Appendices

Final Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition

National Oceanic and Atmospheric Administration

National Ocean Service

November 2022

APPENDIX A: SUMMARY OF NOS PROGRAM OFFICES AND THEIR USE OF ACTIVE ACOUSTIC DATA COLLECTION TECHNOLOGY

Office of Coast Survey

The Office of Coast Survey carries out NOAA's surveying and charting responsibility pursuant to the Coast and Geodetic Survey Act of 1947 and the Ocean and Coastal Mapping Integration Act of 2009. The Office of Coast Survey's area of responsibility includes United States (U.S.) waters extending seaward to the limits of the U.S. Exclusive Economic Zone (U.S. EEZ) – well over 3 million square nautical miles (nm^2) of U.S. waters. The program collects hydrographic data and creates and maintains marine charts and other products to support safe navigation for commercial shipping, the fishing industry, recreational boaters, and state and local governments. Hydrographic data are collected with Office of Coast Survey vessels, NOAA Office of Marine and Aviation Operations (OMAO) vessels, chartered (contracted) vessels, and opportunistically from other government, academic, and industry mapping efforts. The data and data products also support military and government operations. NOAA has identified 500,000 nm^2 within the U.S. EEZ as "navigationally significant waters," which are areas in greater need of modern hydrographic surveying. The Coast Survey Development Laboratory (CSDL) explores, develops, and transitions emerging technologies and techniques for charting, hydrographic, and oceanographic systems to support safe and efficient marine navigation and a healthy and sustainable coastal environment. The Joint Hydrographic Center, with its University of New Hampshire academic partner, conducts applied research and development on hydrographic and ocean mapping topics.

The Office of Coast Survey acquires hydrographic data to update the nation's nautical charts with the accuracy essential to maintain the public trust in navigational products. The public may access survey data at NOAA's National Centers for Environmental Information (NCEI), formerly the National Geophysical Data Center, and nautical charts are available from a variety of sources, including Coast Survey's website. Office of Coast Survey activities include surveying navigationally significant areas annually using four OMAO ships (all of which are equipped with survey boats or "launches"), six navigation response team (NRT) survey boats, a 54-foot research vessel, and chartered vessels operated by private contractors.

The Office of Coast Survey contracts approximately half of its hydrographic survey projects. Contractors often use the same vessels from year to year, regardless of whether the vessels are chartered (i.e., "vessels of opportunity") or owned by the contract firm. During transits, contractors operate under all of the normal regulations for vessels in the area, using shipping lanes, recommended routes, and natural channels as appropriate. Currently, the Coast Survey Development Laboratory is evaluating the use of Autonomous Underwater Vehicles (AUVs) and uncrewed surface vehicles (USVs) as tools for hydrographic surveying. The use of AUVs and USVs could greatly increase survey efficiency. Additionally, AUVs could be used for marine incident response and port security surveys due to their small size and flexible deployment options. The Office of Coast Survey funds hydrographic and ocean mapping research at the Joint Hydrographic Center via cooperative agreement.

Center for Operational Oceanographic Products and Services

The Center for Operational Oceanographic Products and Services (CO-OPS) and its predecessors have gathered oceanographic data along our nation's coasts for over 200 years. CO-OPS is the authoritative source for accurate, reliable, and timely measurements that support safe and efficient maritime commerce, sound coastal management, and recreation. CO-OPS maintains over 200 continuously operating water level stations throughout the U.S. and its territories, data from which support water level forecasts and real time observations, determination of water level based datums, and monitoring of long term trends in mean sea level (msl). The National Water Level Observation Network (NWLON) provides historical and present-day water level information to understand the patterns of water level trends and

high tide events. The entire collection of water level data forms the basis of many NOAA products and services that have evolved to support both national and local needs. CO-OPS also developed and maintains the Physical Oceanographic Real-Time System (PORTS®), a tool that integrates real-time environmental observations, forecasts, and other geospatial information from measurements of water levels, currents, salinity, and meteorological parameters (e.g., winds, atmospheric pressure, air and water temperatures). CO-OPS disseminates observations and predictions derived from these data to improve the safety and efficiency of maritime commerce and coastal resource management. The Ocean Systems Test and Evaluation Program (OSTEP) lab explores, develops, and transitions emerging technologies and techniques for collecting tidal and current data and oceanographic systems to support safe and efficient marine navigation and a healthy and sustainable coastal environment.

CO-OPS' water level stations and PORTS Program use hydroacoustic tools associated with their tidal gauges and water level stations. A number of water level stations and current survey applications require implementation of an Acoustic Doppler Current Profiler (ADCP) along with an acoustic water level sensor that operates above the water.

For maritime navigation in harbors and coastal waterways, real-time water level information reduces risks to life, property, and the coastal environment. Real-time water level data from a nearby gauge provides mariners with the tide levels to inform decision-making to avoid groundings. This information is collected through ADCPs in the form of side-lookers, bottom-lookers, or bottom mounted devices, depending on the specific PORTS station requirements.

National Centers for Coastal Ocean Science

The National Centers for Coastal Ocean Science (NCCOS) conducts and funds research in support of NOS core priorities. In addition, NCCOS research focuses on four thematic priority areas: 1) coastal change: vulnerability, mitigation, and restoration; 2) marine spatial ecology; 3) stressor impacts and mitigation (e.g., harmful algal blooms) and 4) social science. NCCOS conducts work nationally through its facilities located in Silver Spring, MD; Charleston, SC; Beaufort, NC; Oxford, MD; and Kasitsna Bay, AK and funds external grant recipients nationwide through the Competitive Research Program. The majority of the NCCOS hydroacoustics survey work is conducted through the Biogeography Branch, which develops detailed benthic habitat and fish distribution maps via hydroacoustic or visual methods (e.g., self-contained underwater breathing apparatus (SCUBA) diving, remotely operated vehicle (ROV) surveys, video cameras, etc.). The results of these data are used, among other things, to: (1) identify areas that may be high priorities for management or protection; (2) inform renewable energy infrastructure or aquaculture; and (3) understand the mechanisms that influence the distribution and connectivity of fishery resources.

NCCOS hydroacoustic activities currently involve developing innovative ecosystem maps, models, and assessments to guide communities in managing coastal ecosystems. Multibeam, single/splitbeam and side-scan sonar data are used to develop benthic seafloor habitat or cultural resource maps, as well as maps on the distribution and biomass of fishery resources. NCCOS also uses ROVs, AUVs, drop cameras, and divers to ground truth the benthic habitat maps for accuracy. NCCOS conducts mapping and other survey work nationwide in estuaries, and in marine ecosystems – especially in marine protected areas (MPAs), National Marine Sanctuaries, and coral reefs. Habitat maps enhance the ability of coastal managers and policy makers to assess, protect, and preserve the condition of marine ecosystems and are essential tools for ocean planning and ecosystem management. By providing the baseline data on the ecological condition of reefs and other natural resources, these data can show conservation efficacy over

time. They are most often used by federal and state planners to identify areas in need of enhanced management (e.g., protection of fish spawning areas and deep coral habitats) and facilitate informed decisions and proper placement of offshore energy development and aquaculture, as well as the examination of proposed changes in national marine sanctuary boundaries. Through acoustic sonar technologies, NCCOS has advanced understanding of the connectivity, distribution, abundance, ecology, and ecological condition of marine ecosystems. These ecosystems are often difficult to survey due to their remoteness (i.e., deep-sea habitats).

Office for Coastal Management

The Office of Coastal Management (OCM) is composed of four principal programs: Coastal Zone Management Program, National Estuarine Research Reserve System, Coral Reef Conservation Program (CRCP), and Digital Coast Program. Major components of the Coastal Zone Management Program include federal consistency, nonpoint pollution control, and coastal zone enhancements. Thirty-four states and territories currently participate in the voluntary partnership. OCM provides annual cooperative agreements to these states for diverse projects that manage and enhance coastal areas. There are 29 National Estuarine Research Reserves to which NOAA provides annual funding and technical guidance. Much of the day-to-day management is conducted by states or universities, in coordination with state and local partners. These reserves aim to protect and study important estuaries that, collectively, encompass more than 1.3 million acres. Program goals are purposefully broad and could include use of a wide array of hydroacoustic methods, such as tracking fish habitat utilization. The Coral Reef Conservation Act of 2000 established the CRCP to protect, conserve, and restore the nation's coral reefs. The Program brings together expertise from across NOAA to address impacts from climate change and related ocean acidification, land-based sources of pollution and unsustainable fishing practices. It partners with state and territorial governments, academic institutions, non-governmental organizations (NGOs), and community groups. The Program provides annual funds to support coral conservation projects and scientific studies to address the three primary threats. Finally, NOAA developed Digital Coast to provide coastal data and the tools, training, and other information necessary to make those data useful. Data sets range from economic data to satellite imagery and are designed to be most useful to the coastal management community.

OCM provides funds to coastal states and National Estuarine Research Reserves to conduct site-specific sonar benthic mapping exercises, though this occurs infrequently. OCM also provides funds to other levels of government (state, local, foreign), as well as to academia and non-profits, via grants, cooperative agreements, or contracts.

The CRCP provides funds to other parts of NOAA (e.g., NCCOS, Office of National Marine Sanctuaries [ONMS], and National Marine Fisheries Service [NMFS]), which may engage in hydroacoustic work. These “action offices” conduct any necessary NEPA analyses of those activities. In addition, CRCP develops and implements contracts, MOUs, and grants to federal, foreign, state, and local governments, as well as academia and NGOs.

Some of the projects that have been funded through OCM include:

- Side scan sonar in the Hudson River;
- Acoustic backscatter imagery; and
- Benthic habitat mapping in the Tortugas area of south Florida and other areas as part of the Marine Cadastre for ocean use planning.

Office of National Marine Sanctuaries

ONMS is the federal agency that oversees the fifteen sites in the National Marine Sanctuary System and two Marine National Monuments. Together, these protected areas encompass more than 600,000 square miles of ocean and Great Lake waters. National Marine Sanctuaries have been established via acts of Congress or an administrative process for focused, long-term management. The two Marine National Monuments (Papahānaumokuākea and Rose Atoll) were designated by Presidential proclamation under the Antiquities Act.

Sanctuaries and monuments contain unique resources, including: deep ocean habitats, kelp forests, coral and temperate reefs, whale migration corridors, deep-sea canyons, and historically significant shipwrecks and other underwater archaeological sites. Organizationally, the Sanctuary System is divided into four regions: Northeast and Great Lakes; Southeast Atlantic, Gulf of Mexico, and Caribbean; West Coast; and Pacific Islands. The mission of ONMS is to identify, protect, conserve, and enhance the natural and maritime heritage resources, values, and qualities of the National Marine Sanctuary System for present and future generations. The National Marine Sanctuaries Act (NMSA) is the governing statute for all designated sanctuaries. The act authorizes the U.S. Secretary of Commerce to designate as national marine sanctuaries areas of the marine environment or Great Lakes with special national significance due to their conservation, recreational, ecological, historical, scientific, cultural, archeological, educational, or aesthetic qualities.

Each sanctuary and marine national monument conducts a number of field operations that support management, research, and education objectives. Sanctuary vessel operations include all activities conducted on the water from an ONMS small boat or via an ONMS-sponsored mission. These include, but are not limited to, research, education, outreach, marine or cultural resource and habitat assessments, restoration activities, marine mammal disentanglement, and law enforcement. All ONMS vessels must comply with the operational protocols and procedures in the NOAA Small Boats Policy (NAO 209-125).

Hydroacoustic operations may include the use of AUVs, ROVs, and towed gliders; bathymetric and seafloor habitat mapping; and remote sensing. Underwater sampling platforms such as AUVs, ROVs, and ocean gliders may feature acoustic sensors that can be deployed to monitor whales and their habitat, survey the seafloor for entanglement threats, and monitor water quality and ocean conditions (e.g., detecting hypoxia and ocean acidification).

ONMS vessels may be used to deploy passive acoustic monitoring equipment that is anchored to the sea floor and may also tow or deploy drifting passive acoustic monitoring equipment. Passive acoustic devices are used to study biological and anthropogenic sound and behavior of marine animals. Some equipment and instruments, such as ROVs, hydrophones, and towed camera systems, may be tethered to the ship and towed behind a vessel, or are otherwise operated from a vessel. AUVs are ROVs that are usually launched from the ship with a pre-programmed navigation route and then recovered once the AUV track has been completed. All of the technologies are operated pursuant to valid permits and regulations.

Other acoustic equipment may be deployed using snorkelers or SCUBA divers, or from vessels. Towing missions normally occur monthly to quarterly. Equipment, such as hydrophones or other acoustic receivers, is often deployed within a sanctuary by anchoring it with cable ties, brackets, or clamps to existing infrastructure (e.g., buoys, channel markers), weights, or lengths of rebar that have been installed by SCUBA divers using hammers or pneumatic drills. In some cases, acoustic tags may be attached to fish to monitor movement and to marine mammals for tracking and research pursuant to NMFS, Endangered

Species Act (ESA), and Marine Mammal Protection Act (MMPA) permits. OMAO vessels are used to deploy AUVs, ROVs, towed magnetometers, multibeam echo sounders, and side scan sonars in order to inventory resources and document new maritime heritage sites. Aircraft use lidar in nearshore areas for long-term monitoring and to characterize shallow-water benthic and intertidal habitats.

Diver surveys are sometimes used to supplement normal remote sensing surveys and are particularly helpful in shallow areas of high topographical complexity. Divers working to ground-truth remotely sensed information may be stationary at a single site or towed behind a boat at approximately 3 knots/hour when surveying larger areas of the marine environment.

Office of Response and Restoration

The Office of Response and Restoration (ORR) is a center of expertise in preparing for, evaluating, and responding to threats to coastal environments, including oil and chemical spills, releases from hazardous waste sites, and marine debris. Within ORR, the Emergency Response Division provides scientific expertise for responses to oil and chemical spills in U.S. marine and coastal waters. Its efforts facilitate spill prevention, preparedness, response, and restoration at national and local levels. The Assessment and Restoration Division conducts natural resource damage assessments with the objective of restoring natural resources injured by releases of oil and hazardous substances in marine and coastal waters. The Marine Debris Division (MDD) undertakes national and international efforts focused on researching, reducing, and preventing debris in the marine environment.

ORR hydroacoustic data collection may include the use of various devices such as ADCPs and echo sounders to track and map oil plumes and to characterize fish and plankton presence. ORR's MDD funds marine debris research, prevention, and removal activities. Since 2006, the MDD has supported more than 135 removal projects across the country and has removed more than 12 million pounds of debris from the oceans. To accomplish this, the MDD may perform and fund activities that use sensing technologies for the detection and subsequent removal of submerged marine debris. These technologies include: multibeam and side-scan sonar, side-imaging sonar, ROVs and AUVs with cameras or other sensors attached, diver towed video, and propeller cameras. The sonar systems typically used by the MDD-funded projects are commercially-available, low powered, high frequency systems, not fundamentally different from those used by most recreational boats and fishing vessels.

Integrated Ocean Observing System

The Integrated Ocean Observing System (IOOS) is a national-regional partnership that provides observational coastal data, forecasts, and new tools to improve safety, enhance the economy, and protect the environment. Integrated ocean information is available in near real time, as well as retrospectively, and improves NOAA's ability to understand and predict coastal storms, wave heights, and sea level change. The IOOS Program Office is organized into two divisions that implement policies, protocols, and standards to implement IOOS and oversee daily operations and coordination: (1) Operations Division (Ops) and (2) Regions, Budget, and Policy (RB&P). Ops coordinates the contributions of federally-owned observing and modeling systems and develops and integrates non-federal observing and modeling capacity into the system in partnership with IOOS regions. Ops serves as the system architect for data processing, management, and communications in accordance with standards and protocols established by the National Ocean Council, and leads nationwide program integration for modeling development, undersea glider operations, high frequency radar, and animal telemetry. RB&P oversees functions such as management, budgeting, execution, policy, and regional and external affairs. Additionally, RB&P initiates

and maintains relationships to encourage participation in U.S. IOOS by federal agencies, non-federal groups, and industries.

Technologies deployed and observational activities under the IOOS program can be categorized as: 1) passive sensors and instrumentation; 2) vessels and sampling; 3) AUVs, gliders, and drifters; 4) moorings, marine stations, buoys, and fixed arrays; 5) high frequency radar; 6) sonar; and 7) lidar.

Marine vessels, including personal watercraft, may be used to implement, operate, and maintain aspects of the IOOS program. Activities may range in size and involve small vessels to larger research vessels. Sampling may be performed from aboard a vessel or on-land along shorelines and can include activities such as conductivity, temperature, and depth surveys; beach monitoring; bathymetric surveys; monitoring of algae, zooplankton, and ocean conditions; invertebrate and fish sampling; and monitoring of fixed arrays.

Office of National Geodetic Survey

The National Geodetic Survey (NGS) has, for more than 200 years, provided the nation with geodetic and geographic positioning services. NGS provides a common reference framework, the National Spatial Reference System (NSRS), for establishing the coordinate positions of all geographic and geospatial data. The foundational elements – latitude, longitude, elevation, shoreline information, and their changes over time – contribute to informed decision making and impact a wide range of important activities including mapping and charting, navigation, flood risk determination, transportation, land use, and ecosystem management.

NGS delineates the shoreline through various photogrammetric sources, including tide-coordinated stereo aerial photographs, commercial satellite imagery, Light Detection and Ranging (lidar), and related remote sensing technologies. The data-gathering process results in a vector database of the national shoreline and products such as high-resolution aerial frame photographs, orthoimagery, and coastal lidar data sets.

processing, management, and communications in accordance with standards and protocols established by the National Ocean Council, and leads nationwide program integration for modeling development, undersea glider operations, high frequency radar, and animal telemetry. RB&P oversees functions such as management, budgeting, execution, policy, and regional and external affairs. Additionally, RB&P initiates and maintains relationships to encourage participation in U.S. IOOS by federal agencies, non-federal groups, and industries.

APPENDIX B: NOTICE OF AVAILABILITY OF A DRAFT PROGRAMMATIC EIS FOR SURVEYING AND MAPPING PROJECTS IN U.S. WATERS FOR COASTAL AND MARINE DATA ACQUISITION

availability of the Final Evaluation Findings.

Submitting Comments

Timely comments received by the Office for Coastal Management are considered part of the public record and may be publicly accessible. Any personal information (*e.g.,* name, address) submitted voluntarily by the sender may also be publicly accessible. NOAA will accept anonymous comments. You may also provide public comments during the virtual public meeting. You may participate online or by phone. If you would like to provide comment during the public meeting, please select ''yes'' during the online registration. The line-up of speakers will be based on the date and time of registration. Once you register, you will receive a confirmation of your registration. One hour prior to the start of the meeting on August 4, 2021, you will be emailed a link to the public meeting and information about participating.

Keelin Kuipers,

Deputy Director, Office for Coastal Management, National Ocean Service, National Oceanic and Atmospheric Administration.

[FR Doc. 2021–13583 Filed 6–24–21; 8:45 am]

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

Notice of Availability of a Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition

AGENCY: National Ocean Service (NOS), National Oceanic and Atmospheric Administration (NOAA), Department of Commerce (DOC).

ACTION: Notice of availability of a draft programmatic environmental impact statement; request for comments.

SUMMARY: The National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS) has prepared a draft programmatic environmental impact statement (PEIS) in accordance with the National Environmental Policy Act of 1969, as amended (NEPA), to analyze the potential environmental impacts associated with NOS's recurring data collection projects to characterize submerged features (*e.g.,* habitat, bathymetry, marine debris). The ''action area'' for these projects encompasses United States (U.S.) rivers, states' offshore waters, the U.S. territorial sea, the contiguous zone, the U.S. Exclusive Economic Zone (U.S. EEZ), and coastal and riparian lands. As a part of the Proposed Action, NOS may use active acoustic equipment such as sub-bottom profilers, single beam and multibeam echo sounders, side-scan sonars, and Acoustic Doppler Current Profilers. The Draft PEIS analyzes NOS data collection projects for a time period of 6 years. Publication of this document begins the 60-day public comment period for the Draft PEIS.

DATES: Written comments on the Draft PEIS will be accepted on or before August 24, 2021.

ADDRESSES: The Draft PEIS can be viewed or downloaded from the NOS website at *https://oceanservice.noaa.gov/about/environmental-compliance/surveying-mapping.html.* You may submit comments on this document, identified by NOAA–NOS–2021–0055, by any of the following methods:

- *Electronic Submission:* Submit all electronic public comments via the Federal e-Rulemaking Portal. Go to *https://www.regulations.gov* and enter NOAA–NOS–2021–0055 in the Search box. Click on the ''Comment'' icon, complete the required fields, and enter or attach your comments.
- *Mail:* Please direct written comments to DOC/NOAA/NOS Environmental Compliance Coordinator, SSMC4-Station 13612, 1305 East West Highway, Silver Spring, MD 20910.
- *Email: nosaa.ec@noaa.gov.*

Instructions: Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered by NOAA. All comments received are a part of the public record and will generally be posted for public viewing on *www.regulations.gov* without change. All personal identifying information (*e.g.,* name, address, etc.), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NOAA will accept anonymous comments (enter ''N/A'' in the required fields if you wish to remain anonymous).

FOR FURTHER INFORMATION CONTACT: Giannina DiMaio, DOC/NOAA/NOS, Environmental Compliance Coordinator, SSMC4-Station 13612, 1305 East West Highway, Silver Spring, MD 20910, *nosaa.ec@noaa.gov,* 240–533–0918.

SUPPLEMENTARY INFORMATION: The Proposed Action analyzed in the Draft PEIS is to continue NOS's surveying and mapping projects throughout the action area. The Draft PEIS has been prepared to: (1) Inform NOS and the public on the physical, biological, economic, and social impacts of NOS mapping and surveying projects; and (2) assist NOS in deciding how to execute its mapping and surveying program over the next 6 years.

The Draft PEIS assesses the direct, indirect, and cumulative environmental impacts of a suite of surveying and mapping data collection activities. NOS initially planned to address the environmental impacts of the Proposed Action through a Programmatic Environmental Assessment (PEA) and published a Notice of Intent to prepare a PEA in the **Federal Register** on December 19, 2016 (81 FR 91921). However, during preparation of the PEA, NOS determined that NOS and the public would be better served through the Environmental Impact Statement process due to the geographic scope of the mapping program and the complexities of the analysis.

The purpose of the Proposed Action is to gather accurate and timely data on the marine and coastal environment. The need for the Proposed Action is to ensure safety at sea, economic well-being, and the efficient stewardship of public trust resources. NOS projects would include surveys performed from crewed vessels and remotely-operated or autonomous vehicles, operated by NOS field crews, contractors, grantees, or permit/authorization holders. NOS may use echo sounders and other active acoustic equipment and employ other equipment, including bottom samplers and conductivity, temperature, and depth instruments to collect the needed data. A project could also involve supporting activities, such as the use of divers and the installation of tide buoys.

