts;
- h. To complement the onshore mapping efforts of the Statewide Digital Mapping Initiative (<http://www.alaskamapped.org/>);
- i. To learn more about offshore gas hydrate (frozen natural gas) deposits;
- j. To complement NOAA-sponsored efforts at the University of Alaska Fairbanks to evaluate, from an expense and engineering perspective, seafloor and subseafloor mapping instruments that could be installed on a U.S. Navy submarines.
- k. To learn more about submerged archaeological sites and the more than 1,100 ships that have wrecked off the coast of Alaska since the days of New England whaling. An initial effort to scientifically survey the Alaska shipwrecks, the 1998 “Jeremy Project,” was supported by the Minerals Management Service, NOAA, and the National Park Service, and was conducted off the USCG’s *Polar Sea*. Unfortunately, because the side-scan sonar, contributed by the U.S. Navy, did not properly function, maps of the seafloor could not be made. A return expedition is needed, using a vessel that can successfully complete the mapping mission.

In summary, the Commission strongly supports the intent of H.R. 2864 that calls for enhanced mapping of the Arctic seafloor. If properly supported, NOAA, with assistance from the USCG, is capable, and well positioned to collect Arctic hydrographic data and to provide associated hydrographic services.

Thank you again for considering the Commission’s views on this bill.