The Draft PEIS evaluates three alternatives:

- *Alternative A—No Action:* Under Alternative A, NOS would continue to operate a variety of equipment and technologies to gather accurate and timely data on the nature and condition of the marine and coastal environment. This alternative reflects the technology, equipment, scope, and methods currently in use by NOS, at the level of effort reflecting NOS fiscal year 2019 funding levels. (NOS operations were widely disrupted during the 2020 field season due to the COVID–19 pandemic. Therefore, the PEIS relies on 2019 as the baseline year for Alternative A, as it is the most recent example of typical field operations that would be enacted if NOS chose to continue historical levels of project effort.)
- *Alternative B:* This alternative consists of Alternative A plus the more

widespread adoption of new techniques and technologies (such as remotely operated vehicles (ROVs), microwave water level (MWWL) radar sensors, etc.) to more efficiently perform surveying, mapping, charting and related data gathering. Specific examples of adaptive methods and equipment that NOS programs are likely to adopt under Alternative B in the next 6 years include:

○ Greater use of ROVs with echo sounder technologies;

○ Greater use of autonomous underwater vehicles (AUVs) and autonomous surface vehicles (ASVs) with echo sounder technologies;

○ Conversion of one or more existing 10-m (33 feet) crewed survey boats into ASVs;

○ Greater use of more efficient, wide-beam sonar systems (phase-differencing bathymetric systems) for nearshore hydrographic surveys;

○ Increased field operations in the National Marine Sanctuary system with associated requirements for hydroacoustic charting, surveying, mapping and associated activities; and

○ Installation, operation, and maintenance of additional water level stations including transitioning to mostly MWWL radar sensors and upgraded storm strengthening to make stations more climate resilient.

Under Alternative B, all of the activities and equipment operation described in Alternative A would continue, many at a higher level of effort. The nature of these actions would not change, but the overall level of activity would be increased.

• *Alternative C:* Like Alternative B, Alternative C adopts new techniques and technologies to encourage greater program efficiencies regarding surveying, mapping, charting, and related data gathering activities. In addition, Alternative C would consist of NOS program implementation with an overall funding increase of 20 percent relative to Alternative B. Under Alternative C, all of the activities and equipment operation described in Alternative B would continue, many at a higher level of effort. The nature of these actions would not change, but the overall level of activity would be augmented.

NOS will initiate consultations under the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), the Magnuson–Stevens Fishery Conservation and Management Act, and the National Marine Sanctuaries Act following publication of the Draft PEIS. NOS will also complete the required analysis and documentation to comply with Section 106 of the National Historic Preservation Act and Section 307 of the Coastal Zone Management Act.

The purpose of this NOA is to invite affected government agencies, non-governmental organizations, tribes and tribal organizations, and interested members of the public to participate in the Draft PEIS process and provide comments on the structure, contents, and analysis in the Draft PEIS. The official public review and comment period ends on August 24, 2021. Please visit the project web page for additional information regarding the program: *https://oceanservice.noaa.gov/about/environmental-compliance/surveying-mapping.html.*

Authority: The preparation of the Draft PEIS was conducted in accordance with the requirements of NEPA, the Council on Environmental Quality's Regulations (40 CFR 1500 *et seq.* (1978)), other applicable regulations, and NOAA's policies and procedures for compliance with those regulations. While the CEQ regulations implementing NEPA were revised as of September 14, 2020 (85 FR 43304, Jul. 16, 2020), NOS prepared this Draft PEIS using the 1978 CEQ regulations because this environmental review began on December 19, 2016, when NOS published a Notice of Intent to conduct scoping and prepare a Draft Programmatic Environmental Assessment. Written comments must be received on or before August 24, 2021.

Paul M. Scholz,

Acting Deputy Assistant Administrator for Ocean Services and Coastal Zone Management, National Ocean Service.

[FR Doc. 2021–13361 Filed 6–24–21; 8:45 am]

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648–XB162]

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Marine Site Characterization Surveys Off of Delaware and New Jersey

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; issuance of incidental harassment authorization.

SUMMARY: In accordance with the regulations implementing the Marine Mammal Protection Act (MMPA) as amended, notification is hereby given that NMFS has issued an IHA to Garden State Offshore Energy, LLC (Garden State) to incidentally harass, by Level B harassment, marine mammals incidental to marine site characterization surveys offshore of Delaware and New Jersey in the area of the Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf (OCS–A 0482) and along potential export cable routes to landfall locations in Delaware and New Jersey.

DATES: This authorization is effective from June 11, 2021 through June 10, 2022.

FOR FURTHER INFORMATION CONTACT: Carter Esch, Office of Protected Resources, NMFS, (301) 427–8421. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act.* In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

The MMPA prohibits the ''take'' of marine mammals, with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed incidental take authorization may be provided to the public for review.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other ''means of effecting the least practicable adverse impact'' on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stocks for taking for certain subsistence uses (referred to in shorthand as ''mitigation''); and requirements pertaining to the mitigation, monitoring and reporting of the takings are set forth.

The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

APPENDIX C: RESPONSE TO PUBLIC COMMENTS ON THE NATIONAL OCEAN SERVICE DRAFT PEIS

Response to Public Comments on the National Ocean Service Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition

November 2022

CONTENTS

ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
ADCP	Acoustic Doppler Current Profiler
AEWC	Alaska Eskimo Whaling Commission
AIS	Automatic Identification System
ANC	Alaska Native Corporation
ANSCA	Alaska Native Claims Settlement Act
ANO	Alaska Native Organization
BIA	Biologically Important Area
BMP	Best Management Practice
BOEM	Bureau of Ocean Energy Management
CAA	Conflict Avoidance Agreement
CARB	California's Air Resources Board
CBPA	Chesapeake Bay Preservation Area
CD	Consistency Determination
CFR	Code of Federal Regulations
CMP	Coastal Management Program
CNMI	Commonwealth of the Northern Mariana Islands
CRCP	Coral Reef Conservation Program
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB	Decibel
DCMP	Delaware Coastal Management Program
DCRM	Division of Coastal Resources Management
DEP	Department of Environmental Protection
DEQ	Department of Environmental Quality
DFW	Division of Fish and Wildlife
DMR	Department of Marine Resources
DOC	Department of Commerce
DPEIS	Draft Programmatic Environmental Impact Statement
DWM	Department of Wildlife Management
DWR	Department of Wildlife Resources
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EGLE	Environment, Great Lakes, and Energy
EIS	Environmental Impact Statement
EJ	Environmental Justice
ENC	Electronic Navigational Charts
ENOW	Economics National Ocean Watch
EO	Executive Order
EPA	Environmental Protection Agency
ESC	Erosion and Sediment Control
ESA	Endangered Species Act
F	Fahrenheit
FAQ	Frequently Asked Questions

FMC	Fishery Management Council
FR	Federal Register
ft	Foot/Feet
GDP	Gross Domestic Product
GPS	Global Positioning System
HC	Hydrocarbons
HPO	Historic Preservation Office
HRG	High Resolution Geophysical
Hz	Hertz
IPaC	Information for Planning and Consultation
IPC	Intergovernmental Policy Council
ITR	Incidental Take Regulation
IWC	International Whaling Commission
JPA	Joint Permit Application
kHz	Kilohertz
km	Kilometer
km^2	Square Kilometer
lbs	Pounds
LCRP	Louisiana Coastal Resources Program
m	Meter
MARCO	Mid-Atlantic Regional Council on the Ocean
MARPOL	Marine Pollution
MBTA	Migratory Bird Treaty Act
MCL	Michigan Compiled Laws
MMPA	Marine Mammal Protection Act
MPA	Marine Protected Area
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSD	Marine Sanitation Device
MTNM	Marianas Trench Marine National Monument
NAVTEX	Navigational Telex
NEPA	National Environmental Policy Act
NGO	Non-Governmental Organization
NHO	Native Hawaiian Organization
NHPA	National Historic Preservation Act
nm	Nautical Mile
NMFS	National Marine Fisheries Service
NMSA	National Marine Sanctuaries Act
NOAA	National Oceanic and Atmospheric Administration
NOAA/OCS	National Oceanic and Atmospheric Administration's Office of Coast Survey
NOx	Nitrous Oxides
NOS	National Ocean Service
NRDC	Natural Resources Defense Council
NREPA	Natural Resources and Environmental Protection Act
NRHP	National Register of Historic Places
NRT	Navigation Response Team

NSB	North Slope Borough
OCM	Office for Coastal Management
OMB	Office of Management and Budget
ONMS	Office of National Marine Sanctuaries
OPR	Office of Protected Resources
ORR	Office of Response and Restoration
PA	Programmatic Agreement
PEIS	Programmatic Environmental Impact Statement
PM	Particulate Matter
PSA	Public Service Announcement
PSO	Protected Species Observer
ROV	Remotely Operated Vehicles
RPA	Resource Protection Area
SAR	Stock Assessment Report
SCHPR	South Carolina Historic Properties Record
SHPO	State Historic Preservation Officer
SLA	Submerged Lands Act
SWI	Sea Watch International
SWM	Storm Water Management
SWPPP	Storm Water Pollution Prevention Plan
TCP	Traditional Cultural Place
THPO	Tribal Historic Preservation Officer
U.S.	United States
U.S.C.	U.S. Code
USFWS	U.S. Fish and Wildlife Service
VESCL&R	Virginia Erosion and Sediment Control Law and Regulations
VAFWIS	Virginia Fish and Wildlife Information Service
VMRC	Virginia Marine Resource Commission
VSMP	Virginia Stormwater Management Program
VSWML&R	Virginia Storm Water Management Law and Regulations
WQIA	Water Quality Impact Assessment

1.0 INTRODUCTION

The public has a critical role in helping the National Ocean Service (NOS) understand the environmental impacts of the Proposed Action analyzed in the Programmatic Environmental Impact Statement (PEIS) for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition. Public participation promotes transparency, facilitates better decision-making, and helps federal agencies identify data gaps and sources of potential concern regarding the environmental impacts of a proposed action.

NOS published a "Notice of Availability of a Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition" in the *Federal Register* (FR) on June 25, 2021 to announce the availability of the Draft PEIS for public review. In conjunction with publication of the Draft PEIS, NOS prepared a comprehensive public involvement and outreach plan outlining the development and distribution of materials to inform the public and solicit input on the scope of the Proposed Action and related impact analysis. An interested party letter inviting public comment on the draft was distributed via email or U.S. mail to federal agencies; states and territories; Non-Governmental Organizations (NGOs); tribes; regional organizations; Alaska regional and village corporations; Native Hawaiian Organizations (NHOs); and NOS grantees, partners, and permit/authorization recipients with potential interest in the Proposed Action. Potentially interested tribes include those in geographic proximity to the action area (i.e., located in coastal states, Great Lakes states, or along major navigable rivers) as well as tribes with historic, religious, or cultural connections to coastal and marine resources regardless of proximity to the action area. In addition to contacting interested parties directly, the availability of the Draft PEIS was advertised in newspapers in coastal cities throughout the United States (U.S.) and posted on NOAA and NOS social media platforms. These announcements directed readers to the project website at https://oceanservice.noaa.gov/about/environmental-compliance/surveying-mapping.html. The website provides helpful information detailing key components of the Draft PEIS including an overview of the Proposed Action, fact sheets about the resources analyzed, and instructions on how to comment on the document. In order to reach communities in Alaska without reliable internet access, in addition to newspaper advertisements, NOS developed a Public Service Announcement (PSA) that was broadcasted by public radio stations to reach a broad geographic range along the Alaska coast. NOS offered to send a physical copy (a CD, USB drive, or hard copy) of the Draft PEIS to individuals or communities on request, to ensure that the Draft would be made available at community centers, libraries, and other public facilities as needed.

Following the publication of the Draft PEIS, the NOS Environmental Compliance Coordinator presented a brief overview of the Draft PEIS to the Alaska Eskimo Whaling Commission (AEWC), including information about NOS, the Proposed Action, expected impacts to marine mammals and subsistence hunting and fishing, and compliance with the Marine Mammal Protection Act (MMPA). In response to preliminary feedback received from AEWC members and other Alaska Native community members, NOS extended the original 60-day public comment period deadline by 90 days from August 24, 2021 to November 22, 2021 to accommodate the Alaskan subsistence hunting and fishing season. The extension of the public comment period was published in the *Federal Register* on August 24, 2021.

During the public comment period for the Draft PEIS, NOS received 31 comment submissions from 30 commenters via Regulations.gov and email. Commenters included State Historic

Preservation Officers (SHPOs), Tribal Historic Preservation Officers (THPOs), state Coastal Management program (CMP) offices, federally recognized tribes, Alaska Native corporations (ANCs), Alaska Native Organizations (ANOs), NGOs, and members of the public. The comments addressed a range of issues including the following:

- Protection of cultural and historic resources;
- Federal consistency under the Coastal Zone Management Act (CZMA);
- Incorporation of mitigation measures;
- Environmental justice (EJ) concerns pertaining to subsistence hunting and fishing in Alaska communities;
- Future coordination between NOS and other key stakeholders, such as the AEWC, North Slope Borough Department of Wildlife Management, Calista Corporation in Alaska, Donlin Gold, National Resources Defense Council, Cultural Heritage Partners representing the Upper Mattaponi Indian Tribe, the Chickahominy Indian Tribe, and the Seneca Nation of New York;
- The National Environmental Policy Act (NEPA) process, scope of the PEIS, selection of a programmatic NEPA approach, alternatives to the Proposed Action, cumulative effects analysis, references and data cited in the effects analysis;
- Impacts to marine mammals, fish, habitats, birds, sea turtles
- Methodology and data consideration for the acoustic modeling;
- Impacts to socioeconomic resources such as fisheries; and
- Access to surveying and mapping data collected during NOS projects through data sharing.

NOS has thoroughly considered all of the input received and has responded to the public comments in this document. Revisions to the Final PEIS have been made in response to comments where appropriate.

2.0 RESPONSE TO PUBLIC COMMENTS

This section is organized alphabetically by the name of the organization or private individual that submitted a comment. These submissions were reviewed by NOS, and comments on specific issues were identified and labeled with a subject and comment number (e.g., Cultural and Historic Resources–1). This enabled NOS to provide consistent responses to similar comments made by multiple commenters.

Each subsection below begins with the original comment submission as received by NOS. Following the original submittal, the individual comments identified are presented by subject followed by NOS's response. A complete list of acronyms and abbreviations is provided at the beginning of this document.

2.1 Advisory Council on Historic Preservation (ACHP) (Alexis Clark)

2.1.1 Comment Submission

From: NOSAA Environmental Compliance - NOAA Service Account
To: Michelle.Smyk@solvllc.com
Subject: Fwd: NOAA National Ocean Service Releases Draft PEIS for Surveying and Mapping Projects
Date: Friday, October 15, 2021 11:35:41 AM
Attachments: image001.png

ACHP

v/r
Giannina DiMaio
NOS Environmental Compliance Coordinator
Pronouns: she/her/hers

NOAA, National Ocean Service
Office of the Assistant Administrator
1305 East-West Hwy, SSMC4 13th Floor
Silver Spring, MD 20910
V: 240-533-0918
nosaa.ec@noaa.gov

---------- Forwarded message ---------
From: **Alexis Clark** <aclark@achp.gov>
Date: Wed, Aug 4, 2021 at 4:14 PM
Subject: Re: NOAA National Ocean Service Releases Draft PEIS for Surveying and Mapping Projects
To: nosaa.ec@noaa.gov <nosaa.ec@noaa.gov>
Cc: Chris Daniel <cdaniel@achp.gov>, Jaime Loichinger <jloichinger@achp.gov>, Erik M. Hein <hein@ncshpo.org>

Dear Ms. DeMaio,

Thank you for providing the additional information regarding the Draft PEIS. We concur with NCSHPO that it appears NOAA is proposing to develop a program alternative with the ACHP. We request NOAA provide some additional clarification about the "programmatic approach" mentioned. Does NOAA intend to develop a Program Specific Programmatic Agreement (PA) or a PA for complex undertakings? Additionally, if NOAA intends to develop a PA, the agency needs to formally initiate consultation. An agency can provide this documentation via our Electronic Section 106 Documentation Submittal System (e106). Information for this can be found on our website at https://www.achp.gov/e106-email-form.

Further, as a reminder, a Program or Project PA that would guide Section compliance for a Program of Projects or specific Projects should be completed prior to the finalization of the EIS, as conclusion

of the EIS prior to completion of the Section 106 process would appear to limit alternatives in the PA. The Draft PEIS is vague on how the Section 106 process will be completed.

We would welcome having a call with NOAA and NCSHPO to discuss these questions and next steps.

Thank you,

Alexis Clark

Historic Preservation Specialist

Advisory Council on Historic Preservation

401 F Street NW, Suite 308, Washington, DC 20001

(202) 517-0208

www.achp.gov

COVID-19 and the ACHP. The ACHP staff is teleworking and available by e-mail and phone. Up to date information on Section 106 and ACHP operations can be found at www.achp.gov/coronavirus.

From: NOSAA Environmental Compliance - NOAA Service Account [mailto:nosaa.ec@noaa.gov]
Sent: Tuesday, July 06, 2021 12:45 PM
To: Erik M. Hein
Cc: Chris Daniel; Jaime Loichinger
Subject: [External] Re: NOAA National Ocean Service Releases Draft PEIS for Surveying and Mapping Projects

Erik,

Thank you for taking the time to reach out to me regarding our plans for Section 106 Consultation under the NHPA. The Draft PEIS is not intended to substitute the requirement to consult with SHPOs. The document was provided to State Historic Preservation Offices and Tribal Historic Preservation Officers for information and awareness. The Draft PEIS was also provided to all federally recognized tribes in the action area as well as Native Hawaiian Organizations and Alaska Native tribes as part of our government-to-government consultation process.

NOS will be working on a programmatic approach with the Advisory Council on Historic Preservation (ACHP) and the National Conference of SHPOs. It is our understanding SHPOs will be part of this process. We would appreciate any comments or assistance in identifying historic or cultural resources that may be potentially affected by NOS surveying and mapping activities in your area. Additionally, if you have any thoughts or suggestions on how we could minimize or avoid potential adverse impacts of our surveying and mapping activities to historic properties that would be helpful as we develop a programmatic agreement with SHPOs.

My apologies for the delayed response as I was on leave last week. Please feel free to contact me if you have any additional questions or would like to discuss the process further.

v/r

Giannina DiMaio

NOS Environmental Compliance Coordinator

Pronouns: she/her/hers

NOAA, National Ocean Service

Office of the Assistant Administrator

1305 East-West Hwy, SSMC4 13th Floor

Silver Spring, MD 20910

V: 240-533-0918

nosaa.ec@noaa.gov

On Mon, Jun 28, 2021 at 1:30 PM Erik Hein <hein@ncshpo.org> wrote:

> Dear Giannina:
>
> Thank you for reaching out. I am, however, unclear on what this is – or what you are specifically asking State Historic Preservation Officers to do in the context of Section 106 of the National Historic Preservation Act. Are you substituting NEPA for 106? Is there an independent 106 consultation taking place? Are you seeking some sort of nationwide programmatic solution for Section 106?
>
> Thank you in advance for any additional information you could provide.
>
> Erik M. Hein
>
> Executive Director
>
> **National Conference of State Historic Preservation Officers**
>
> Hall of States | 444 N. Capitol Street NW, Suite 342 | Washington, DC 20001
>
> p| 202.624.5465 e| hein@ncshpo.org f| 202.624.5419
>
> ---
>
> **From:** NOSAA Environmental Compliance - NOAA Service Account <nosaa.ec@noaa.gov>
> **Sent:** Friday, June 25, 2021 5:26 PM
> **Subject:** NOAA National Ocean Service Releases Draft PEIS for Surveying and Mapping Projects

Dear State Historic Preservation Officer,

The National Oceanic and Atmospheric Administration (NOAA) National Ocean Service (NOS) has prepared a Draft Programmatic Environmental Impact Statement (PEIS) for S*urveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition* pursuant to the National Environmental Policy Act. The Draft PEIS is now available for a 60-day public comment ending August 24, 2021. The Notice of Availability was published today in the *Federal Register.*

The Draft PEIS analyzes the potential environmental impacts of recurring surveying and mapping data collection in United States coastal and marine waters over a period of six years. The analysis in this document covers the use of active acoustic equipment such as sub-bottom profilers, single beam and multibeam echo sounders, and side-scan sonars by NOS to collect data on the depths and shapes of underwater terrain, including the ocean, rivers, and lakes. The Draft PEIS analyzes impacts to critical environmental resources such as marine mammals, endangered and threatened species, and cultural and historic resources. The document can be found on the NOS Surveying and Mapping Draft PEIS website at https://oceanservice.noaa.gov/about/environmental-compliance/surveying-mapping.html.

Attached is the notification letter with additional information regarding the Draft PEIS.

If you have any questions, please feel free to contact me by phone at 240-533-0918 or email at nosaa.ec@noaa.gov.

v/r

Giannina DiMaio

NOS Environmental Compliance Coordinator

Pronouns: she/her/hers

NOAA, National Ocean Service

Office of the Assistant Administrator

1305 East-West Hwy, SSMC4 13th Floor

Silver Spring, MD 20910

V: 240-533-0918

nosaa.ec@noaa.gov

2.1.2 NOS Response

Cultural and Historic Resources-1: We concur with NCSHPO that it appears NOAA is proposing to develop a program alternative with the ACHP. We request NOAA provide some additional clarification about the "programmatic approach" mentioned. Does NOAA intend to develop a Program Specific Programmatic Agreement (PA) or a PA for complex undertakings?

> **NOS Response:** While NOS may consider developing a Programmatic Agreement (PA) for multiple undertakings in the future, NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources.

Cultural and Historic Resources-2: Additionally, if NOAA intends to develop a PA, the agency needs to formally initiate consultation. An agency can provide this documentation via our Electronic Section 106 Documentation Submittal System (e106). Information for this can be found on our website at https://www.achp.gov/e106-email-form.

> **NOS Response:** Thank you for providing this information. NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources.

Cultural and Historic Resources-3: Further, as a reminder, a Program or Project PA that would guide Section compliance for a Program of Projects or specific Projects should be completed prior to the finalization of the EIS, as conclusion of the EIS prior to completion of the Section 106 process would appear to limit alternatives in the PA. The Draft PEIS is vague on how the Section 106 process will be completed.

> **NOS Response:** While NOS may consider developing a PA for multiple undertakings in the future, NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any project with the potential to affect cultural or historic resources.
>
> This PEIS contains a programmatic effects analysis, meaning it provides an effects analysis for activities as they are typically conducted, with impacts assessed based on regional conditions, habitat types, species, and other factors. However, the PEIS does not identify the specific time or place for individual projects or activities over the next five years.
>
> The PEIS will be used to inform NOS responsibilities under NHPA when conducting project-specific reviews. Completing the PEIS before initiating consultation under Section 106 prior to commencing project-specific activities will not limit the ability to develop and evaluate alternatives or modifications to the undertaking that could avoid, minimize, or mitigate adverse effects. NOS will be able to consider and implement alternatives or additional mitigation measures developed through project-specific Section 106 consultations.

2.2 Alaska Eskimo Whaling Commission (John Hopson, Jr.)

2.2.1 Comment Submission

ALASKA ESKIMO
WHALING COMMISSION

August 6, 2021

Giannina DiMaio
DOC/NOAA/NOS
Environmental Compliance Coordinator
SSMC4-Station 13612
1305 East West Highway
Silver Spring, MD 20910

Via email: nosaa.ec@noaa.gov

Re: Notice of Availability of a Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition

Dear Ms. DiMaio:

Please accept this request for an extension to the comment period on behalf of the Alaska Eskimo Whaling Commission (AEWC) for the the Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition (DPEIS).[1] We request an extension from August 24 to November 24 to allow adequate time to comment on the document.

AEWC is a non-profit organization representing subsistence Whaling Captains in Northern coastal Alaska. AEWC represents the eleven bowhead whale subsistence hunting villages of Utqiaġvik (Barrow), Nuiqsut, Kaktovik, Pt. Hope, Kivalina, Wales, Savoonga, Gambell, Little Diomede, Wainwright and Pt. Lay. Our whaling captains and their communities rely on the subsistence hunt of bowhead whales and other marine mammals in or adjacent to the Bering, Beaufort and Chukchi Seas.

We understand the importance of having good maps for our region, for the safety of all vessels. We appreciated the presentation provided at our July 2021 Board meeting in Fairbanks, AK. However, the presentation was general in nature and did not get into the specifics of the anticipated surveys in Alaska. Further, the surveying activities described in this DPEIS are of great concern to us as our communities participate in, and are dependent, on subsistence whaling. Marine activities during specific time periods have a high potential to disrupt bowhead whale migrations. This may put our hunters' safety at risk and negatively impact our subsistence hunts, which are necessary for our food security. For this reason, most industrial and governmental operations in the Beaufort and Chukchi Seas coordinate closely with the AEWC and the North Slope Borough Department of Wildlife Management to prevent and reduce the impacts of such activities. We have also been able to coordinate with NOAA and the National Ocean Service in the past, including the recent Saildrone project by the Office of Coast Survey to make

[1] 86 FR 33663.

adjustments to address community needs during the fall harvest. This type of consultation and coordination must continue.

Unfortunately, the timing of the DPEIS process makes it difficult to adequately review the document. The next few months, August to October, are a particularly busy time for our whaling communities, and our colleagues at the North Slope Borough. Many of our North Slope Communities are actively whaling and then successful whaling captains are getting ready in November/December timeframe for Thanksgiving and Christmas Feasts. We also hope we do not end up with a situation like 2019 where, because of changes to the migration, the Captains in Utqiaġvik were unable to harvest a whale until November. In addition, the communities on St. Lawrence Island of Gambell and Savoonga often catch whales in late December.

Moreover, at this time, we are unclear on what activities are planned for our region. We would like more time to review the document, interact with National Ocean Service personnel and learn more about this issue so that we can provide more useful comments. Accordingly, we believe that additional time is needed to adequately comment on this DPEIS.

Thank you for your consideration of this request.

Sincerely,

John Hopson, Jr.
Chairman
Alaska Eskimo Whaling Commission

cc: AEWC Commissioners
Mayor Brower, North Slope Borough
Voice of the Arctic Inupiat
Inupiat Community of the Arctic Slope

2.2.2 NOS Response

NEPA Process-3: Please accept this request for an extension to the comment period on behalf of the AEWC for the Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition (DPEIS)[1] We request an extension from August 24 to November 24 to allow adequate time to comment on the document (86 FR 33663).

> **NOS Response:** After receiving your letter, NOS extended the original 60-day public comment period deadline by 90 days from August 24, 2021 to November 22, 2021 to accommodate the Alaskan subsistence hunting and fishing community (86 FR 47299).

Purpose and Need-1: We understand the importance of having good maps for our region, for the safety of all vessels.

> **NOS Response:** Thank you for your comment and support of the purpose and need for the Proposed Action.

NEPA Process-4: We appreciated the presentation provided at our July 2021 Board meeting in Fairbanks, AK. However, the presentation was general in nature and did not get into the specifics of the anticipated surveys in Alaska.

> **NOS Response:** NOS appreciated the opportunity to present to the AEWC in July 2021. NOS will work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses.
>
> Federally recognized tribes and ANCs may request formal government-to-government consultation pursuant to Executive Order (EO) 13175 at any time.

Environmental Justice-9: the surveying activities described in this DPEIS are of great concern to us as our communities participate in, and are dependent, on subsistence whaling. Marine activities during specific time periods have a high potential to disrupt bowhead whale migrations. This may put our hunters' safety at risk and negatively impact our subsistence hunts, which are necessary for our food security.

> **NOS Response:** Thank you for your comment. NOS understands the North Slope Borough (NSB) and AEWC concerns for possible effects on subsistence, food security, and safety. NOS activities are conducted with the highest regard to health and safety, including the safety of subsistence hunters. NOS understands that protecting Alaska Native subsistence resources is vital.
>
> NOS will coordinate with tribes and subsistence hunters and fishers prior to conducting projects in subsistence hunting areas. NOS will also work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses. Through this communication strategy, NOS would minimize the

potential for adverse impacts on subsistence communities, food security, and the safety of hunters.

NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request formal government-to-government consultation pursuant to EO 13175 at any time.

Future Coordination-3: We have also been able to coordinate with NOAA and the National Ocean Service in the past, including the recent Saildrone project by the Office of Coast Survey to make adjustments to address community needs during the fall harvest. This type of consultation and coordination must continue.

NOS Response: NOS agrees that the previous discussion regarding the Saildrone project was an example of effective coordination. We look forward to a continued cooperative partnership and open communication with tribes and subsistence hunters and fishers.

NEPA Process-5: Unfortunately, the timing of the DPEIS process makes it difficult to adequately review the document. The next few months, August to October, are a particularly busy time for our whaling communities, and our colleagues at the North Slope Borough. Many of our North Slope Communities are actively whaling and then successful whaling captains are getting ready in November/December timeframe for Thanksgiving and Christmas Feasts.

NOS Response: After receiving your comment, NOS extended the original 60-day public comment period deadline by 90 days from August 24, 2021 to November 22, 2021 to accommodate the Alaskan subsistence hunting and fishing community (86 FR 47299).

Alaska-1: Moreover, at this time, we are unclear on what activities are planned for our region.

NOS Response: NOS determined that a programmatic approach was appropriate because NOS conducts, authorizes, permits, and funds a suite of similar, ongoing data collection activities associated with recurring projects across a wide geographic area to characterize underwater features (e.g., habitat, bathymetry, marine debris). This Final PEIS is a comprehensive document that provides detailed programmatic effects analyses for surveying and mapping data collection activities based on regional conditions, habitat types, species, and other factors. However, the Final PEIS does not identify the specific time or place for individual projects or activities over the next five years. The analysis will be used to inform NOS leadership and the public on the environmental impacts of these activities before a decision is made on how to execute each project. All projects will require a project-specific review by NOS before proceeding.

Specific project locations are determined annually for the upcoming surveying season. NOS will coordinate with tribes and subsistence hunters and fishers prior to conducting projects in subsistence hunting areas. NOS will work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses. Through this communication strategy, NOS would minimize the potential for adverse impacts on subsistence communities, food security, and the safety of hunters.

NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation at any time for a proposed action that may have tribal implications. NOS will also initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources.

2.3 Calista Corporation (Andrew Guy)

2.3.1 Comment Submission

CALISTA CORPORATION
www.calistacorp.com

November 22, 2021

Giannina DiMaio
National Ocean Service, National Oceanic and Atmospheric Administration
1305 East West Highway
SSMC4-Station 13612
Silver Spring, MD

Via Email: nosaa.ec@noaa.gov

Re: Calista Comments on National Oceanic and Atmospheric Administration (NOAA) National Ocean Service (NOS) Draft Programmatic Environmental Impact Statement (PEIS) for Survey and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition (NOAA-NOS-2021-0055)

Dear Ms. DiMaio:

Introduction

On behalf of the Calista Corporation ("Calista"), an Alaska Native Claims Settlement Act ("ANCSA") Regional Corporation, we thank the National Oceanic and Atmospheric Association ("NOAA") National Ocean Service ("NOS") for the opportunity to review and submit written comments on the Draft PEIS to analyze environmental impacts associated with NOS's 2022-2027 survey and data collection activities. This issue is very important to the health and well-being of Calista shareholders, as it is vital to understand and protect our marine environment to protect our subsistence way of life.

Alternative C is Calista's Preferred Alternative

Calista supports Alternative C. Improving efficiencies in surveying, mapping, charting, and related data gathering, combined with a funding increase of 20 percent relative to Alternative B, would maximize the amount of this work in the Calista region in 2022-2027. This would be consistent with our goal of better understanding and protecting our marine environment in order to protect our subsistence way of life.

Calista

Calista serves more than 34,000 Alaska Native shareholders with roots in the 56 tribal communities of the Yukon-Kuskokwim River Delta Region ("YK Region"). YK Region communities are located along the Yukon and Kuskokwim Rivers and along Bering Sea coast, spread across an area the size of New York State. The State of Alaska has the largest coastline of the U.S. totaling 6,640 miles. Of that, the Calista region contains 2,674 miles, or 40 percent, of Alaska's coastline.

Calista shareholders include the tribal citizens of these 56 federally recognized Tribes – nearly one-quarter of all the Tribes in Alaska. The YK Region is not connected by a road system: Access to each community is by river ice road, frozen tundra, small watercraft during the short summer, or airplane. Many commercial goods and fuel are barged into the main hub community of Bethel, Alaska. Logistical limitations due to cost and weather often make it difficult to provide even basic goods and services in the YK Region.

5015 Business Park Blvd., Suite 3000, Anchorage, AK 99503
t: (907) 275-2800 ★ f: (907) 275-2919

Subsistence and Food Security

Subsistence is a top priority for Calista and our 34,000 shareholders. Food security today relies on a mixed cash economy: It takes a cash income to afford the fuel, equipment, and supplies necessary to participate in subsistence hunting, fishing, and gathering activities. This year we saw a drastic decline in salmon escapement on the Yukon and Kuskokwim rivers, forcing fishing closures on communities that rely on salmon during the winter months. The State of Alaska, Calista, Doyon Limited, and other partners joined together to donate 37,000 of pounds of salmon to the Lower Yukon communities in September 2020 to alleviate the loss of this year's salmon harvest. While we were able to come together to share resources during hard times, the source of the lower salmon numbers needs to be understood and managed at the local, state, federal and international level. Subsistence is our natural right to be a part of the ecosystem, and as caretakers and stewards of our natural resources, we support co-management approaches that combine science and Traditional Knowledge.

Environmental impact mitigation during these coastal activities and data gathering should include protection of Alaska Native subsistence resources, including salmon, and responding to such threats through disaster declarations and other remedial action. NOAA NOS should also include responding to such threats by researching potential causes using methods that incorporate and account for Indigenous knowledge, climate change, and species-specific data. In the case of salmon, such species-specific data might include the life cycle of salmon species in the ocean; the effect changes in the ocean environment are having on salmon as they return to their spawning grounds in the Arctic, including the YK Region; by-catch practices of commercial trawlers; and international poaching.

We recommend increased funding as outlined in Alternative C, to further scientific studies on Arctic activities to support an increased understanding of our socio-ecologic and socio-economic systems that support the health of Alaskan Arctic communities. Given the alarming decline of various fisheries and the importance of these fisheries to Tribal subsistence users and well-being of the Alaska Native Communities, Tribal participation and representation on the Northwest Pacific Fisheries Management Council must demand additional studies and observations on trawler impacts of the seafloor, where the impacts of that activity cascades through the ecosystem, to the detriment of Calista shareholders.

Environmental Threats Due to Climate Change

The YK Region is the most impacted region in Alaska from environmental threats due to climate change, per the 2019 Alaska Statewide Threat Assessment for Environmentally Threatened Communities (Figure 1). Calista participates in Yukon Kuskokwim Comprehensive Economic Development Strategy (YK CEDS) work sessions with Tribes, Village Corporations and non-profits to assess the YK Region for economic viability and resilience. In the Climate Change Adaption Workshop, Calista met with the Alaska Native Tribe Health Consortium ("ANTHC"), Center for Environmentally Threatened Communities (CETC), Association of Village Council Presidents ("AVCP") and U.S. Fish and Wildlife Service to address the actions needed to assist the YK Region's 28 high-risk and 19 next-highest-risk communities. Continued surveys will only strengthen the data and observation in our rapidly changing environment.

ENVIRONMENTALLY THREATENED COMMUNITIES SUMMARY STATISTICS BY ALASKA REGION (2019)				
Region	Highest Risk Communities	Next Highest Risk Communities	Risk Assessment Cost (million)	Mitigation Cost (million)
Yukon Kuskokwim	28	19	12.6	1,718
Northwest	21	4	7.2	1,124
Arctic Slope	6	2	0.0	287
Interior	13	14	6.9	182
Bristol Bay	3	12	2.4	72
Aleutian Pribilof	1	4	0.8	69
South Central, Southeast, Kodiak	1	16	2.0	27
Total	**73**	**71**	**31.8**	**3,478**

Figure 1: From ANTHC, based on data summarized from the 2019 Statewide Threat Assessment

Incorporation of Both Tribal and ANC Consultation is Required

President Biden's Memorandum on Tribal Consultation and Strengthening Nation-to-Nation Relationships was issued on January 26, 2021. The Memorandum reaffirms Executive Order 13175,[1] which requires federal agencies to consult with American Indians and Alaska Natives on federal policies that have tribal implications in regulation, legislation, or policy statements or actions that have direct effects on one or more Tribe, impacts Federal-Tribal relations, or impacts the distribution of power and responsibility between the Federal Government and Tribes.

In line with the Presidential Memorandum, we ask that the NOAA NOS prioritize upholding and complying with Congress's clear and unambiguous mandate to also extend to Alaska Native Corporations the OMB and federal agencies' tribal consultation obligations under Executive Order 13175. [2] Any plans, reports, policies, regulation, or other actions directed under the Biden Memorandum regarding consultation with "Indian tribes" and "Tribal officials," as defined in EO 13175, by statute also apply to consultation with ANCs. All federal agencies must consult with ANCs "*on the same basis*" as Tribes to ensure the economic, social, and cultural interests of ANC shareholders are protected and advanced. One important reason for this is that under ANCSA, it is the ANCs, rather than the tribal governments, that are the caretakers and managers of the conveyed lands, which lands constitute all that remains of the traditional homelands of Alaska Native peoples.

Calista respects and supports YK Region Tribes, as well as the 45 ANCSA Village Corporations in the YK Region. While there are important and unequivocal differences between ANCs and sovereign Tribes, let there be no mistake: Congress made clear that federal agencies are required to consult with ANCs "*on the same basis*" as Tribes. Consistent with this requirement, it is critical that ANCs be provided the

[1] Executive Office of the President, Tribal Consultation and Strengthening Nation-to-Nation Relationships, 86 Fed. Reg. 7491 (Jan. 29, 2021).

[2] Public Law No. 108-199, as amended by Public Law No. 108-447, specifically extended these obligations to ANCs, requiring OMB and all Federal agencies to "consult with Alaska Native corporations on the same basis as Indian tribes under Executive Order No. 13175." Consolidated Appropriations Act, 2004, Pub. L. 108-199, Div. H § 161, 118 Stat. 3, 452 (2004), as amended by Consolidated Appropriations Act, 2005, Pub. L. 108-447, Div. H, Title V § 518, 118 Stat. 2809, 3267.

opportunity to meaningfully participate in the development and implementation of policies that could impact our ability to fulfill the purposes for which we were established under ANCSA: to provide economic and social benefits to our Alaska Native shareholders, including tribal citizens.

ANCs should receive notice of all Tribal consultation notices provided to federally recognized Tribes within their respective regions. As previously mentioned, the region that Calista represents is home to 56 federally recognized Tribes and 45 ANCSA Village Corporations spread across a roadless area the size of New York State. Calista works closely with the Tribes and Village ANCs in our region and provides support on a variety of matters including self-governance, rural economies, lands, and natural resources. Rural and remote tribal governments often have limited funding, administrative capacity, technology including internet access, and infrastructure, so Calista and YK Village Corporation staffs regularly provide administrative, financial, and other needed support.

Moreover, because of the split surface-subsurface land ownership under ANCSA (Regional Corporations predominantly own subsurface lands, while Village Corporations predominantly own surface lands), it is imperative that ANCs be notified of any NOAA initiatives that may impact ANC lands and natural resources. This will enable Calista and the YK Region Village Corporations to support and work with the Tribes on issues of common concern. The NOAA NOS may not be aware of implications to ANC lands, projects, and resources unless potentially impacted ANCs, who own and manage the land, are invited to consult and given the opportunity to weigh in on any unforeseen lands and natural resources impacts.

Current Project

In 2018 to 2019, Calista worked with NOAA and the State of Alaska to the prioritize coastal surveys in the YK Region. This year, a new survey conducted by NOAA in coordination with the State of Alaska, gives Calista an additional opportunity to verify the coastal mapping priorities that were finalized in 2019, and also to expand that coastal surveying activity to include ocean mapping. This expansion will not only ensure that Calista's ANCSA land selections along the coast are valid, but also help us better understand and protect the marine environment of the YK Region, in order to protect our subsistence way of life.

Conclusion

Calista supports the purpose of the proposed action, "to gather accurate and timely data on the marine and coastal environment," and also the need for the proposed action, "to ensure safety at sea, economic well-being, and the efficient stewardship of public trust resources." Alternative C aligns well with this purpose and need, and is consistent with Calista's goal of better understanding and protecting the marine environment of the YK Region in order to protect our subsistence way of life.

Quyana,

CALISTA CORPORATION

Andrew Guy
President and CEO

2.3.2 NOS Response

Alternatives-3: Calista supports Alternative C. Improving efficiencies in surveying, mapping, charting, and related data gathering, combined with a funding increase of 20 percent relative to Alternative B, would maximize the amount of this work in the Calista region in 2022-2027. This would be consistent with our goal of better understanding and protecting our marine environment in order to protect our subsistence way of life…We recommend increased funding as outlined in Alternative C, to further scientific studies on Arctic activities to support an increased understanding of our socio-ecologic and socio-economic systems that support the health of Alaskan Arctic communities.

> **NOS Response:** Thank you for your support of Alternative C in which NOS would adopt new techniques and technologies to encourage greater program efficiencies regarding surveying, mapping, and related data gathering activities. Alaska continues to be a mapping priority for NOS.

Mitigation Measures-19: Environmental impact mitigation during these coastal activities and data gathering should include protection of Alaska Native subsistence resources, including salmon, and responding to such threats through disaster declarations and other remedial action. NOAA NOS should also include responding to such threats by researching potential causes using methods that incorporate and account for Indigenous knowledge, climate change, and species-specific data. In the case of salmon, such species-specific data might include the life cycle of salmon species in the ocean; the effect changes in the ocean environment are having on salmon as they return to their spawning grounds in the Arctic, including the YK Region; by-catch practices of commercial trawlers; and international poaching.

> **NOS Response:** The Final PEIS has been updated to include additional mitigation measures that NOS has developed to be implemented on each project as appropriate to minimize the impacts of project activities, including reducing impacts on sensitive species and subsistence hunting and fishing. The mitigation measures in the Final PEIS were developed with subject matter experts and in coordination with field crews and with the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and the Office of National Marine Sanctuaries (ONMS). The complete list of mitigation measures is included as an appendix to the Final PEIS.
>
> NOS will work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses.
>
> NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes and ANCs may request formal government-to-government consultation pursuant to EO 13175 at any time.

Out of Scope-2: Given the alarming decline of various fisheries and the importance of these fisheries to Tribal subsistence users and well-being of the Alaska Native Communities, Tribal participation and representation on the Northwest Pacific Fisheries Management Council must demand additional studies and observations on trawler impacts of the seafloor, where the impacts of that activity cascades through the ecosystem, to the detriment of Calista shareholders.

NOS Response: NOS does not regulate or conduct trawling operations. Generally, research on the effects of particular fishing gear is conducted by the NMFS Fisheries Science Centers and by NMFS through the fisheries management process. Chapter 2 of the Final PEIS describes the NOS surveying and mapping activities included under the Proposed Action.

Cultural and Historic Resources-26: Incorporation of Both Tribal and ANC Consultation is Required

President Biden's Memorandum on Tribal Consultation and Strengthening Nation-to-Nation Relationships was issued on January 26, 2021. The Memorandum reaffirms Executive Order 13175,1 which requires federal agencies to consult with American Indians and Alaska Natives on federal policies that have tribal implications in regulation, legislation, or policy statements or actions that have direct effects on one or more Tribe, impacts Federal-Tribal relations, or impacts the distribution of power and responsibility between the Federal Government and Tribes.

In line with the Presidential Memorandum, we ask that the NOAA NOS prioritize upholding and complying with Congress's clear and unambiguous mandate to also extend to Alaska Native Corporations the OMB and federal agencies' tribal consultation obligations under Executive Order 13175. 2 Any plans, reports, policies, regulation, or other actions directed under the Biden Memorandum regarding consultation with "Indian tribes" and "Tribal officials," as defined in EO 13175, by statute also apply to consultation with ANCs. All federal agencies must consult with ANCs ""on the same basis"" as Tribes to ensure the economic, social, and cultural interests of ANC shareholders are protected and advanced. One important reason for this is that under ANCSA, it is the ANCs, rather than the tribal governments, that are the caretakers and managers of the conveyed lands, which lands constitute all that remains of the traditional homelands of Alaska Native peoples.

NOS Response: NOS recognizes its responsibility to conduct consultation when federal actions and decisions may have implications on ANCs. NOS appreciates that the Calista Corporation may also want to engage in consultation for this Proposed Action. NOS would like to assure the Calista Corporation that NOS recognizes its responsibility to conduct consultation with federally recognized ANCs on the same basis as federally recognized Indian tribes under EO 13175 (Public Law (Pub. L.) 108-199, 118 Stat. 452, as amended by Pub. L. 108-447, 118 Stat. 3267).

NOS understands that protecting Alaska Native subsistence resources is vital. NOS is committed to ongoing communication with both federally recognized tribes and ANCs to understand the implications of NOS activities in Alaska and to mitigate the effects on subsistence activities, food security, and climate change.

Cultural and Historic Resources-27: ANCs should receive notice of all Tribal consultation notices provided to federally recognized Tribes within their respective regions.

NOS Response: NOS recognizes its responsibility to conduct consultation when federal actions and decisions may have implications on ANCs. NOS appreciates that the Calista Corporation may also want to engage in consultation for this Proposed Action. NOS would

like to assure you that NOS recognizes its responsibility to conduct consultation with federally recognized ANCs on the same basis as federally recognized Indian tribes under EO 13175 (Pub. L. 108-199, 118 Stat. 452, as amended by Pub. L. 108-447, 118 Stat. 3267). Please feel free to contact us if you would like to engage in consultation under EO 13175 for this Proposed Action.

NOS understands that protecting Alaska Native subsistence resources is vital. NOS is committed to ongoing communication with both federally recognized tribes and ANCs to understand the implications of NOS activities in Alaska and to mitigate the effects on subsistence activities, food security, and climate change.

Future Coordination-12: Moreover, because of the split surface-subsurface land ownership under ANCSA (Regional Corporations predominantly own subsurface lands, while Village Corporations predominantly own surface lands), it is imperative that ANCs be notified of any NOAA initiatives that may impact ANC lands and natural resources. This will enable Calista and the YK Region Village Corporations to support and work with the Tribes on issues of common concern. The NOAA NOS may not be aware of implications to ANC lands, projects, and resources unless potentially impacted ANCs, who own and manage the land, are invited to consult and given the opportunity to weigh in on any unforeseen lands and natural resources impacts.

NOS Response: NOS understands that protecting Alaska Native subsistence resources is vital. NOS is committed to ongoing communication with both federally recognized tribes and ANCs to understand the implications of NOS activities in Alaska and to mitigate the effects on subsistence activities, food security, and climate change. NOS would like to assure you that it recognizes its responsibility to conduct consultation with federally recognized ANCs on the same basis as federally recognized Indian tribes under EO 13175 (Public Law (Pub. L.) 108-199, 118 Stat. 452, as amended by Pub. L. 108-447, 118 Stat. 3267). Please feel free to contact NOS if you would like to engage in consultation under EO 13175 for this Proposed Action.

Purpose and Need-5: Calista supports the purpose of the proposed action, “to gather accurate and timely data on the marine and coastal environment,” and also the need for the proposed action, “to ensure safety at sea, economic well- being, and the efficient stewardship of public trust resources.”

NOS Response: Thank you for your comment and support of the purpose and need for the Proposed Action.

Alternatives-4: Alternative C aligns well with this purpose and need, and is consistent with Calista’s goal of better understanding and protecting the marine environment of the YK Region in order to protect our subsistence way of life.

NOS Response: Thank you for your support of Alternative C. Alaska continues to be a mapping priority for NOS.

2.4 Catawba Tribal Historic Preservation Officer (Wenonah Haire)

2.4.1 Comment Submission

From: NOSAA Environmental Compliance - NOAA Service Account
To: Wendy.Grome@solvllc.com; Michelle.Smyk@solvllc.com
Subject: Fwd: NOAA National Ocean Service Releases Draft PEIS for Surveying and Mapping Projects
Date: Friday, June 25, 2021 7:08:02 PM

First request to print! See address below.

v/r
Giannina DiMaio
NOS Environmental Compliance Coordinator
Pronouns: she/her/hers

NOAA, National Ocean Service
Office of the Assistant Administrator
1305 East-West Hwy, SSMC4 13th Floor
Silver Spring, MD 20910
V: 240-533-0918
nosaa.ec@noaa.gov

---------- Forwarded message ---------
From: **Wenonah Haire** <wenonah.haire@catawba.com>
Date: Fri, Jun 25, 2021 at 7:05 PM
Subject: Re: NOAA National Ocean Service Releases Draft PEIS for Surveying and Mapping Projects
To: NOSAA Environmental Compliance - NOAA Service Account <nosaa.ec@noaa.gov>

Sorry but we have to have all documents in hard copy format. Please send in care of Caitlin Rogers at 1536 Tom Steven Road, Rock Hill, SC. 29730.

Sincerely,
Wenonah g. Haire, DMD

Sent from my iPhone

> On Jun 25, 2021, at 5:46 PM, NOSAA Environmental Compliance - NOAA Service Account <nosaa.ec@noaa.gov> wrote:
>
> Dear Tribal Historic Preservation Officer,
>
> The National Oceanic and Atmospheric Administration (NOAA) National Ocean Service (NOS) has prepared a Draft Programmatic Environmental Impact Statement (PEIS) for S*urveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition* pursuant to the National Environmental Policy Act. The Draft PEIS is now available for a 60-day public comment ending August 24, 2021. The Notice of Availability was

published today in the *Federal Register.*

The Draft PEIS analyzes the potential environmental impacts of recurring surveying and mapping data collection in United States coastal and marine waters over a period of six years. The analysis in this document covers the use of active acoustic equipment such as sub-bottom profilers, single beam and multibeam echo sounders, and side-scan sonars by NOS to collect data on the depths and shapes of underwater terrain, including the ocean, rivers, and lakes. The Draft PEIS analyzes impacts to critical environmental resources such as marine mammals, endangered and threatened species, and cultural and historic resources. The document can be found on the NOS Surveying and Mapping Draft PEIS website at https://oceanservice.noaa.gov/about/environmental-compliance/surveying-mapping.html.

Attached is the notification letter with additional information regarding the Draft PEIS.

If you have any questions, please feel free to contact me by phone at 240-533-0918 or email at nosaa.ec@noaa.gov.

v/r
Giannina DiMaio
NOS Environmental Compliance Coordinator
Pronouns: she/her/hers

NOAA, National Ocean Service
Office of the Assistant Administrator
1305 East-West Hwy, SSMC4 13th Floor
Silver Spring, MD 20910
V: 240-533-0918
nosaa.ec@noaa.gov
<NOS Surveying and Mapping DPEIS Notification Letter - THPO 06252021.pdf>

2.4.2 NOS Response

Out of Scope-1: Sorry but we have to have all documents in hard copy format. Please send in care of Caitlin Rogers at 1536 Tom Steven Road, Rock Hill, SC. 29730.

> **NOS Response:** A copy of the Draft PEIS was mailed to this contact at the address provided on June 30, 2021.

2.5 Chickahominy Indian Tribe (Stephen Adkins)

2.5.1 Comment Submission

August 24, 2021

Chief Stephen Adkins
8200 Lott Cary Road
Providence Forge, VA 23140

Giannina DiMaio
DOC/NOAA/NOS
Environmental Compliance Coordinator
SSMC4-Station 13612
1305 East West Highway
Silver Spring, MD 20910
Submitted electronically via Regulations.gov

Re: Public Comment on NOAA-NOS-2021-0055 National Oceanic and Atmospheric Administration (NOAA) National Ocean Service (NOS) Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition

Dear Ms. DiMaio,

The Chickahominy Indian Tribe (Tribe) appreciates the opportunity to comment on the Draft Programmatic Environmental Impact Statement (PEIS) for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition. We are a federally recognized tribe located in Virginia on the watershed of the Chickahominy River. The Tribe has over 970 tribal citizens, most of whom live near the Chickahominy Tribal Office and the tribe's historic Samaria Indian Baptist Church in Charles City County. The Tribe was acknowledged by the federal government in 2018 by the Thomasina E. Jordan Act and our service and trust areas consist of Henrico, Charles City, New Kent, and James City Counties.

Because of the location of Chickahominy contemporary and ancestral territory, the Tribe is most concerned about potential impacts affecting the Virginia coastline, Chesapeake Bay, and any activities where anadromous fish or other species might return from to the James River watershed. This is predominantly in the Southeast Region but may include small portions of the Greater Atlantic Region of the PEIS study areas especially for migratory species. The Tribe requests that NOAA extend the comments deadline and evaluate more closely the Surveying and Mapping Projects' potential impacts on species of significance to Virginia Algonquian tribes, cultural and historic properties, and to tribes, tribal governments, and tribal trust resources.

1. **NOAA should extend the comment deadline on this Environmental Impact Statement**

This PEIS is almost 700 pages long with over 260 pages of appendices and is highly technical. A sixty-day review time is not sufficient for such a broad PEIS of such complexity, and the Tribe requests that NOAA extends the review time for an additional 60 days. In addition, the Tribe recommends that National Historic Preservation Act consultation on this federal action should be accompanied by regional area meetings and presentations to allow tribal communities to discuss the proposed actions within their areas of interest in more detail.

2. **The Tribe is especially concerned about anadromous fish species and other potential environmental effects that could impact plants and animals of traditional significance to the Chickahominy**

The Chickahominy Indian Tribe is especially interested in the surveying results for species such as shad, striped and largemouth bass, sturgeon, blueback herring, and alewife. The Tribe is a signatory to the 1677 Treaty of Middle Plantation, which enumerates the rights of Virginia tribal communities who negotiated a peace settlement with the English crown. Article VII explicitly assures the Indians rights to "their wonted conveniences of oystering, fishing, and gathering [of various plants]" used by Virginia tribes to support themselves. Fishing has been significant to Chickahominy people since well before English contact, and fishing has remained a very important practice for our Tribe.[1]

The PEIS acknowledges that fish species with swim bladders (like sturgeon, herrings, and American shad) are susceptible to barotrauma from sound waves associated with some surveying equipment, and some have sensitive hearing and may be affected by hearing noises of survey systems. Some, like Atlantic sturgeon, are also threatened or endangered. The PEIS acknowledges that survey equipment, vessels, and ROV and autonomous vehicle operations may disturb animals from preferred feeding or breeding grounds or may cause discomfort for some species. However, effects of these types of activities are routinely characterized as insignificant, minimal, or unlikely. The Tribe requests that reviews of specific surveying activities provide more detail regarding the rationale for characterizing these adverse effects as minimal.

The Tribe also observes that there are no references in the PEIS to fish hatchery, research, and restoration efforts conducted by Virginia Tidewater tribes. The EIS should be revised to include information regarding the Pamunkey NOAA Species Recovery grant to study Atlantic sturgeon, the shad fishery and hatchery on the Pamunkey Indian reservation, and the impacts on Virginia tribes of over-fishing and environmental damage that inhibited fish populations. The surveying and mapping that this PEIS contemplates should generally be used to encourage more consideration of the tribe trust rights of Virginia Tribes and to evaluate impacts of the culturally important fish populations and species health issues.[2]

---

[1] See Stern, Theodore. 1952. Chickahominy: The Changing Culture of a Virginia Indian Community. Proceedings of the American Philosophical Society 96(2): 157-225.

[2] For more details, see Jenkins, Alexis. 2019. Remembering the River: Traditional Fishery Practices, Environmental Change and Sovereignty on the Pamunkey Indian Reservation. Undergraduate thesis. https://scholarworks.wm.edu/cgi/viewcontent.cgi?article=2437&context=honorstheses

3. **NOAA acknowledges that the impacts of the activities permitted under this PEIS to cultural resources, historic properties, and Tribes could be severe, but does not provide much insight or specifics about how it intends to identify, evaluate, avoid, or mitigate these effects**

NOS states that this PEIS will have a moderate adverse impact on cultural and historical resources but claims that this impact would be "insignificant." In Section 3.3.6, NOS states that they will coordinate with the Advisory Council on Historic Preservation to develop approaches for addressing potential cultural resources impacts of these programmatic activities. In Section 3.11.2.2.3, NOAA acknowledges that the installation of tidal gauges could destroy part or all of historic properties in the project area. In Section 3.11.2.2.4, NOAA acknowledges that activities permitted under this PEIS could have effects on reservations or villages, impact tribal trust resources, affect facilities or entities owned or operated by tribes, affect Tribes, tribal governments, and traditional lifeways, and affect TCPs or traditional use areas.

NOAA should provide more information regarding how it intends to consult with ACHP and tribes and should provide greater information regarding how the agency intends to identify tribes to reach out to for consultation on a given program or action. The Tribe requests that given NOAA's acknowledgement that such significant impacts to Tribes and historic properties may occur, the agency develop a separate report analyzing how permitted actions in the Surveying and Mapping program might have such effects and propose how it intends to identify, evaluate, avoid, and mitigate such effects.

4. **The Tribe requests that surveying and mapping projects include archaeological equipment, staff, and expertise wherever practicable**

While these activities provide significant risks to tribal, historic, and cultural resources, the planned surveying and mapping of the oceans off the coasts also provide an opportunity to evaluate submerged archaeological resources with very little additional cost, as the vessels and equipment will likely be making similar survey routes and using similar approaches for survey as would be needed for archaeological evaluations. The Tribe requests that NOAA examine ways that draped multibeam and sub-bottom profilers calibrated for archaeological data collection could be added to NOAA survey vessels wherever possible, and that NOAA comprehensively evaluates projects where archaeological data gathering on paleochannels and paleolandscapes of interest to tribes could be gathered during the completion of other types of research. Currently, the coast of Virginia has received much less marine archaeology evaluation compared with the northeast Atlantic and the Gulf Coast, and this is a needed corrective so that the potential impacts to offshore cultural resources of importance to tribes can be more readily identified.

Thank you for the opportunity to comment on the National Oceanic Service Survey and Mapping Draft Programmatic EIS.

Respectfully,

Chief Stephen Adkins
Chickahominy Indian Tribe

2.5.2 NOS Response

Fish-5: Because of the location of Chickahominy contemporary and ancestral territory, the Tribe is most concerned about potential impacts affecting the Virginia coastline, Chesapeake Bay, and any activities where anadromous fish or other species might return from to the James River watershed. This is predominantly in the Southeast Region but may include small portions of the Greater Atlantic Region of the PEIS study areas especially for migratory species. The Tribe requests that NOAA extend the comments deadline and evaluate more closely the Surveying and Mapping Projects' potential impacts on species of significance to Virginia Algonquian tribes, cultural and historic properties, and to tribes, tribal governments, and tribal trust resources…2. The Tribe is especially concerned about anadromous fish species and other potential environmental effects that could impact plants and animals of traditional significance to the Chickahominy

The Chickahominy Indian Tribe is especially interested in the surveying results for species such as shad, striped and largemouth bass, sturgeon, blueback herring, and alewife.

> **NOS Response:** EO 13175 and the NOAA Tribal Consultation Handbook provide required procedures for consultation with federally recognized Tribes in recognition of the sovereignty of federally recognized Tribes and the federal government's trust responsibility to those tribes. NOS would also continue to facilitate Tribal involvement related to planned projects throughout the action area. NOS will coordinate with your office about projects in Virginia waters about potential impacts on species of significance to Virginia Algonquian tribes; impacts are expected to be small.
>
> After receiving your comment, NOS extended the original 60-day public comment period deadline by 90 days from August 24, 2021 to November 22, 2021.
>
> Section 3.7.2 of the PEIS discusses that underwater acoustic sources have not been known to cause direct injury or mortality to fish, and that direct injuries (e.g., barotrauma) from sound sources used by NOS are unlikely because of slow rise times, lack of strong shock waves, and relatively low peak pressures. The Final PEIS also discusses that vessels, remotely operated vehicles (ROVs), and survey equipment can disturb and displace nearby fish, interrupt feeding, cause other behavior modifications, and possibly mask biologically important signals; such impacts would vary among species as most fish cannot hear the higher frequencies emitted by vessel, ROV, and equipment sound, except for perhaps shad, river herring, and menhaden. Therefore, impacts are expected to be adverse and negligible as they would be limited to temporary behavioral and stress-startle responses to individual fish or schools of fish found within the project area. The severity of effects on shad, river herring, and menhaden, species that can potentially hear the higher frequencies of vessel sound, could be somewhat higher but are not expected to be more than minor, as impacts would still be temporary or short-term, may include some stress responses without permanent physiological damage, and may disturb breeding, feeding, or other activities but without any impacts on population levels. Any displacement of fish would be short-term and limited to the NOS project area or its immediate surroundings.

This PEIS does not cover fisheries research, which is conducted by NOAA's Fisheries Science Centers. NOS conducts benthic habitat surveys, and results may be found at https://products.coastalscience.noaa.gov/collections/benthic/default.aspx.

NEPA Process-10: 1. NOAA should extend the comment deadline on this Environmental Impact Statement.

This PEIS is almost 700 pages long with over 260 pages of appendices and is highly technical. A sixty-day review time is not sufficient for such a broad PEIS of such complexity, and the Tribe requests that NOAA extend the review time for an additional 60 days.

NOS Response: NOS extended the original 60-day public comment period deadline by 90 days from August 24, 2021 to November 22, 2021(86 FR 47299).

Cultural and Historic Resources-22: In addition, the Tribe recommends that National Historic Preservation Act consultation on this federal action should be accompanied by regional area meetings and presentations to allow tribal communities to discuss the proposed actions within their areas of interest in more detail.

NOS Response: NOS intends to notify individual tribes pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation at any time for a proposed action that may have tribal implications.

NOS will also initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources. NOS will consider providing regional meetings if interest is expressed after consultation is initiated.

Fish-6: The PEIS acknowledges that fish species with swim bladders (like sturgeon, herrings, and American shad) are susceptible to barotrauma from sound waves associated with some surveying equipment, and some have sensitive hearing and may be affected by hearing noises of survey systems. Some, like Atlantic sturgeon, are also threatened or endangered. The PEIS acknowledges that survey equipment, vessels, and ROV and autonomous vehicle operations may disturb animals from preferred feeding or breeding grounds or may cause discomfort for some species. However, effects of these types of activities are routinely characterized as insignificant, minimal, or unlikely. The Tribe requests that reviews of specific surveying activities provide more detail regarding the rationale for characterizing these adverse effects as minimal.

NOS Response: The PEIS uses the best available information to evaluate impacts on fish species. As discussed in Section 3.7.2 of the Final PEIS, adverse effects from NOS activities are possible for the small numbers of individual fish that could occur in close proximity (i.e., within several meters) to an active sound source. Generally, adverse effects on a species can be considered significant if they result in a reduction in the overall health and viability of a population. However, given the localized and transient spatial scale of no more than a few NOS projects occurring at any one time, relative to the generally large-scale distribution of fish populations and the considerably narrow beam characteristics of equipment such as echo sounders, no population level effects are expected on marine or freshwater fish.

Environmental Justice-13: The Tribe also observes that there are no references in the PEIS to fish hatchery, research, and restoration efforts conducted by Virginia Tidewater tribes. The EIS should be revised to include information regarding the Pamunkey NOAA Species Recovery grant to study Atlantic sturgeon, the shad fishery and hatchery on the Pamunkey Indian reservation, and the impacts on Virginia tribes of over-fishing and environmental damage that inhibited fish populations. The surveying and mapping that this PEIS contemplates should generally be used to encourage more consideration of the tribe trust rights of Virginia Tribes and to evaluate impacts of the culturally important fish populations and species health issues.2

> **NOS Response:** Thank you for your comment. Fish hatchery, research, and restoration efforts conducted by Virginia Tidewater tribes and the Pamunkey NOAA Species Recovery grant are not expected to be impacted by the Proposed Action.
>
> NOS determined that a programmatic approach was appropriate because NOS conducts, authorizes, permits, and funds a suite of similar, ongoing data collection activities associated with recurring projects across a wide geographic area to characterize underwater features (e.g., habitat, bathymetry, marine debris). This Draft PEIS is a comprehensive document that provides detailed programmatic effects analyses for surveying and mapping data collection activities based on regional conditions, habitat types, species, and other factors. However, the Draft PEIS does not identify the specific time or place for individual projects or activities over the next five years. The analysis will be used to inform NOS leadership and the public on the environmental impacts of these activities before a decision is made on how to execute each project. All projects will require a project-specific review by NOS before proceeding.
>
> NOS agrees that surveying and mapping data could be useful to evaluate and protect tribal trust fisheries resources. NOS coastal and marine data support ecosystem stewardship, such as fisheries research and restoration work by the Virginia Tidewater Tribes. For instance, bathymetric base layers provide valuable information about essential habitat for fish.
>
> Tribes and the public can reach out to NOAA Navigation Managers to engage in the planning process for future surveying and mapping projects. Information regarding contacting NOAA Navigation Managers can be found at the following website: https://nauticalcharts.noaa.gov/customer-service/regional-managers/index.html.
>
> NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources.
>
> NOS intends to notify individual tribes pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation at any time for a proposed action that may have tribal implications.

Cultural and Historic Resources-23: 3. NOAA acknowledges that the impacts of the activities permitted under this PEIS to cultural resources, historic properties, and Tribes could be severe,

but does not provide much insight or specifics about how it intends to identify, evaluate, avoid, or mitigate these effects.

NOS states that this PEIS will have a moderate adverse impact on cultural and historical resources but claims that this impact would be "insignificant." In Section 3.3.6, NOS states that they will coordinate with the Advisory Council on Historic Preservation to develop approaches for addressing potential cultural resources impacts of these programmatic activities. In Section 3.11.2.2.3, NOAA acknowledges that the installation of tidal gauges could destroy part or all of historic properties in the project area. In Section 3.11.2.2.4, NOAA acknowledges that activities permitted under this PEIS could have effects on reservations or villages, impact tribal trust resources, affect facilities or entities owned or operated by tribes, affect Tribes, tribal governments, and traditional lifeways, and affect TCPs or traditional use areas. NOAA should provide more information regarding how it intends to consult with ACHP and tribes and should provide greater information regarding how the agency intends to identify tribes to reach out to for consultation on a given program or action

> **NOS Response:** Significance criteria and determinations presented in the PEIS were developed for the purpose of compliance with NEPA. Impacts that would be considered major and significant are defined in Table 3.11-1; none of the potential impacts from NOS activities were evaluated to be major and significant under NEPA.
>
> While the Draft PEIS will be used to inform NOS responsibilities under NHPA, NOS will comply with Section 106 of the NHPA for any activity that has the potential to affect cultural or historic resources as described in the regulations at 36 Code of Federal Regulations (CFR) 800.8, regardless of the NEPA impact category.
>
> NOS will conduct project-specific NHPA consultations before commencing any project with the potential to affect cultural or historic resources. NOS intends to notify individual tribes before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation under EO 13175 at any time.

Cultural and Historic Resources-24: The Tribe requests that given NOAA's acknowledgement that such significant impacts to Tribes and historic properties may occur, the agency [should] develop a separate report analyzing how permitted actions in the Surveying and Mapping program might have such effects and propose how it intends to identify, evaluate, avoid, and mitigate such effects.

> **NOS Response:** Adverse effects were analyzed as required for compliance with NEPA. No significant adverse impacts to cultural and historic resources are expected under any alternative of the Proposed Action (See Sections 3.11.2.2 - 3.11.2.4). NOS intends to notify individual tribes before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation under EO 13175 at any time.

Cultural and Historic Resources-25: 4. The Tribe requests that surveying and mapping projects include archaeological equipment, staff, and expertise wherever practicable.

While these activities provide significant risks to tribal, historic, and cultural resources, the planned surveying and mapping of the oceans off the coasts also provide an opportunity to evaluate submerged archaeological resources with very little additional cost, as the vessels and equipment will likely be making similar survey routes and using similar approaches for survey as would be needed for archaeological evaluations. The Tribe requests that NOAA examine ways that draped multibeam and sub-bottom profilers calibrated for archaeological data collection could be added to NOAA survey vessels wherever possible, and that NOAA comprehensively evaluates projects where archaeological data gathering on paleochannels and paleolandscapes of interest to tribes could be gathered during the completion of other types of research. Currently, the coast of Virginia has received much less marine archaeology evaluation compared with the northeast Atlantic and the Gulf Coast, and this is a needed corrective so that the potential impacts to offshore cultural resources of importance to tribes can be more readily identified.

NOS Response: Adverse effects were analyzed as required for compliance with NEPA. No significant adverse impacts to cultural and historic resources are expected under any alternative of the Proposed Action (See Sections 3.11.2.2 - 3.11.2.4).

All data collected by NOS is made publicly available to the extent allowed by federal law. Tribes and the public can reach out to NOAA Navigation Managers to engage in the planning process for future surveying and mapping projects. Information regarding contacting NOAA Navigation Managers can be found at the following website: https://nauticalcharts.noaa.gov/customer-service/regional-managers/index.html.

2.6 Commonwealth of the Northern Mariana Islands Division of Coastal Resources Management (Arthur Charfauros)

2.6.1 Comment Submission

Dear Ms. DiMaio,

Thank you for the opportunity to review and comment on the National Oceanic and Atmospheric Administration (NOAA) National Ocean Service (NOS) Surveying and Mapping Draft Programmatic Environmental Impact Statement (PEIS). Please see comments regarding this Draft PEIS from the Commonwealth of the Northern Mariana Islands (CNMI) Division of Coastal Resources Management (DCRM). We hope to have continued collaboration leading up to a CZMA determination for the programmatic actions, and any supplemental activities throughout the life of the project.

- 1.3.1 describes how project or site-specific review or analysis will be conducted, wherein the majority of future projects would not require additional project-specific analysis. For some potential projects such as installation of buoys or other large anchoring masses, especially those that trigger federal permits and are within the coastal zone, we request further coordination with our office as these potential projects materialize. For any addendum of activities or subsequent phases beyond the timeframe of the program that may have additional coastal effects which are not listed within the purview of the PEIS, CNMI DCRM encourages continued coordination pursuant to §930.34.

-Page xxii lists the acronym and abbreviation for the Coral Reef Conservation Program (CRCP), which is part of NOAA's Office for Coastal Management (OCM). The CRCP includes research and monitoring to assess coral reef and other marine ecosystems, however it is unclear whether the program is included in the Draft PEIS.

- Would Executive Order 13352-Facilitation of Cooperative Conservation be applicable under 3.3.8 Executive Orders?

- Presidential Proclamation 8335 established the Marianas Trench Marine National Monument (MTNM) under the authority of the Antiquities Act. Why was there no mention of the MTNM or the Antiquities Act, although the MTNM is within the project scope?

-The Submerged Lands Act (SLA) (43 U.S.C. §§ 1301 et seq.) is referenced on page 62 pertaining to the Archaeological Resources Protection Act (ARPA) stating that the permit system established under ARPA applies to federal marine protected areas and submerged lands which were not transferred under the SLA. SLA is not listed under Acronyms and Abbreviations, and there is minimal information regarding its applicability throughout the Draft PEIS. For the CNMI, SLA includes Public Law 94-241, Public Law 93-435, Public Law 113-34, Proclamation 9077, and also involves the MTNM. There should be more substantive analysis within the PEIS between the relevance of federal laws and regulations for the SLA, the MTNM, and NOS's proposed activities within the region.

2.6.2 NOS Response

CZMA-1: For some potential projects such as installation of buoys or other large anchoring masses, especially those that trigger federal permits and are within the coastal zone, we request further coordination with our office as these potential projects materialize.

> **NOS Response:** NOS provided Consistency Determination (CD) letters to all coastal states and territories with approved Coastal Management Programs (CMPs). The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under CZMA. Potential requirements for future coordination will be developed through the CZMA process.

CZMA-2: For any addendum of activities or subsequent phases beyond the timeframe of the program that may have additional coastal effects which are not listed within the purview of the PEIS, CNMI DCRM encourages continued coordination pursuant to §930.34.

> **NOS Response:** NOS does not intend to pursue a phased consistency determination under 15 CFR 930.36(d). NOS will continue to coordinate under CZMA for all future projects, as appropriate.

Scope-2: The CRCP includes research and monitoring to assess coral reef and other marine ecosystems, however it is unclear whether the program is included in the Draft PEIS.

> **NOS Response:** The NOS PEIS addresses surveys and related projects undertaken by NOS. These projects may include those NOS survey and mapping activities funded by the Coral Reef Conservation Program (CRCP). The CRCP Final PEIS can be found online at: https://coast.noaa.gov/data/coralreef_noaa_gov/about/resources/CRCP_FPEIS_07132020_NS_508c.pdf.

Scope-3: Would Executive Order 13352-Facilitation of Cooperative Conservation be applicable under 3.3.8 Executive Orders?

> **NOS Response:** Yes, EO 13352 Facilitation of Cooperative Conservation would be applicable and has been added in Section 3.3.8.

Scope-4: Presidential Proclamation 8335 established the Marianas Trench Marine National Monument (MTNM) under the authority of the Antiquities Act. Why was there no mention of the MTNM or the Antiquities Act, although the MTNM is within the project scope?

> **NOS Response:** The Proposed Action could occur anywhere in U.S. waters, including state waters, marine protected areas (MPAs), and other special status areas. The Marianas Trench Marine National Monument (MTNM) is within the geographic scope; however, there are no consultation requirements under the Antiquities Act for the MTNM that require detailed discussion of the resources within the MTNM. The analysis of impacts to resources in the NOS PEIS includes resources within marine national monuments.

Scope-5: SLA is not listed under Acronyms and Abbreviations, and there is minimal information regarding its applicability throughout the Draft PEIS.

NOS Response: Submerged Lands Act (SLA) has been added to the list of acronyms and abbreviations for the Final PEIS. The SLA (43 U.S. Code [U.S.C.] § 1301 et seq.) establishes the title of the states to submerged navigable lands within their boundaries including navigable waterways, such as rivers, as well as marine waters within the state's boundaries, generally 3 nautical miles (nm) (5.6 kilometers [km]) from the coastline. State and territory offshore waters are part of the action area for the PEIS. The analysis in the PEIS considers projects that could take place on submerged lands as defined in the SLA.

Scope-6: There should be more substantive analysis within the PEIS between the relevance of federal laws and regulations for the SLA, the MTNM, and NOS's proposed activities within the region.

NOS Response: The Proposed Action could occur anywhere in U.S. waters, including state waters, MPAs, and other special status areas. NOS will follow all federal requirements for operating in state and territory waters, including the MTNM. Due to the extensive scope of the Proposed Action, the PEIS does not include an exhaustive list of applicable federal environmental laws, regulations, and EOs.

NOS provided CD letters to all coastal states and territories with approved CMPs. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under CZMA. Potential requirements for future coordination will be developed through the CZMA process.

2.7 Connecticut State Historic Preservation Officer (Jonathan Kinney)

2.7.1 Comment Submission

Connecticut

Department of Economic and Community Development

State Historic Preservation Office

July 16, 2021

Ms. Giannina DiMaio
National Oceanic and Atmospheric Administration
National Ocean Service
1305 East West Highway
Silver Spring, Maryland 20910
(sent via email only to nosaa.ec@noaa.gov)

Subject: *Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition*
Long Island Sound, Connecticut

Dear Ms. DiMaio:

The Connecticut State Historic Preservation Office (CT SHPO) has reviewed the referenced Draft Programmatic Environmental Impact Statement (PEIS) and provides the following comments only as it pertains to activities in the Connecticut waters of Long Island Sound. The mission of the National Ocean Service (NOS) is to provides data, tools, and services to support coastal economies. The Office of Coast Survey within NOS uses acoustic technology for developing and upgrading charts, surveying the seafloor, responding to maritime emergencies, and searching for underwater obstructions that pose a danger to navigation. The primary goals and activities of NOS also can afford additional protection to our State's important cultural resources through identification and avoidance.

Although only small portions of Long Island Sound have been subjected to previous cultural resources surveys, several properties eligible for listing or listed on the National Register of Historic Places have been reported. However, CT SHPO concurs with NOS that the proposed activities described in the PEIS are not likely to affect significant historic or cultural resources. Our office also understands that if NOS determines that an activity has the potential for adverse impacts, CT SHPO will have the opportunity for additional consultation to avoid or minimize those effects.

SHPO appreciates the opportunity to review and comment upon this important planning document and we look forward to additional consultation, as needed. For additional information, please contact Catherine Labadia, Environmental Reviewer, at (860) 500-2329 or catherine.labadia@ct.gov.

Sincerely,

Jonathan Kinney
Deputy State Historic Preservation Officer

2.7.2 NOS Response

Purpose and Need-2: The primary goals and activities of NOS also can afford additional protection to our State's important cultural resources through identification and avoidance.

> **NOS Response:** We agree and look forward to working with the Connecticut SHPO for the protection of cultural resources.

Cultural and Historic Resources-4: CT SHPO concurs with NOS that the proposed activities described in the PEIS are not likely to affect significant historic or cultural resources. Our office also understands that if NOS determines that an activity has the potential for adverse impacts, CT SHPO will have the opportunity for additional consultation to avoid or minimize those effects.

> **NOS Response:** Thank you for your careful consideration and your input. NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources.

2.8 Cultural Heritage Partners (representing the Upper Mattaponi Indian Tribe) (Marion F. Werkheiser)

2.8.1 Comment Submission

August 24, 2021

DOC/NOAA/NOS
Environmental Compliance Coordinator
SSMC4-Station 13612
1305 East West Highway
Silver Spring, MD 20910
Submitted electronically via Regulations.gov

Re: Public Comment on NOAA-NOS-2021-0055 National Oceanic and Atmospheric Administration (NOAA) National Ocean Service (NOS) Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition

Dear Ms. DiMaio,

Our law firm represents the Upper Mattaponi Indian Tribe. We write regarding the Draft Programmatic Environmental Impact Statement (PEIS) for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition.

The Upper Mattaponi Indian Tribe is a federally recognized sovereign tribe, headquartered in King William County. The Upper Mattaponi were members of the Powhatan chiefdom and have significant cultural affiliation to the Mattaponi River, the James River watershed, and environmental impacts in the Chesapeake Bay. Citizens of the Nation are descended from a Virginia Algonquian tribe residing in the Mattaponi watershed. One of the Tribe's villages recorded by Captain John Smith was the village of Passaunkack, at the location of the present day Upper Mattaponi. Particularly important consultation areas include their historic area of Adamstown near Central Garage, the Mattaponi Indian Reservation, and the general area between the Pamunkey and the Mattaponi rivers. At this time, the most active Upper Mattaponi cultural resources consultation areas include King William, Caroline, Hanover, King and Queen, and New Kent Counties. The Tribe may also have consultation interests anywhere in the Middle Peninsula or the Northern Neck. The Tribe has environmental consultation areas anywhere where a project may affect the water or air quality in the above areas, the Chesapeake Bay, or the Atlantic Ocean.

Because of the location of Upper Mattaponi contemporary and ancestral territory, the Tribe is most concerned about potential impacts affecting the Virginia coastline, Chesapeake Bay, and any activities where anadromous fish or other species might return from to the James River watershed. This is predominantly in the Southeast Region, but may include small portions of the Greater Atlantic Region of the PEIS study areas especially for migratory species. The Tribe requests that NOAA evaluate more closely the Surveying and Mapping Projects' potential

impacts on species of significance to Virginia Algonquian tribes, cultural and historic properties, and to tribes, tribal governments, and tribal trust resources.

1. **NOAA should extend the comment deadline on this Environmental Impact Statement**

This PEIS is almost 700 pages long with over 260 pages of appendices and is highly technical. A sixty-day review time is not sufficient for such a broad PEIS of such complexity, and the Tribe requests that NOAA extends the review time for an additional 60 days. In addition, the Tribe recommends that National Historic Preservation Act consultation on this federal action should be accompanied by regional area meetings and presentations to allow tribal communities to discuss the proposed actions within their areas of interest in more detail.

2. **The Tribe is especially concerned about anadromous fish species and other potential environmental effects that could impact plants and animals of traditional significance to the Upper Mattaponi**

The Upper Mattaponi Indian Tribe is especially interested in the surveying results for species such as shad, striped and largemouth bass, sturgeon, blueback herring, and alewife. The Tribe is a signatory to the 1677 Treaty of Middle Plantation, which enumerates the rights of Virginia tribal communities who negotiated a peace settlement with the English crown. Article VII explicitly assures the Indians rights to "their wonted conveniences of oystering, fishing, and gathering [of various plants]" used by Virginia tribes to support themselves. Fishing has been significant to Mattaponi people since well before English contact, and fishing has remained a very important practice for the Tribe.

The PEIS acknowledges that fish species with swim bladders (like sturgeon, herrings, and American shad) are susceptible to barotrauma from sound waves associated with some surveying equipment, and some have sensitive hearing and may be affected by hearing noises of survey systems. Some of these fish, like Atlantic sturgeon, are also threatened or endangered. The PEIS acknowledges that survey equipment, vessels, and ROV and autonomous vehicle operations may disturb animals from preferred feeding or breeding grounds or may cause discomfort for some species. However, the effects of these types of activities are routinely characterized as insignificant, minimal, or unlikely. The Tribe requests that reviews of specific surveying activities provide much more detail regarding the rationale for these minimal assessments of adverse effects.

The Tribe also observes that there are no references in the PEIS to fish hatchery, research, and restoration efforts conducted by Virginia Tidewater tribes. The EIS should be revised to include information regarding the Pamunkey NOAA Species Recovery grant to study Atlantic sturgeon, the shad fishery and hatchery on the Pamunkey and Mattaponi Indian reservations, and the impacts on Virginia tribes of over-fishing and environmental damage that inhibited the fish populations. The surveying and mapping that this PEIS contemplates should generally be used to

encourage more consideration of the tribe trust rights of Virginia Tribes and to evaluate tribal impacts of these fish population and species health issues.[1]

3. **NOAA acknowledges that the impacts of the activities permitted under this PEIS to cultural resources, historic properties, and Tribes could be severe, but does not provide much insight or specifics about how it intends to identify, evaluate, avoid, or mitigate these effects**

NOS states that this PEIS will have a moderate adverse impact on cultural and historical resources, but claims that this impact would be "insignificant." In Section 3.3.6, NOS states that they will coordinate with the Advisory Council on Historic Preservation to develop approaches for addressing potential cultural resources impacts of these programmatic activities. In Section 3.11.2.2.3, NOAA acknowledges that the installation of tidal gauges could destroy part or all of historic properties in the project area. In Section 3.11.2.2.4, NOAA acknowledges that activities permitted under this PEIS could have effects on reservations or villages, impact tribal trust resources, affect facilities or entities owned or operated by tribes, affect Tribes, tribal governments, and traditional lifeways, and affect TCPs or traditional use areas.

NOAA should provide more information regarding how it intends to consult with ACHP and tribes, and should provide greater information regarding how the agency intends to identify tribes to reach out to for consultation on a given program or action. The Tribe requests that given NOAA's acknowledgement that such significant impacts to Tribes and historic properties may occur, that the agency develop a separate report analyzing how permitted actions in the Surveying and Mapping program might have such effects and propose how it intends to identify and evaluate such effects.

4. **The Tribe requests that surveying and mapping projects include archaeological equipment, staff, and expertise wherever practicable**

While these activities provide significant risks to tribal, historic, and cultural resources, the planned surveying and mapping of the oceans off the coasts also provide an opportunity to evaluate submerged archaeological resources with very little additional cost, as the vessels and equipment will likely be making similar survey routes and using similar approaches for survey as would be needed for archaeological evaluations. The Tribe requests that NOAA examine ways that draped multibeam and sub-bottom profilers calibrated for archaeological data collection could be added to NOAA survey vessels wherever possible, and that NOAA comprehensively evaluates projects to identify situations where archaeological data gathering on paleochannels and paleolandscapes of interest to tribes could be added to other types of research. Currently, the coast of Virginia has received comparably much less marine archaeology evaluation compared with the northeast Atlantic and the Gulf Coast, and this is a needed corrective so that the

[1] For more details, see Jenkins, Alexis. 2019. Remembering the River: Traditional Fishery Practices, Environmental Change and Sovereignty on the Pamunkey Indian Reservation. Undergraduate thesis. https://scholarworks.wm.edu/cgi/viewcontent.cgi?article=2437&context=honorstheses

potential impacts to offshore cultural resources of importance to tribes can be more readily identified.

Thank you for the opportunity to comment on the National Oceanic Service Survey and Mapping Draft Programmatic EIS.

Sincerely,

Marion F. Werkheiser
Attorney at Law

2.8.2 NOS Response

Fish-2: Because of the location of Upper Mattaponi contemporary and ancestral territory, the Tribe is most concerned about potential impacts affecting the Virginia coastline, Chesapeake Bay, and any activities where anadromous fish or other species might return from to the James River watershed. This is predominantly in the Southeast Region, but may include small portions of the Greater Atlantic Region of the PEIS study areas especially for migratory species. The Tribe requests that NOAA evaluate more closely the Surveying and Mapping Projects' potential impacts on species of significance to Virginia Algonquian tribes, cultural and historic properties, and to tribes, tribal governments, and tribal trust resources…2. The Tribe is especially concerned about anadromous fish species and other potential environmental effects that could impact plants and animals of traditional significance to the Upper Mattaponi.

The Upper Mattaponi Indian Tribe is especially interested in the surveying results for species such as shad, striped and largemouth bass, sturgeon, blueback herring, and alewife.

> **NOS Response:** EO 13175 and the NOAA Tribal Consultation Handbook provide required procedures for consultation with federally recognized Tribes in recognition of the sovereignty of federally recognized Tribes and the federal government's trust responsibility to those tribes. NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation at any time for a proposed action that may have tribal implications.
>
> Section 3.7.2 of the Final PEIS discusses that underwater acoustic sources have not been known to cause direct injury or mortality to fish, and that direct injuries (e.g., barotrauma) from sound sources used by NOS are unlikely because of slow rise times, lack of strong shock waves, and relatively low peak pressures. The Final PEIS also discusses that vessels, ROVs, and survey equipment can disturb and displace nearby fish, interrupt feeding, cause other behavior modifications, and possibly mask biologically important signals; such impacts would vary among species as most fish cannot hear the higher frequencies emitted by vessel, ROV, and equipment sound, except for perhaps shad, river herring, and menhaden. Therefore, impacts are expected to be adverse and negligible as they would be limited to temporary behavioral and stress-startle responses to individual fish or schools of fish found within the project area. The severity of effects on shad, river herring, and menhaden (species that can potentially hear the higher frequencies of vessel sound), could be somewhat higher but are not expected to be more than minor, as impacts would still be temporary or short-term, may include some stress responses without permanent physiological damage, and may disturb breeding, feeding, or other activities but without any impacts on population levels. Any displacement of fish would be short term and limited to the NOS project area or its immediate surroundings.
>
> NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources.
>
> This PEIS does not cover fisheries research, which is conducted by NOAA's Fisheries Science Centers. NOS conducts benthic habitat surveys, and results may be found at https://products.coastalscience.noaa.gov/collections/benthic/default.aspx.

NEPA Process-9: 1. NOAA should extend the comment deadline on this Environmental Impact Statement.

This PEIS is almost 700 pages long with over 260 pages of appendices and is highly technical. A sixty-day review time is not sufficient for such a broad PEIS of such complexity, and the Tribe requests that NOAA extends the review time for an additional 60 days.

> **NOS Response:** After receiving your comment, NOS extended the original 60-day public comment period deadline by 90 days from August 24, 2021 to November 22, 2021. (86 FR 47299).

Cultural and Historic Resources-16: In addition, the Tribe recommends that National Historic Preservation Act consultation on this federal action should be accompanied by regional area meetings and presentations to allow tribal communities to discuss the proposed actions within their areas of interest in more detail.

> **NOS Response:** NOS intends to notify individual tribes pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation at any time for a proposed action that may have tribal implications.
>
> NOS will also initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources.
>
> NOS will consider providing regional meetings if interest is expressed after notice is provided or consultation is initiated.

Fish-3: The PEIS acknowledges that fish species with swim bladders (like sturgeon, herrings, and American shad) are susceptible to barotrauma from sound waves associated with some surveying equipment, and some have sensitive hearing and may be affected by hearing noises of survey systems. Some of these fish, like Atlantic sturgeon, are also threatened or endangered. The PEIS acknowledges that survey equipment, vessels, and ROV and autonomous vehicle operations may disturb animals from preferred feeding or breeding grounds or may cause discomfort for some species. However, the effects of these types of activities are routinely characterized as insignificant, minimal, or unlikely. The Tribe requests that reviews of specific surveying activities provide much more detail regarding the rationale for these minimal assessments of adverse effects.

> **NOS Response:** The PEIS uses the best available science to evaluate impacts on fish species. As discussed in Section 3.7.2 of the Final PEIS, adverse effects from NOS activities are possible for the small numbers of individual fish that could occur in close proximity (i.e., within several meters) to an active sound source. Generally, adverse effects on a species can be considered significant if they result in a reduction in the overall health and viability of a population. However, given the localized and transient spatial scale of no more than a few NOS projects occurring at any one time, relative to the generally large-scale distribution of fish populations and the considerably narrow beam characteristics of

equipment such as echo sounders, no population level effects are expected on marine or freshwater fish.

Environmental Justice-12: The Tribe also observes that there are no references in the PEIS to fish hatchery, research, and restoration efforts conducted by Virginia Tidewater tribes. The EIS should be revised to include information regarding the Pamunkey NOAA Species Recovery grant to study Atlantic sturgeon, the shad fishery and hatchery on the Pamunkey and Mattaponi Indian reservations, and the impacts on Virginia tribes of over-fishing and environmental damage that inhibited the fish populations. The surveying and mapping that this PEIS contemplates should generally be used to encourage more consideration of the tribe trust rights of Virginia Tribes and to evaluate tribal impacts of these fish population and species health issues.

NOS Response: Thank you for your comment. Fish hatchery, research, and restoration efforts conducted by Virginia Tidewater tribes and the Pamunkey NOAA Species Recovery grant are not expected to be impacted by the Proposed Action.

NOS determined that a programmatic approach was appropriate because NOS conducts, authorizes, permits, and funds a suite of similar, ongoing data collection activities associated with recurring projects across a wide geographic area to characterize underwater features (e.g., habitat, bathymetry, marine debris). This Final PEIS is a comprehensive document that provides detailed programmatic effects analyses for surveying and mapping data collection activities based on regional conditions, habitat types, species, and other factors. However, the Final PEIS does not identify the specific time or place for individual projects or activities over the next five years. The analysis will be used to inform NOS leadership and the public on the environmental impacts of these activities before a decision is made on how to execute each project. All projects will require a project-specific review by NOS before proceeding.

NOS agrees that surveying and mapping data could be useful to evaluate and protect tribal trust fisheries resources. NOS coastal and marine data support ecosystem stewardship, such as fisheries research and restoration work by the Virginia Tidewater Tribes. For instance, bathymetric base layers provide valuable information about essential habitat for fish.

Tribes and the public can reach out to NOAA Navigation Managers to engage in the planning process for future surveying and mapping projects. Information regarding contacting NOAA Navigation Managers can be found at the following website: https://nauticalcharts.noaa.gov/customer-service/regional-managers/index.html.

NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources.

NOS intends to notify individual tribes pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation at any time for a proposed action that may have tribal implications.

Cultural and Historic Resources-17: 3. NOAA acknowledges that the impacts of the activities permitted under this PEIS to cultural resources, historic properties, and Tribes could be severe, but does not provide much insight or specifics about how it intends to identify, evaluate, avoid, or mitigate these effects.

NOS states that this PEIS will have a moderate adverse impact on cultural and historical resources, but claims that this impact would be "insignificant." In Section 3.3.6, NOS states that they will coordinate with the Advisory Council on Historic Preservation to develop approaches for addressing potential cultural resources impacts of these programmatic activities. In Section 3.11.2.2.3, NOAA acknowledges that the installation of tidal gauges could destroy part or all of historic properties in the project area. In Section 3.11.2.2.4, NOAA acknowledges that activities permitted under this PEIS could have effects on reservations or villages, impact tribal trust resources, affect facilities or entities owned or operated by tribes, affect Tribes, tribal governments, and traditional lifeways, and affect TCPs or traditional use areas.

NOAA should provide more information regarding how it intends to consult with ACHP and tribes, and should provide greater information regarding how the agency intends to identify tribes to reach out to for consultation on a given program or action

> **NOS Response:** Significance criteria and determinations presented in the PEIS were developed for the purpose of compliance with the NEPA. Impacts that would be considered major and significant are defined in Table 3.11-1; none of the potential impacts from NOS activities were evaluated to be major and significant under NEPA.
>
> While the Final PEIS will be used to inform NOS responsibilities under NHPA, NOS will comply with Section 106 of the NHPA for any activity that has the potential to affect cultural or historic resources as described in the regulations at 36 CFR 800.8. NOS will continue to conduct project-specific NHPA consultations before commencing any project with the potential to affect cultural or historic resources.
>
> NOS intends to notify individual tribes before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation under EO 13175 at any time.

Cultural and Historic Resources-18: The Tribe requests that given NOAA's acknowledgement that such significant impacts to Tribes and historic properties may occur, that the agency develop a separate report analyzing how permitted actions in the Surveying and Mapping program might have such effects and propose how it intends to identify and evaluate such effects.

> **NOS Response:** Adverse effects were analyzed as required for compliance with NEPA. No significant adverse impacts to cultural and historic resources are expected under any alternative of the Proposed Action (See Sections 3.11.2.2 - 3.11.2.4). NOS intends to notify individual tribes before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation under EO 13175 at any time.

Cultural and Historic Resources-19: 4. The Tribe requests that surveying and mapping projects include archaeological equipment, staff, and expertise wherever practicable.

While these activities provide significant risks to tribal, historic, and cultural resources, the planned surveying and mapping of the oceans off the coasts also provide an opportunity to evaluate submerged archaeological resources with very little additional cost, as the vessels and equipment will likely be making similar survey routes and using similar approaches for survey as would be needed for archaeological evaluations. The Tribe requests that NOAA examine ways that draped multibeam and sub-bottom profilers calibrated for archaeological data collection could be added to NOAA survey vessels wherever possible, and that NOAA comprehensively evaluates projects to identify situations where archaeological data gathering on paleochannels and paleolandscapes of interest to tribes could be added to other types of research. Currently, the coast of Virginia has received comparably much less marine archaeology evaluation compared with the northeast Atlantic and the Gulf Coast, and this is a needed corrective so that the potential impacts to offshore cultural resources of importance to tribes can be more readily identified.

> **NOS Response:** Adverse effects were analyzed as required for compliance with NEPA. No significant adverse impacts to cultural and historic resources are expected under any alternative of the Proposed Action (See Sections 3.11.2.2 - 3.11.2.4).
>
> All data collected by NOS is made publicly available to the extent allowed by federal law. Tribes and the public can reach out to NOAA Navigation Managers to engage in the planning process for future surveying and mapping projects. Information regarding contacting NOAA Navigation Managers can be found at the following website: https://nauticalcharts.noaa.gov/customer-service/regional-managers/index.html.

2.9 Delaware State Historic Preservation Officer (Stephanie Soder)

2.9.1 Comment Submission

HCA
DELAWARE HISTORICAL & CULTURAL AFFAIRS

Delaware Division of Historical & Cultural Affairs
21 The Green, Dover, Delaware 19901
Tel. (302) 736-7400 | Fax. (302) 739-5660
history.delaware.gov

July 28, 2021

Ms. Giannina DiMaio
Environmental Compliance Coordinator
National Ocean and Atmospheric Administration, National Ocean Service
1305 East-West Highway
Silver Spring, MD 20910

RE: NOAA Draft PEIS for NOS's Surveying and Mapping Projects in U.S. Waters
NOAA-NOS-2021-0055
SHPO Project Review #2021.06.25.01

Dear Ms. DiMaio,

Thank you for your recent consultation with the Delaware State Historic Preservation Office (DE SHPO) on June 25, 2021 regarding changes to the Programmatic Environmental Impact Statement (PEIS) for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition. The PEIS demonstrates several alternatives that will aid in the National Ocean Service's (NOS) efforts to conduct surveying and mapping throughout the coastal and marine waters of the United States over a period of six years. The PEIS takes into consideration potential impacts that these activities may have to historic and cultural resources.

Upon review of the PEIS, DE SHPO believes that efforts to mitigate or avoid impacts to historical and cultural resources, both terrestrial and underwater, have been adequately addressed in the sections regarding bottom sampling and installation, maintenance, and removal of tidal gauges, buoys, and GPS Reference Stations. However, DE SHPO requests further clarification and re-review of the definition of *moderate* in Section 3.11.2.1 Methodology regarding its significance. Currently the PEIS defines *moderate impact* context, intensity, and likelihood as:

> The action would diminish the integrity of a submerged cultural or historic resource or a historic property's location, design, setting, materials, workmanship, feeling, or association, resulting in the loss of diagnostic features or research potential.

While this definition is adequate to describe *moderate impact*, it is then categorized as *insignificant* under NOS- determined significance criteria. Under regulations 36 CFR Part 800 – Protection of Historic Properties, the definition of an *adverse effect* to historic properties is:

> when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register [NRHP] in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

The definition of *adverse effect* under the regulations is closely matched to the NOS-determined definition of *moderate impact*, but NOS considers them *insignificant*. DE SHPO believes that the NOS should consider *moderate impact* as *significant* to appropriately relate to the regulations. This change would likely only impact anchoring practices and subsistence hunting and fishing areas under the PEIS, as it is determined that their impacts range from *negligible* to *moderate*. Given the protocol by NOS to anchor in previously surveyed areas to avoid impacting a historic property and ongoing consultation between THPOs and NOS, DE SHPO does not believe that a change in significance criteria for

moderate impact will alter the way in which these practices are conducted. DE SHPO does, however, believe that it is important to appropriately acknowledge the potential severity of impacts that *moderate impact* rated practices could have to historic properties.

DE SHPO would also like to advocate for the addition of data sharing initiatives in Section 3.11.2.2.1 Anchoring. We appreciate that NOS has included protocol for alerting SHPOs in the event that an object is discovered that may be eligible for listing on the NRHP in Section 3.11.2.2.2 Bottom Sampling. However, in the case that anchoring cannot be conducted within a previously surveyed area as proposed in the PEIS and SHPOs cannot be consulted beforehand, there may be an occasion where a historic property is discovered while anchoring. In this case, we request that NOS include protocol for data sharing in the PEIS.

Based on the outlined practices and mitigation efforts, DE SHPO concurs with all three alternatives presented by NOS, as they all indicate minimal effects to historical and cultural resources and adequate avoidance measures. DE SHPO prefers that Alternative 2 or Alternative 3 be considered over Alternative 1. Incorporating best practices and new technology into protocols may lead to an increase in non-disturbance survey practices, which will better protect historic and cultural resources, as well as natural resources.

Thank you for your consideration of these comments. If you have any questions or if the PEIS changes after public comment, please feel free to contact Gwen Davis at gwen.davis@delaware.gov.

Sincerely,

Stephanie Soder, Archaeologist
Cultural Preservation Specialist

ec: Gwenyth A. Davis, DE SHPO

2.9.2 NOS Response

Cultural and Historic Resources-28: Upon review of the PEIS, DE SHPO believes that efforts to mitigate or avoid impacts to historical and cultural resources, both terrestrial and underwater, have been adequately addressed in the sections regarding bottom sampling and installation, maintenance, and removal of tidal gauges, buoys, and GPS Reference Stations.

> **NOS Response:** Thank you for your careful consideration and your input.

Cultural and Historic Resources-29: However, DE SHPO requests further clarification and re-review of the definition of moderate in Section 3.11.2.1 Methodology regarding its significance. Currently the PEIS defines moderate impact context, intensity, and likelihood as:

The action would diminish the integrity of a submerged cultural or historic resource or a historic property's location, design, setting, materials, workmanship, feeling, or association, resulting in the loss of diagnostic features or research potential.

While this definition is adequate to describe moderate impact, it is then categorized as insignificant under NOS- determined significance criteria. Under regulations 36 CFR Part 800 – Protection of Historic Properties, the definition of an adverse effect to historic properties is:

when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register [NRHP] in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

The definition of adverse effect under the regulations is closely matched to the NOS-determined definition of moderate impact, but NOS considers them insignificant. DE SHPO believes that the NOS should consider moderate impact as significant to appropriately relate to the regulations. This change would likely only impact anchoring practices and subsistence hunting and fishing areas under the PEIS, as it is determined that their impacts range from negligible to moderate.

> **NOS Response:** Significance criteria and determinations presented in the PEIS were developed for the purpose of compliance with NEPA. Impacts that would be considered major and significant are defined in Table 3.11-1; none of the potential impacts from NOS activities were evaluated to be major and significant under NEPA.
>
> While the Final PEIS will be used to inform NOS responsibilities under NHPA, NOS will comply with Section 106 of the NHPA for any activity that has the potential to affect cultural or historic resources as described in the regulations at 36 CFR 800.8, regardless of the NEPA impact category. NOS will conduct project-specific NHPA consultations before commencing any project with the potential to affect cultural or historic resources.

Future Coordination-14: DE SHPO would also like to advocate for the addition of data sharing initiatives in Section 3.11.2.2.1 Anchoring. We appreciate that NOS has included protocol for alerting SHPOs in the event that an object is discovered that may be eligible for listing on the NRHP in Section 3.11.2.2.2 Bottom Sampling. However, in the case that anchoring cannot be conducted within a previously surveyed area as proposed in the PEIS and SHPOs cannot be

consulted beforehand, there may be an occasion where a historic property is discovered while anchoring. In this case, we request that NOS include protocol for data sharing in the PEIS.

> **NOS Response:** NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources. NOS will also contact the relevant SHPOs in the event that NOS activities result in the recovery of a potentially historic resource or artifact.
>
> All data collected by NOS is made publicly available to the extent allowed by federal law. The DE SHPO and the public can reach out to NOAA Navigation Managers to engage in the planning process for future surveying and mapping projects. Information regarding contacting NOAA Navigation Managers can be found at the following website: https://nauticalcharts.noaa.gov/customer-service/regional-managers/index.html.

Cultural and Historic Resources-30: Based on the outlined practices and mitigation efforts, DE SHPO concurs with all three alternatives presented by NOS, as they all indicate minimal effects to historical and cultural resources and adequate avoidance measures. DE SHPO prefers that Alternative 2 or Alternative 3 be considered over Alternative 1. Incorporating best practices and new technology into protocols may lead to an increase in non-disturbance survey practices, which will better protect historic and cultural resources, as well as natural resources.

> **NOS Response:** Thank you for your careful consideration and your input on the alternatives to the Proposed Action.

2.10 Delaware Natural Resources and Environmental Control (DNREC) (Kimberly B. Cole)

2.10.1 Comment Submission

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL
DIVISION OF CLIMATE, COASTAL & ENERGY
STATE STREET COMMONS
100 W. WATER STREET, SUITE 7B
DOVER, DELAWARE 19904

DELAWARE COASTAL MANAGEMENT PROGRAM

PHONE
(302) 739-9283

August 24, 2021

Giannina DiMaio
National Ocean Service
National Oceanic and Atmospheric Administration
1305 East West Highway
SSMC4-Station 13612
Silver Spring, MD 20910

RE: Request for Comments on National Oceanic and Atmospheric Administration (NOAA) National Ocean Service (NOS) *Draft Programmatic Environmental Impact Statement (PEIS) for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition* (NOAA-NOS-2021-0055)

Dear Ms. DiMaio:

The Delaware Coastal Management Program (DCMP) of the Delaware Department of Natural Resources and Environmental Control (DNREC) appreciates the opportunity to review and comment on the above referenced Draft PEIS, received by this office on June 25, 2021. As specified in the June 25, 2021 publication in the Federal Register, NOAA NOS has prepared a Draft PEIS to analyze environmental impacts associated with NOS's recurring survey and data collection activities during a six-year time frame (2022-2027).

Although Delaware is a small state, its coast and marine resources yield a healthy and robust ocean environment, substantially contributing to the economy and livelihood of its citizens. Activities with the potential to impact these resources are carefully considered to ensure resource sustainability, while advancing Delaware's commitment to support and encourage data collection and research by scientists, organizations, and institutions for the purpose of informed decision-making.

DCMP recognizes the importance of responsible data collection activities for ocean planning purposes and frequently utilizes the Mid-Atlantic Regional Council on the Ocean (MARCO) Data

Portal to access comprehensive, regional information to aid in spatial visualizations. The importance of data sharing cannot be understated as development expands in offshore waters. DCMP urges NOS to continue coordination with MARCO to ensure the relevant data obtained in the proposed surveys is included in the Data Portal.

DCMP reviewed the Draft PEIS in the context of activities occurring in the Greater Atlantic Region. The Draft PEIS includes rivers; states' offshore waters; the U.S. territorial sea; the contiguous zone; and the U.S. Exclusive Economic Zone (U.S. EEZ) as the "action area". The action area also includes coastal and riparian lands for activities such as the installation, maintenance, and removal of tide gauges. It is unclear which surveying and mapping activities may be occurring on State-owned lands and waters (up to 3 nautical miles), where broader regulatory considerations would be necessary. To increase transparency, DCMP recommends the addition of a clearer description of activities occurring in State-owned lands and waters, including more detailed maps defining potential data collection locations.

When work occurs within State waters, DCMP requests that the activity complies with the State of Delaware's Surface Water Quality Standards. Additionally, in-water work should be coordinated with DNREC, Division of Water, Wetlands and Subaqueous Lands Section.

As it relates to affected living resources identified in the Draft PEIS, DCMP has the following comments:

Fish

Much concern has been raised at the Mid-Atlantic Fishery Management Council about the effect of hydroacoustic mapping on commercially and recreationally important structure-oriented fish species like Black Sea Bass and Summer Flounder. Anecdotal reports from fishermen suggest that such species leave any area in which hydroacoustic mapping is occurring. The Council has suggested a time of year restriction for Black Sea Bass of December 1st through mid-May, which corresponds to the recreational closed season for Black Sea Bass. Additionally, we ask that vessel strikes be listed as potential impacts to fish.

On page 260 of the Draft PEIS, herring-like fishes and cod-like fishes are listed as the most economically important in terms of commercial value. However, this is not necessarily true for Delaware and much of the Greater Atlantic Region. Based on 2016 data, key species for landings revenue in Delaware included American eel, blue crab, eastern oyster, quahog clam, striped bass, and whelks[1]. Many State of Delaware fishermen fish the U.S. EEZ. However, due to the lack of a port to support large scale commercial landings, residents are forced to land and report catch in adjacent states, often bringing their product back to Delaware for sale. Additionally, Delaware is home to one of Sea Watch International's (SWI) three processing plants. This Delaware founded company, has been granted the largest offshore clam allocation in the industry, utilizing 34 vessels for fishery harvests. SWI is also the nation's largest supplier of branded canned and frozen clams[2]. Although this product is not landed in Delaware, many of the harvested ocean quahog and surf clam come to Delaware for processing. As such, impacts that might affect commercial fishing

[1] National Marine Fisheries Service (2018). Fisheries Economics of the United States, 2016. U.S. Dept. of Commerce, NOAA Tech. Memo. NMFS-F/SPO-187-a, 116p.

[2] https://seawatch.com/about/

resources in the U.S. EEZ have the potential to have significant impacts to our state's economy.

Sea Turtles
The Draft PEIS Section 3.6.1.2.1 Greater Atlantic Region indicates that there are no known sea turtle nest sites in the Greater Atlantic Region. However, there have been several occurrences of sea turtles nesting in Delaware, as well as in Maryland. Delaware's most recent instance occurred in 2018 when 48 loggerhead hatchlings emerged from a nest at Fenwick Island State Park.

Seabirds, Shorebirds and Coastal Birds, and Waterfowl
The Delaware shorelines and waterways are important sites for migrating and breeding shorebirds, marsh birds, and waterbirds. Delaware supports a number of federally-protected bird species including migrating rufa Red Knots (*Calidris canutus rufa*) and breeding Piping Plovers (*Charadrius melodus*). Hundreds of thousands of migrating shorebirds stop along the shorelines of Delaware Bay to refuel during their northward migration. Breeding secretive marsh birds, such as Saltmarsh Sparrows (*Ammodramus caudacutus*), are found within Delaware's saltmarshes. Pea Patch Island and smaller inland islands support large breeding heronries and waterbird colonies. Disturbance of key foraging locations and breeding areas may be detrimental to the survival and productivity of these birds. We suggest that any onshore or nearshore activities, such as the installation of monitoring stations, should avoid important foraging and breeding sites in Delaware.

With respect to potential impacts to cultural and historic resources analyzed by NOS in the Draft PEIS, in consultation with Delaware's State Historic Preservation Office (DE SHPO), DCMP suggests NOS re-define *moderate* in Section 3.11.2.1 Methodology regarding its significance. *Moderate impact* is categorized as *insignificant* under NOS-determined significance criteria.

The definition of *adverse effect* under regulations 36 CFR Part 800 – Protection of Historic Properties, is closely matched to the NOS-determined definition of *moderate impact*, but NOS considers them *insignificant*. In conjunction with DE SHPO, DCMP suggests that NOS should consider *moderate impact* as *significant* to appropriately relate to the regulations.

Additionally, DCMP shares the request of DE SHPO for similar data sharing initiatives in Section 3.11.2.2.1 Anchoring as in Section 3.11.2.2.2 Bottom Sampling. In the case that anchoring cannot be conducted within a previously surveyed area as proposed in the PEIS and SHPOs cannot be consulted beforehand, there may be an occasion where a historic property is discovered while anchoring. In this case, we request that NOS include protocol for data sharing in the PEIS.

DCMP is generally supportive of the preferred, Alternative B, under which NOS would increase the adoption of newer techniques and technologies to more efficiently perform surveying, mapping, charting, and related data gathering. As data collection activities are planned, DCMP expects NOS to submit federal consistency determinations for activities with reasonably foreseeable direct and/or indirect effects on any coastal use or resource (15 CFR § 930.33). DCMP is of the opinion that exploration, survey, and testing activities will have reasonably foreseeable coastal effects due to the potential to cause seafloor disturbance, temporary or permanent decrease in water or air quality, impacts to living resources and their habitats, and impacts to cultural and historical resources.

Thank you for your early coordination with the DCMP, implementing the federal consistency provision of the Coastal Zone Management Act, prior to official regulatory engagement. If you have any questions, please contact Kristi Lieske of my staff at (302) 739-9283.

Sincerely,

Kimberly B. Cole, Administrator
Delaware Coastal Management Program

KBC/kl
cc: File FC 2021.0085
Samantha Robinson, DNREC DFW
Katie Esposito, DNREC DW
Gwen Davis, DOS HCA

2.10.2 NOS Response

Future Coordination-10: DCMP recognizes the importance of responsible data collection activities for ocean planning purposes and frequently utilizes the Mid-Atlantic Regional Council on the Ocean (MARCO) Data Portal to access comprehensive, regional information to aid in spatial visualizations. The importance of data sharing cannot be understated as development expands in offshore waters. DCMP urges NOS to continue coordination with MARCO to ensure the relevant data obtained in the proposed surveys is included in the Data Portal.

> **NOS Response:** NOS program offices intend to continue to collaborate with the Mid-Atlantic Regional Council on the Ocean (MARCO) to support efficient data sharing. The MARCO Data Portal is accessible via the Office for Coastal Management (OCM) Digital Coast website: https://coast.noaa.gov/digitalcoast/contributing-partners/marco.html.

Scope-12: It is unclear which surveying and mapping activities may be occurring on State-owned lands and waters (up to 3 nautical miles), where broader regulatory considerations would be necessary. To increase transparency, DCMP recommends the addition of a clearer description of activities occurring in State-owned lands and waters, including more detailed maps defining potential data collection locations.

> **NOS Response:** NOS determined that a programmatic approach under NEPA was appropriate because NOS conducts, authorizes, permits, and funds a suite of similar, ongoing data collection activities associated with recurring projects across a wide geographic area including states' offshore waters (0 to 3 nautical miles [nm] offshore).
>
> NOS has completed the Delaware CZMA Federal Consistency Form for the Proposed Action. This form was included with a CZMA Consistency Determination letter that was sent to the Delaware CMP. NOS provided CD letters to all coastal states and territories with approved CMPs. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under CZMA.

Future Coordination-11: When work occurs within State waters, DCMP requests that the activity complies with the State of Delaware's Surface Water Quality Standards. Additionally, in-water work should be coordinated with DNREC, Division of Water, Wetlands and Subaqueous Lands Section.

> **NOS Response:** NOS intends to comply with Delaware Surface Water Quality Standards as required in the enforceable policies of the Delaware Coastal Management Program (DCMP). Outside of those regulated materials required for normal vessel operation (diesel fuel, motor oil, etc.), no regulated, hazardous, or radioactive materials, or biological warfare agents would be used in the course of the Proposed Action. No part of the Proposed Action would require or involve a thermal discharge. The Proposed Action will not involve the discharge or dumping of any garbage, refuse, dead animal, poultry, trash, carton, bottle, container, box, lumber, timber, paper, or light material or other solid waste into state waters. NOS looks forward to future coordination with the State of Delaware through the CZMA process.

Fish-4: Fish

Much concern has been raised at the Mid-Atlantic Fishery Management Council about the effect of hydroacoustic mapping on commercially and recreationally important structure-oriented fish species like Black Sea Bass and Summer Flounder. Anecdotal reports from fishermen suggest that such species leave any area in which hydroacoustic mapping is occurring. The Council has suggested a time of year restriction for Black Sea Bass of December 1st through mid-May, which corresponds to the recreational closed season for Black Sea Bass. Additionally, we ask that vessel strikes be listed as potential impacts to fish.

NOS Response: The hearing frequency range of most fish is below approximately 1,500 hertz (Hz) with the most sensitive range below 800 Hz. The hearing range of pressure-sensing fish is typically extended to a few kHz (up to about 4 kilohertz [kHz]). NOS expects to use very high frequency (200 kHz+) sources in Delaware Bay that have not been known to cause direct injury or mortality to fish. Fish leaving the area in which surveys are being conducted could be due to disturbance from vessel presence, movement, and wake.

NOS assessed the potential impacts to fisheries, including fish, aquatic macroinvertebrates, essential fish habitat (EFH), and socioeconomic resources. Socioeconomic resources include commercial fishing, fish hatcheries and aquaculture, seafood processing, and seafood markets industries. Among the impacts assessed, effects to fish include some stress responses without permanent physiological damage, and some disturbance to breeding, feeding, or other activities, but without any impacts on population levels; additionally, there would not be long-term changes in habitat availability and use or in fish behavior. NOS also assessed the impact of interactions with fishing gear and survey equipment on the fishing industry. Effects to commercial and recreational fishing from gear interaction are very unlikely.

Data collected by NOS would have beneficial effects as that data is used to conserve, preserve, and restore ecological resources, including wildlife, fish, and habitat. The data would provide the public and private sectors with nautical charts, benthic habitat condition maps, current and tide charts, and other products that could support the management of fisheries. These products allow federal, state, and local governments to make informed decisions about fishing areas and other natural resource management issues.

NOS developed additional mitigation measures in coordination and consultation with expert agencies including NMFS and USFWS to avoid and minimize any potential effects. Mitigation measures to protect fisheries include implementing mandatory invasive species prevention procedures and following the International Convention for the Prevention of Pollution by Ships (MARPOL) discharge protocols. NOS considered time-area restrictions for Black Sea Bass as suggested by the Mid-Atlantic Fishery Management Council (FMC). An evaluation of potential effectiveness and practicability of such a geographic and temporal mitigation resulted in a determination that restrictions as presented by the commenter were not warranted and impracticable. Time-area restrictions would impact NOS' ability to collect data during suitable conditions for using acoustic sources and result in lost survey time.

NOS does not expect any mortality and very little injury of fish as a result of implementing any of the alternatives, including vessel strikes which are unlikely because of fish avoidance behavior. Vessel strikes are discussed in the PEIS in the cumulative impacts analysis in Section 3.2.4.

Socioeconomic Resources-3: On page 260 of the Draft PEIS, herring-like fishes and cod-like fishes are listed as the most economically important in terms of commercial value. However, this is not necessarily true for Delaware and much of the Greater Atlantic Region. Based on 2016 data, key species for landings revenue in Delaware included American eel, blue crab, eastern oyster, quahog clam, striped bass, and whelks. Many State of Delaware fishermen fish the U.S. EEZ. However, due to the lack of a port to support large scale commercial landings, residents are forced to land and report catch in adjacent states, often bringing their product back to Delaware for sale. Additionally, Delaware is home to one of Sea Watch International's (SWI) three processing plants. This Delaware founded company, has been granted the largest offshore clam allocation in the industry, utilizing 34 vessels for fishery harvests. SWI is also the nation's largest supplier of branded canned and frozen clams. Although this product is not landed in Delaware, many of the harvested ocean quahog and surf clam come to Delaware for processing. As such, impacts that might affect commercial fishing resources in the U.S. EEZ have the potential to have significant impacts to our state's economy.

NOS Response: Thank you for providing information regarding indirect effects to Delaware's commercial fishing industry. The values used to quantify the contribution to state gross domestic products (GDPs) were published by OCM in the NOAA Report on the U.S. Marine Economy which uses Economics: National Ocean Watch (ENOW) data. The purpose of this analysis was to review the economic impact of this programmatic action over the entire action area and the OCM data was the best available data for the entire action area. There may be discrepancies between state collected data and data collected by NOAA. The Proposed Action is not anticipated to have significant impacts to any commercially fished species.

NOS assessed the potential impacts to fisheries, including fish, aquatic macroinvertebrates, EFH, and socioeconomic resources. Socioeconomic resources include commercial fishing, fish hatcheries and aquaculture, seafood processing, and seafood markets industries. All surveying and mapping activities listed in Section 2.0 could impact fisheries. Detailed analysis can be found in the following sections of the Final PEIS: Section 3.7 (Fish), Section 3.8 (Aquatic Macroinvertebrates), Section 3.9 (Essential Fish Habitat), and Section 3.12 (Socioeconomic Resources). Among the impacts assessed, effects to fish include some stress responses without permanent physiological damage, and some disturbance to breeding, feeding, or other activities, but without any impacts on population levels; additionally, there would not be long-term changes in habitat availability and use or in fish behavior. NOS also assessed the impact of interactions with fishing gear and survey equipment on the fishing industry. Effects to commercial and recreational fishing from gear interaction are very unlikely.

Data collected by NOS would have beneficial effects as that data is used to conserve, preserve, and restore ecological resources, including wildlife, fish, and habitat. The data would provide the public and private sectors with nautical charts, benthic habitat condition maps, current and tide charts, and other products that could support the management of

fisheries. These products allow federal, state, and local governments to make informed decisions about fishing areas and other natural resource management issues.

NOS developed additional mitigation measures in coordination and consultation with expert agencies including NMFS and USFWS to avoid and minimize any potential effects. Mitigation measures to protect fisheries include implementing mandatory invasive species prevention procedures and following MARPOL discharge protocols. NOS communicates with the public on future survey projects through announcements such as the annual Office of Coast Survey story map[1] and, when appropriate, public "Notices to Mariners" to provide general information on timing and locations. This helps minimize interference with commercial and recreational fishing and reduces the potential for interactions with fishing gear like lobster traps. The full list of mitigation measures can be found in Appendix D of the Final PEIS.

Overall, the impacts to fishery resources would be adverse, minor and insignificant as defined in the Final PEIS. NOS data collection and the resulting improvements in charting and mapping are expected to have indirect, beneficial, and moderate impacts on the ocean economy.

Sea Turtles-1: Sea Turtles

The Draft PEIS Section 3.6.1.2.1 Greater Atlantic Region indicates that there are no known sea turtle nest sites in the Greater Atlantic Region. However, there have been several occurrences of sea turtles nesting in Delaware, as well as in Maryland. Delaware's most recent instance occurred in 2018 when 48 loggerhead hatchlings emerged from a nest at Fenwick Island State Park.

NOS Response: Thank you for providing an example of sea turtles nesting in Delaware. This information from this event has been incorporated into Section 3.6.1.2.1 of the Final PEIS.

Seabirds, Shorebirds & Coastal Birds, & Waterfowl-2: Seabirds, Shorebirds and Coastal Birds, and Waterfowl

The Delaware shorelines and waterways are important sites for migrating and breeding shorebirds, marsh birds, and waterbirds. Delaware supports a number of federally-protected bird species including migrating rufa Red Knots (Calidris canutus rufa) and breeding Piping Plovers (Charadrius melodus). Hundreds of thousands of migrating shorebirds stop along the shorelines of Delaware Bay to refuel during their northward migration. Breeding secretive marsh birds, such as Saltmarsh Sparrows (Ammodramus caudacutus), are found within Delaware's saltmarshes. Pea Patch Island and smaller inland islands support large breeding heronries and waterbird colonies. Disturbance of key foraging locations and breeding areas may be detrimental to the survival and productivity of these birds. We suggest that any onshore or nearshore activities, such as the installation of monitoring stations, should avoid important foraging and breeding sites in Delaware.

[1] https://storymaps.arcgis.com/stories/33758b0990bb4e23a7b61323db3ae670

NOS Response: NOS has engaged in consultation with USFWS on potential effects to birds listed on the Endangered Species Act (ESA), including those with key foraging locations and breeding areas in Delaware. NOS also considered the effects on birds protected by the Migratory Bird Treaty Act (MBTA).

Onshore installations would only occupy very small proportions of available habitat, and no long-term changes in bird habitat availability, quality, or use are expected as a result of onshore activities. During onshore projects, such as the installation, maintenance, and removal of shore-based Global Positioning System (GPS) reference stations and tide gauges, NOS would limit disturbance to foraging and breeding birds and take all necessary precautions to avoid wounding birds or disturbing nests during onshore activities.

Additionally, birds likely cannot hear the majority of sounds produced by active acoustic underwater sound sources; thus, impacts from acoustic sources during nearshore activities would be limited. Birds and their prey are expected to return to project areas after the completion of NOS project activities with no long-term changes in habitat availability, habitat use, or energy expenditure.

Cultural and Historic Resources-20: With respect to potential impacts to cultural and historic resources analyzed by NOS in the Draft PEIS, in consultation with Delaware's State Historic Preservation Office (DE SHPO), DCMP suggests NOS re-define moderate in Section 3.11.2.1 Methodology regarding its significance. Moderate impact is categorized as insignificant under NOS-determined significance criteria.

The definition of adverse effect under regulations 36 CFR Part 800 – Protection of Historic Properties, is closely matched to the NOS-determined definition of moderate impact, but NOS considers them insignificant. In conjunction with DE SHPO, DCMP suggests that NOS should consider moderate impact as significant to appropriately relate to the regulations.

NOS Response: Significance criteria and determinations presented in the PEIS were developed for the purpose of compliance with NEPA. Impacts that would be considered major and significant are defined in Table 3.11-1 under NEPA; none of the potential impacts from NOS activities were evaluated to be major and significant.

While the Final PEIS will be used to inform NOS responsibilities under NHPA, NOS will comply with Section 106 of the NHPA for any activity that has the potential to affect cultural or historic resources as described in the regulations at 36 CFR 800.8, regardless of the NEPA impact category. NOS will conduct project-specific NHPA consultations before commencing any project with the potential to affect cultural or historic resources.

NOS looks forward to working with the State of Delaware for the protection of cultural and historic resources.

Cultural and Historic Resources-21: Additionally, DCMP shares the request of DE SHPO for similar data sharing initiatives in Section 3.11.2.2.1 Anchoring as in Section 3.11.2.2.2 Bottom Sampling. In the case that anchoring cannot be conducted within a previously surveyed area as proposed in the PEIS and SHPOs cannot be consulted beforehand, there may be an occasion

where a historic property is discovered while anchoring. In this case, we request that NOS include protocol for data sharing in the PEIS.

> **NOS Response:** NOS added language to Section 3.11.2.2.1 that "in the event anchoring results in the discovery of a cultural or historic property, the coordinates of the discovery would be noted and provided to the appropriate SHPO along with any information collected."

CZMA-24: As data collection activities are planned, DCMP expects NOS to submit federal consistency determinations for activities with reasonably foreseeable direct and/or indirect effects on any coastal use or resource (15 CFR § 930.33). DCMP is of the opinion that exploration, survey, and testing activities will have reasonably foreseeable coastal effects due to the potential to cause seafloor disturbance, temporary or permanent decrease in water or air quality, impacts to living resources and their habitats, and impacts to cultural and historical resources.

> **NOS Response:** NOS has completed the Delaware CZMA Federal Consistency Form for the Proposed Action. This form was included with the CZMA Consistency Determination letter sent to the Delaware CMP. NOS understands its responsibilities under CZMA. NOS provided CD letters to all coastal states and territories with approved CMPs. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under CZMA.

2.11 Delaware Natural Resources and Environmental Control (DNREC) (Kristi Lieske)

2.11.1 Comment Submission

From:	Lieske, Kristi M (DNREC)
To:	NOSAA Environmental Compliance - NOAA Service Account
Cc:	Michelle.Smyk@solvllc.com; Mensch, Laura (DNREC)
Subject:	RE: NOAA National Ocean Service Releases Draft PEIS for Surveying and Mapping Projects
Date:	Friday, October 15, 2021 8:12:53 AM

Good morning Giannina,

Thank you for the advanced notice. Delaware Coastal Programs looks forward to continued coordination for NOS survey activities. Please also include Laura Mensch, Regulatory Programs Manager, (cc'd above) on future communications.

Thank you,
Kristi

Kristi Lieske
Planner IV
DNREC Delaware Coastal Programs
100 W. Water St. Ste 7B, Dover, Delaware 19904
(302) 739-9136

From: NOSAA Environmental Compliance - NOAA Service Account <nosaa.ec@noaa.gov>
Sent: Thursday, October 14, 2021 6:41 PM
To: Lieske, Kristi M (DNREC) <Kristi.Lieske@delaware.gov>
Cc: Michelle.Smyk@solvllc.com
Subject: Re: NOAA National Ocean Service Releases Draft PEIS for Surveying and Mapping Projects

Ms. Lieske,

NOS will soon be submitting requests to all coastal states for General Consistency Concurrence under CZMA. We will be reaching out to you shortly regarding the process. Thank you!

v/r
Giannina DiMaio
NOS Environmental Compliance Coordinator
Pronouns: she/her/hers

NOAA, National Ocean Service
Office of the Assistant Administrator
1305 East-West Hwy, SSMC4 13th Floor
Silver Spring, MD 20910
V: 240-533-0918
nosaa.ec@noaa.gov

On Wed, Jul 21, 2021 at 2:13 PM Lieske, Kristi M (DNREC) <Kristi.Lieske@delaware.gov> wrote:

Good afternoon,

Thank you for inviting the Delaware Coastal Management Program to review and comment on the Draft PEIS for *Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition.* I represent our federal consistency program and am responsible for coordinating our review. Does the geographic scope of data collection activities include State waters (0-3 nautical miles)? I've found several instances where the Draft PEIS says the scope includes "states' offshore waters" but I want to be sure I correctly understand the exact meaning.

Thank you for your help.

Kristi

Kristi Lieske
Environmental Scientist II
DNREC Delaware Coastal Programs
100 W. Water St. Ste 7B, Dover, Delaware 19904
(302) 739-9136

From: NOSAA Environmental Compliance - NOAA Service Account <nosaa.ec@noaa.gov>
Sent: Friday, June 25, 2021 4:33 PM
Subject: NOAA National Ocean Service Releases Draft PEIS for Surveying and Mapping Projects

Dear Federal Consistency Coordinator,

The National Oceanic and Atmospheric Administration (NOAA) National Ocean Service (NOS) has prepared a Draft Programmatic Environmental Impact Statement (PEIS) for S*urveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition* pursuant to the National Environmental Policy Act. The Draft PEIS is now available for a 60-day public comment ending August 24, 2021. The Notice of Availability was published today in the *Federal Register.*

The Draft PEIS analyzes the potential environmental impacts of recurring surveying and mapping data collection in United States coastal and marine waters over a period of six years. The analysis in this document covers the use of active acoustic equipment such as sub-bottom profilers, single beam and multibeam echo sounders, and side-scan sonars by NOS to collect data on the depths and shapes of underwater terrain, including the ocean, rivers, and lakes. The Draft PEIS analyzes impacts to critical environmental resources such as marine mammals, endangered and threatened species, and cultural and historic resources. The document can be found on the NOS Surveying and Mapping Draft PEIS website at https://oceanservice.noaa.gov/about/environmental-compliance/surveying-mapping.html.

Attached is the notification letter with additional information regarding the Draft

PEIS.

If you have any questions, please feel free to contact me by phone at 240-533-0918 or email at nosaa.ec@noaa.gov.

v/r
Giannina DiMaio
NOS Environmental Compliance Coordinator
Pronouns: she/her/hers

NOAA, National Ocean Service
Office of the Assistant Administrator
1305 East-West Hwy, SSMC4 13th Floor
Silver Spring, MD 20910
V: 240-533-0918
nosaa.ec@noaa.gov

2.11.2 NOS Response

CZMA-3: Delaware Coastal Programs looks forward to continued coordination for NOS survey activities. Please also include Laura Mensch, Regulatory Programs Manager, (cc'd above) on future communications.

> **NOS Response:** NOS will continue to coordinate with Delaware Coastal Programs and will include Laura Mensch, Regulatory Programs Manager, on future communications.

Scope-7: Does the geographic scope of data collection activities include State waters (0-3 nautical miles)? I've found several instances where the Draft PEIS says the scope includes "states' offshore waters" but I want to be sure I correctly understand the exact meaning.

> **NOS Response:** Yes, the PEIS analyzes the environmental impacts of a suite of surveying and mapping data collection activities that could occur in state waters.

2.12 Donlin Gold (Kristina Woolston)

2.12.1 Comment Submission

November 22, 2021

DOC/NOAA/NOS Environmental Compliance Coordinator
SSMC4-Station 13612
1305 East West Highway
Silver Spring, MD 20910

Re: Comments on Draft Programmatic Environmental Impact Statement (PEIS) - Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition, NOAA-NOS-2021-0055

Dear Sir/Madam:

Thank you for the opportunity to provide these comments regarding the National Ocean Service's (NOS') Draft PEIS for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition. Donlin Gold, LLC (Donlin Gold) is in the process of advancing the Donlin Gold Project (Project) which includes marine barging in the coastal waters of western Alaska. Therefore, we are important stakeholders in NOS' efforts to better define the subsurface conditions in these waters.

The Project involves a large gold mine project along the Kuskokwim River about 300 miles west of Anchorage. The Project area is very remote with no road access. Therefore, cargo and diesel fuel would be transported by barge via the ocean and then up the Kuskokwim River. Ports would be constructed in Bethel and upriver near the Project site. We received our federal Joint Record of Decision in 2018 after a multi-year NEPA review process.

The Project's transportation plan has been designed for an annual volume of 115,000 tons of cargo during operations. The cargo would be shipped from Pacific Northwest (Seattle, WA and Vancouver, BC) ports via ocean barges towed by ocean-going tugs to Bethel. Each ocean barge would be 360 feet long by 100 feet wide and would have a net cargo capacity of 10,040 tons at a maximum draft of 16 feet. The Project also requires fuel, and the diesel transportation plan has been designed for a peak annual usage of 42.3 million gallons. Diesel would be shipped from the Pacific Northwest to Dutch Harbor, where it would be transferred to a double-hull, 2.94-million-gallon capacity ocean fuel barge for delivery to Bethel. Overall, the total number of ocean barges to Bethel would be 30 during Project construction (16 cargo barges plus 14 fuel barges), and 26 during operations (12 cargo barges plus 14 fuel barges).

The Project is located on Alaska Native lands. The Alaska Native Claims Settlement Act, or ANSCA, is now celebrating its 50 anniversary and represented an extraordinary

milestone in terms of allowing Alaska Natives to select their lands and resources for their shareholders. Calista Regional Corporation owns the minerals and some of the lands at Donlin. Remaining lands are owned by The Kuskokwim Corporation, or TKC, that represents the local villages in the Middle Kuskokwim area. We operate Donlin Gold under life-of-mine agreements with each of these corporations and they are our true partners in developing the Project.

Donlin Gold's comments on Draft PEIS include:

- Programmatic EISs serve an important function in allowing a detailed, often multi-year, NEPA review of similar activities that then facilitates efficient, project specific reviews and approvals of individual actions. In this case, the Draft PEIS provides an appropriately comprehensive analysis of the broader surveying activities planned for the next 6 years so that individual mapping projects can be approved and proceed in a timely manner. We, therefore, strongly urge NOS to finalize the FEIS and a Record of Decision.
- Donlin Gold recognizes that NOS has identified Alternative B as the preferred alternative considering current funding levels and supports this alternative based on using the latest technologies to conduct surveys. We, however, would prefer adoption of Alternative C to provide additional data if funding is available.
- The Draft PEIS properly recognizes that "Alaskan and U.S. Arctic waters are especially important survey targets…Alaska's approximately 55,000 kilometers (34,000 miles) of coastline contain oil, natural gas, minerals, fish, and other resources that will play an important future role in the U.S. economy, all of which must transit Alaska's waterways to reach domestic and international markets." Based on the this, Donlin Gold strongly urges NOS to maintain or increase the proposed 583,072 nautical miles of Alaska survey work under Alternative B, and, if the funding becomes available, the 636,078 nautical miles proposed under Alternative C.
- As indicated in the Draft PEIS, the coast of Alaska provides very important habitat for migratory birds, marine mammals, and a range of fish species. We concur with the general finding that the proposed surveying and mapping can be done with negligible, insignificant, or minor effects on biological resources, especially with continued Endangered Species Act and Essential Fish Habitat consultation and appropriate mitigations measures developed with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and, in Alaska, the Alaska Department of Fish and Game.
- NOS's Alaska Fact Sheet highlights the benefits of the proposed action by indicating that "the data collected by NOS surveying and mapping projects could provide valuable information for subsistence hunting and fishing activities in the form of nautical charts and topographic maps of the sea floor." We suggest expanding this to further recognize that much of the transport along the Alaska coast involves cargo that is critical to businesses and projects owned and operated by Alaska Natives. Accurate surveying and mapping data will, therefore, yield

additional social and economic benefits to these groups. This is consistent with the preceding language regarding supporting the economic stability of subsistence communities as well as the reference in Table ES-2 that the studies will have beneficial effects on Environmental Justice communities. These findings further support the importance and prioritization work in Alaskan coastal waters.

- We support the plan to avoid areas with active subsistence fishing and hunting and the continued communication with Alaska Natives in planning and performing surveying and mapping activities.
- Finally, we fully support comments submitted by Calista Regional Corporation, our Alaska Native Corporation partner in the Project.

Donlin Gold appreciates the opportunity to provide these comments and looks forward to working with NOS to plan and implement its important marine surveying and mapping efforts in Alaska coastal waters.

Sincerely,

Kristina Woolston
External Affairs Manager

2.12.2 NOS Response

Cumulative Impacts-6: Donlin Gold, LLC (Donlin Gold) is in the process of advancing the Donlin Gold Project (Project) which includes marine barging in the coastal waters of western Alaska. Therefore, we are important stakeholders in NOS' efforts to better define the subsurface conditions in these waters.

The Project involves a large gold mine project along the Kuskokwim River about 300 miles west of Anchorage. The Project area is very remote with no road access.

Therefore, cargo and diesel fuel would be transported by barge via the ocean and then up the Kuskokwim River. Ports would be constructed in Bethel and upriver near the Project site. We received our federal Joint Record of Decision in 2018 after a multi-year NEPA review process.

The Project's transportation plan has been designed for an annual volume of 115,000 tons of cargo during operations. The cargo would be shipped from Pacific Northwest (Seattle, WA and Vancouver, BC) ports via ocean barges towed by ocean-going tugs to Bethel.

Each ocean barge would be 360 feet long by 100 feet wide and would have a net cargo capacity of 10,040 tons at a maximum draft of 16 feet. The Project also requires fuel, and the diesel transportation plan has been designed for a peak annual usage of 42.3 million gallons. Diesel would be shipped from the Pacific Northwest to Dutch Harbor, where it would be transferred to a double-hull, 2.94-million-gallon capacity ocean fuel barge for delivery to Bethel. Overall, the total number of ocean barges to Bethel would be 30 during Project construction (16 cargo barges plus 14 fuel barges), and 26 during operations (12 cargo barges plus 14 fuel barges).

The Project is located on Alaska Native lands. The Alaska Native Claims Settlement Act, or ANSCA, is now celebrating its 50 anniversary and represented an extraordinary milestone in terms of allowing Alaska Natives to select their lands and resources for their shareholders. Calista Regional Corporation owns the minerals and some of the lands at Donlin. Remaining lands are owned by The Kuskokwim Corporation, or TKC, that represents the local villages in the Middle Kuskokwim area. We operate Donlin Gold under life-of-mine agreements with each of these corporations and they are our true partners in developing the Project.

> **NOS Response:** Thank you for providing more information on the Donlin Gold Project occurring along the Kuskokwim River. Projects such as the Donlin Gold Project are considered in the cumulative impact scenario in the Final PEIS under Section 4.1.12, Coastal Development and 4.1.5 Commercial Shipping and Recreational Boating.
>
> NOS recognizes its responsibility to conduct consultation when federal actions and decisions may have implications on ANCs. NOS would like to assure Donlin Gold that NOS recognizes its responsibility to conduct consultation with federally recognized ANCs on the same basis as federally recognized Indian tribes under EO 13175 (Public Law (Pub. L.) 108-199, 118 Stat. 452, as amended by Pub. L. 108-447, 118 Stat. 3267).
>
> NOS understands that protecting Alaska Native subsistence resources is vital. NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes and ANCs may

request government-to-government consultation at any time for a proposed action that may have tribal implications.

NEPA Process-12: Programmatic EISs serve an important function in allowing a detailed, often multi-year, NEPA review of similar activities that then facilitates efficient, project specific reviews and approvals of individual actions. In this case, the Draft PEIS provides an appropriately comprehensive analysis of the broader surveying activities planned for the next 6 years so that individual mapping projects can be approved and proceed in a timely manner. We, therefore, strongly urge NOS to finalize the FEIS and a Record of Decision.

NOS Response: Thank you for your support of the analysis in the PEIS.

Alternatives-5: Donlin Gold recognizes that NOS has identified Alternative B as the preferred alternative considering current funding levels and supports this alternative based on using the latest technologies to conduct surveys. We, however, would prefer adoption of Alternative C to provide additional data if funding is available.

NOS Response: Thank you for your support of Alternative C in which NOS would adopt new techniques and technologies to encourage greater program efficiencies regarding surveying, mapping, charting, and related data gathering activities with an overall potential funding increase of 20 percent relative to Alternative B.

Alternatives-6: The Draft PEIS properly recognizes that "Alaskan and U.S. Arctic waters are especially important survey targets…Alaska's approximately 55,000 kilometers (34,000 miles) of coastline contain oil, natural gas, minerals, fish, and other resources that will play an important future role in the U.S. economy, all of which must transit Alaska's waterways to reach domestic and international markets."" Based on the this, Donlin Gold strongly urges NOS to maintain or increase the proposed 583,072 nautical miles of Alaska survey work under Alternative B, and, if the funding becomes available, the 636,078 nautical miles proposed under Alternative C.

NOS Response: NOS continues to prioritize mapping and surveying of the Alaskan and U.S. Arctic waters. Alaskan communities can reach out to the NOAA Alaska Navigation Manager to engage in the planning process for future surveying and mapping projects. Information regarding contacting NOAA Navigation Managers can be found at the following website: https://nauticalcharts.noaa.gov/customer-service/regional-managers/index.html.

Mitigation Measures-20: As indicated in the Draft PEIS, the coast of Alaska provides very important habitat for migratory birds, marine mammals, and a range of fish species. We concur with the general finding that the proposed surveying and mapping can be done with negligible, insignificant, or minor effects on biological resources, especially with continued Endangered Species Act and Essential Fish Habitat consultation and appropriate mitigations measures developed with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and, in Alaska, the Alaska Department of Fish and Game.

NOS Response: Thank you for your comment concurring with our analysis. The Final PEIS has been updated to include additional mitigation measures; please see the appropriate resource sections and Appendix D to see the full range of mitigation measures that NOS

has developed to be implemented on each project as appropriate to minimize the impacts on species. The additional mitigation measures in the Final PEIS were developed with subject matter experts and in coordination with field crews and with NMFS, USFWS, and ONMS.

Environmental Justice-14: NOS's Alaska Fact Sheet highlights the benefits of the proposed action by indicating that "the data collected by NOS surveying and mapping projects could provide valuable information for subsistence hunting and fishing activities in the form of nautical charts and topographic maps of the sea floor." We suggest expanding this to further recognize that much of the transport along the Alaska coast involves cargo that is critical to businesses and projects owned and operated by Alaska Natives. Accurate surveying and mapping data will, therefore, yield additional social and economic benefits to these groups. This is consistent with the preceding language regarding supporting the economic stability of subsistence communities as well as the reference in Table ES-2 that the studies will have beneficial effects on Environmental Justice communities. These findings further support the importance and prioritization work in Alaskan coastal waters.

NOS Response: Thank you for your support of the NOS surveying and mapping projects in Alaskan waters. NOS has revised the Socioeconomics Environmental Consequences Section in the Final PEIS to add that the data collected as part of the Proposed Action would benefit transportation operations along the Alaska coast which involve cargo that is critical to businesses and projects owned and operated by Alaska Natives.

Environmental Justice-15: We support the plan to avoid areas with active subsistence fishing and hunting and the continued communication with Alaska Natives in planning and performing surveying and mapping activities.

NOS Response: Thank you for your comment. NOS is committed to ongoing communication with both federally recognized tribes and ANCs to understand the implications of NOS activities in Alaska and to mitigate the effects on subsistence activities, food security, and climate change. Please be assured that NOS will notify the appropriate ANC when surveying and mapping activities are planned for the coastal waters in Alaska.

Future Coordination-13: Donlin Gold appreciates the opportunity to provide these comments and looks forward to working with NOS to plan and implement its important marine surveying and mapping efforts in Alaska coastal waters.

NOS Response: Thank you for your comment and support of the Proposed Action.

2.13 U.S. Environmental Protection Agency (EPA) (Robert Tomiak)

2.13.1 Comment Submission

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
POLICY

August 18, 2021

Giannina DiMaio
National Ocean Service, NOAA
SSMC4-Station 13612
1305 East West Highway
Silver Spring, Maryland 20910

Dear Ms. DiMaio:

In accordance with our responsibilities under Section 309 of the Clean Air Act and the National Environmental Policy Act, the U.S. Environmental Protection Agency has reviewed the National Oceanic and Atmospheric Administration's (NOAA) Draft Programmatic Environmental Impact Statement (PEIS) for the Surveying and Mapping Projects in United States Waters for Coastal and Marine Data Acquisition (CEQ No. 20210083).

According to the draft PEIS, NOAA uses hydroacoustic surveys to map the ocean floor to provide reliable nautical charts, benthic habitat condition and distribution maps, fishery distribution maps, current and tide charts, and other products necessary for safe navigation, economic security, environmental sustainability, and sound marine resource decision-making in U.S. ocean and coastal waters. These charts and maps are needed to provide reliable navigation, ecosystem distribution and condition information to the public, private users, and decision makers. Up-to-date navigation charts are used to ensure safety, efficiency of transit, and economic well-being. The preferred alternative includes adoption of new techniques and technologies as well as continuing with current activities at a higher level of effort.

We appreciate the opportunity to review this draft PEIS and have no concerns on the proposed action. We look forward to reviewing the final PEIS related to this project. If you have any questions, please contact Jacob Widner, the lead reviewer for this review, at 202-564-4462 or by email at Widner.Jacob@epa.gov.

Sincerely,

Nancy Abrams for

Robert Tomiak
Director
Office of Federal Activities

2.13.2 NOS Response

Proposed Action-2: The preferred alternative includes adoption of new techniques and technologies as well as continuing with current activities at a higher level of effort. We appreciate the opportunity to review this draft PEIS and have no concerns on the proposed action.

NOS Response: Thank you for your comment.

2.14 Indiana Department of Natural Resources (Cathy Draeger-Williams)

2.14.1 Comment Submission

From: NOSAA Environmental Compliance - NOAA Service Account
To: Draeger-Williams, Cathy
Subject: Re: Draft PEIS for surveying and mapping
Date: Tuesday, July 6, 2021 5:23:04 PM

Cathy,

Thank you for providing these comments and concerns. We will certainly take this information into consideration as we are developing the programmatic approach for Section 106 and ensure you are part of the consultation process.

I look forward to working with you going forward.

v/r
Giannina DiMaio
NOS Environmental Compliance Coordinator
Pronouns: she/her/hers

NOAA, National Ocean Service
Office of the Assistant Administrator
1305 East-West Hwy, SSMC4 13th Floor
Silver Spring, MD 20910
V: 240-533-0918
nosaa.ec@noaa.gov

On Tue, Jul 6, 2021 at 1:24 PM Draeger-Williams, Cathy <CDraeger-Williams@dnr.in.gov> wrote:

> Thank you for clarifying. We are willing to be a part of the consultation. Here are a few comments/concerns.
>
> Surveying and mapping activities should strive to be non-intrusive.
>
> Shipwrecks should be avoided by any ground disturbance, anchoring, equipment placement or other activity that would impact the components of the shipwreck. Depth of shipwreck components should be considered. The locations must also be kept confidential from public disclosure. Please be aware that field investigations on state property (i.e. the lakebed) must comply with state statutes.
>
> If equipment placement is part of any terrestrial activities, would these be considered temporary and would they consider the visual effect of potential historic properties in the viewshed.

Who is evaluating if the activity fits under the PA and if resources are present or not? Does this person have access to the records?

Thanks.

Cathy Draeger-Williams

Archaeologist

Indiana Department of Natural Resources

Division of Historic Preservation and Archaeology

317 234-3791

Cdraeger-williams@dnr.in.gov

From: NOSAA Environmental Compliance - NOAA Service Account <nosaa.ec@noaa.gov>
Sent: Tuesday, July 6, 2021 12:44 PM
To: Draeger-Williams, Cathy <CDraeger-Williams@dnr.in.gov>
Subject: Re: Draft PEIS for surveying and mapping

Cathy,

Thank you for taking the time to reach out to me regarding our plans for Section 106 Consultation under the NHPA. The Draft PEIS is not intended to substitute the requirement to consult with SHPOs. The document was provided to State Historic Preservation Offices and Tribal Historic Preservation Officers for information and awareness. The Draft PEIS was also provided to all federally recognized tribes in the action area as well as Native Hawaiian Organizations and Alaska Native tribes as part of our government-to-government consultation process.

NOS will be working on a programmatic approach with the Advisory Council on Historic Preservation (ACHP) and the National Conference of SHPOs. It is our understanding SHPOs will be part of this process. We would appreciate any

comments or assistance in identifying historic or cultural resources that may be potentially affected by NOS surveying and mapping activities in your area. Additionally, if you have any thoughts or suggestions on how we could minimize or avoid potential adverse impacts of our surveying and mapping activities to historic properties that would be helpful as we develop a programmatic agreement with SHPOs.

My apologies for the delayed response as I was on leave last week. Please feel free to contact me if you have any additional questions or would like to discuss the process further.

v/r

Giannina DiMaio

NOS Environmental Compliance Coordinator

Pronouns: she/her/hers

NOAA, National Ocean Service

Office of the Assistant Administrator

1305 East-West Hwy, SSMC4 13th Floor

Silver Spring, MD 20910

V: 240-533-0918

nosaa.ec@noaa.gov

On Mon, Jun 28, 2021 at 11:57 AM Draeger-Williams, Cathy <CDraeger-Williams@dnr.in.gov> wrote:

> We would like to provide comments but also have a few questions. There may be cultural resources that might be affected by some of the proposed activities, such as anchoring or placing equipment depending on the locations. Will the typical Section 106 process be completed including consultation with the SHPO? Or is this PEIS more of a programmatic agreement to streamline the NEPA/Section 106 process? If this is part of a larger Nationwide PA with the ACHP, will the individual SHPOs be involved in consultation as well? I apologize for any misunderstanding. Thank you.

Cathy Draeger-Williams

Archaeologist

Indiana State Historic Preservation Office

Indiana Department of Natural Resources

Division of Historic Preservation and Archaeology

317 234-3791

Cdraeger-williams@dnr.in.gov

2.14.2 NOS Response

Mitigation Measures-4: Surveying and mapping activities should strive to be non-intrusive.

> **NOS Response:** NOS agrees and has implemented mitigation measures to be as non-intrusive as possible. As stated in Section 3.11.2 of the PEIS, most NOS actions were determined to have no potential to cause effects to historic properties include: operation of crewed vessels, operation of remotely operated vehicles and uncrewed/autonomous systems; use of echo sounders; use of acoustic doppler current profilers (ADCP), use of acoustic communication systems, use of sound speed data collection equipment, operation of drop/towed cameras and video systems, use of passive listening systems.
>
> Substrate-disturbing activities, such as anchoring and bottom sampling, could have negligible to moderate adverse impacts depending upon the extent of damage caused to the resource and the cultural significance of the resource damaged. Although anchoring has the potential to impact submerged isolated artifacts from prehistoric or historic voyages, resources submerged as a result of sea level rise, or undocumented downed aircraft or shipwrecks, the likelihood of an anchor landing on a historic resource is low. When working in an un-surveyed area or in an area that has not been surveyed in many years, the ship would try to anchor in bays where data have already been collected, providing the ship with better information on where to drop the anchor. These practices would minimize the potential for adverse impacts to submerged cultural or historic resources. Likewise, when sampling the sea floor, samples would be obtained from only the top few inches of sediment. This is unlikely to disturb any objects that may be present, as it is likely that there is a thick layer of sediment over long-buried objects.

Cultural and Historic Resources-5: We would like to provide comments but also have a few questions. There may be cultural resources that might be affected by some of the proposed activities, such as anchoring or placing equipment depending on the locations. Will the typical Section 106 process be completed including consultation with the SHPO? Or is this PEIS more of a programmatic agreement to streamline the NEPA/Section 106 process? If this is part of a larger Nationwide PA with the ACHP, will the individual SHPOs be involved in consultation as well? I apologize for any misunderstanding.

> **NOS Response:** Thank you for taking the time to reach out to NOS regarding our plans for Section 106 consultation under the NHPA. While the Final PEIS will be used to inform NOS responsibilities under NHPA, NOS will comply with Section 106 of the NHPA for any activity that has the potential to affect cultural or historic resources as described in the regulations at 36 CFR 800.8. The PEIS was provided to SHPOs, THPOs, federally recognized tribes, Native Hawaiian Organizations, and Alaska Native tribes and corporations for information and awareness.
>
> While NOS may consider developing a PA for multiple undertakings in the future, NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources.

Cultural and Historic Resources-6: Shipwrecks should be avoided by any ground disturbance, anchoring, equipment placement or other activity that would impact the components of the

shipwreck. Depth of shipwreck components should be considered. The locations must also be kept confidential from public disclosure.

> **NOS Response:** NOS understands the potential for some surveying activities to affect historic properties. See 3.11.2 of the Final PEIS for more details on impacts to shipwrecks from anchoring, bottom sampling, tide gauges, buoys and GPS reference stations. NOS considers the depth and position of shipwrecks when avoiding their location. This PEIS considers the impacts to historical and cultural resources from data collection, as discussed in Chapter 3, Section 3.11, Cultural Resources. NOS understands the need for protecting sensitive data. NOAA, like other federal agencies, is required to comply with Section 304 of the NHPA, which protects certain sensitive information about historic properties from disclosure to the public when such disclosure could result in a significant invasion of privacy, damage to the historic property, or impede the use of a traditional religious site by practitioners. NOS will comply with Section 304 of the NHPA in the course of creating public data products.

CZMA-4: Please be aware that field investigations on state property (i.e. the lakebed) must comply with state statutes.

> **NOS Response:** Pursuant to the CZMA, federal agencies must comply with approved state coastal enforceable policies, some of which contain state laws, to the maximum extent practicable. NOS provided CD letters to all coastal states and territories with approved CMPs. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under CZMA.

Cultural and Historic Resources-7: If equipment placement is part of any terrestrial activities, would these be considered temporary and would they consider the visual effect of potential historic properties in the viewshed.

> **NOS Response:** Installations of tide gauges, buoys, and GPS reference stations could be temporary or permanent, depending on the project. NOS understands that installations could affect the viewshed of a historic property or designed cultural landscape. NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources.

Cultural and Historic Resources-8: Who is evaluating if the activity fits under the PA and if resources are present or not? Does this person have access to the records?

> **NOS Response:** NOS-trained environmental compliance coordinators will evaluate proposed projects and review project areas for listed or eligible properties before commencing any project that has the potential to affect cultural or historic resources. NOS will contact the appropriate SHPO/THPO to identify cultural and historic properties. For offshore projects, NOS has access to charts and several databases of shipwrecks for reference during project planning.

2.15 Louisiana Department of Natural Resources (Charles Reulet)

2.15.1 Comment Submission

JOHN BEL EDWARDS
GOVERNOR

THOMAS F. HARRIS
SECRETARY

State of Louisiana

DEPARTMENT OF NATURAL RESOURCES

OFFICE OF COASTAL MANAGEMENT

July 26, 2021

Giannina DiMaio
National Ocean Service
National Ocean and Atmospheric Administration
1305 East West Highway, SSMC4 13th Floor
Silver Spring, MD 20910
Via email: nosaa.ec@noaa.gov

RE: **C20210090,** Coastal Zone Consistency
NOAA National Ocean Service
Direct Federal Action
Draft PEIS for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Aquisition
Offshore Louisiana

Dear Ms. DiMaio:

The above referenced project has been reviewed for consistency with the Louisiana Coastal Resources Program in accordance with Section 307 (c) of the Coastal Zone Management Act of 1972, as amended. The project, as proposed in the application, is consistent with the LCRP.

If you have any questions concerning this determination please contact Jim Bondy of the Consistency Section at (225) 342-3870 or james.bondy@la.gov.

Sincerely,

/S/ Charles Reulet
Administrator
Interagency Affairs/Field Services Division

CR/MH/jab

cc: Dave Butler, LDWF

2.15.2 NOS Response

CZMA-5: The above referenced project has been reviewed for consistency with the Louisiana Coastal Resources Program in accordance with Section 307 (c) of the Coastal Zone Management Act of 1972, as amended. The project, as proposed in the application, is consistent with the LCRP.

> **NOS Response:** Thank you for your consideration and consistency determination. NOS provided CD letters to all coastal states and territories with approved CMPs. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under CZMA.

2.16 Maryland Department of Natural Resources (Joseph Abe)

2.16.1 Comment Submission

From: NOSAA Environmental Compliance - NOAA Service Account
To: Michelle.Smyk@solvllc.com
Subject: Fwd: August 24 Deadline/Request Potential Extension
Date: Friday, October 15, 2021 11:37:00 AM

---

v/r
Giannina DiMaio
NOS Environmental Compliance Coordinator
Pronouns: she/her/hers

NOAA, National Ocean Service
Office of the Assistant Administrator
1305 East-West Hwy, SSMC4 13th Floor
Silver Spring, MD 20910
V: 240-533-0918
nosaa.ec@noaa.gov

---------- Forwarded message ---------
From: **Joseph Abe -DNR-** <joseph.abe@maryland.gov>
Date: Wed, Aug 4, 2021 at 12:36 PM
Subject: August 24 Deadline/Request Potential Extension
To: <nosaa.ec@noaa.gov>
Cc: Heather Nelson -MDE- <hnelson@maryland.gov>, McCall, Catherine <catherine.mccall@maryland.gov>

Hi Giannina:

I am writing to inform you that Maryland just discovered (this week) your June 25 request for comments RE NOAA/NOS' Programmatic Environmental Impact Statement (PEIS) for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition.

We found out via email communication from New York and Delaware. Who did you send the letter to in Maryland? Heather Nelson is Maryland's Federal Consistiency Coordinator. Heather and I work together to manage Federal Consistency Reviews in Maryland.

We see that you have an August 24 deadline to receive comments. I've already contacted key Maryland folks to review and comment. Given our late notice, can we have an extension to get our comments in?

Thanks for considering of our request.

Best Regards, Joe

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MD Logo.png

dnr.maryland.gov

Joseph Abe
Coastal Policy Coordinator Chesapeake
and Coastal Service
Department of Natural Resources
580 Taylor Avenue, E-2
Annapolis, MD 21401
410-260-8740 (office)
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Click here to complete a three question customer experience survey.

Beginning on Friday March 13th, 2020 state workers have been on mandatory telework. If you need to speak by phone please use my cell phone number or respond to my email with a request for a conference line number. Thank you.

2.16.2 NOS Response

CZMA-6: Heather Nelson is Maryland's Federal Consistency Coordinator. Heather and I work together to manage Federal Consistency Reviews in Maryland.

> **NOS Response:** Thank you. NOS has updated the contact information for Maryland's Federal Consistency Coordinator.

NEPA Process-7: Given our late notice, can we have an extension to get our comments in?

> **NOS Response:** NOS extended the original 60-day public comment period deadline by 90 days from August 24, 2021 to November 22, 2021 after receiving this comment.

2.17 Maine Department of Marine Resources (Meredith Mendelson)

2.17.1 Comment Submission

STATE OF MAINE
DEPARTMENT OF MARINE RESOURCES
21 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0021

JANET T. MILLS
GOVERNOR

PATRICK C. KELIHER
COMMISSIONER

August 24, 2021

Giannina DiMaio
Environmental Compliance Coordinator
U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service
SSMC4-Station 13612
1305 East West Highway
Silver Spring, MD 20910

Delivered by E-mail

RE: NOAA-NOS-2021-0055; Comments on Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition

Dear Ms. DiMaio:

I am writing in response to NOAA's notice of opportunity to comment on its *Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition* ("DPEIS").[1]

The Maine Department of Marine Resources' ("DMR") is "established to conserve and develop marine and estuarine resources; to conduct and sponsor scientific research; to promote and develop the Maine coastal fishing industries; to advise and cooperate with local, state, and federal officials concerning activities in coastal waters; and to implement, administer, and enforce the laws and regulations necessary for these purposes..."[2] Ocean and coastal data and information developed and shared by NOAA are key components in addressing each aspect of this multi-faceted statutory mission. Consequently, DMR has a direct and significant interest in how NOAA prioritizes and undertakes its ocean survey and mapping activities ("ocean surveys"), and a desire to continue and improve its coordination and cooperation with NOAA regarding those activities.

The following comments are offered in the spirit of helping NOAA to optimize the many benefits of its ocean surveys to DMR as well as many other state and federal agencies, local governments,

[1] *Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition* (National Oceanic and Atmospheric Administration, National Ocean Service), June 2021 ("DPEIS"), noticed in 86 FR 33663 (June 25, 2021).
[2] 12 M.R.S. §6021.

commercial fishing, aquaculture, renewable ocean energy, and other private sector enterprises, academic institutions and researchers, and the general public.

I. Improve Coordination with Coastal States on Planning and Implementing Ocean Surveys to Avoid and Minimize Conflicts with Commercial Fishing Activities.

A. Acknowledge the potential for ocean survey-commercial fishing conflicts.

DMR suggests that the final PEIS's section on socioeconomic resources[3] and related sections as appropriate include discussion of the potential for conflicts between ocean surveys and commercial fishing activities.

DMR agrees with the DPEIS's overall assessment of the vital importance of NOAA's ocean surveys and their many, diverse, and significant socio-economic benefits to commercial fishing and allied industries and many others.[4] The DPEIS does not, however, adequately assess the potential for conflicts between ocean surveys and fishing gear and activities as a potential adverse impact. In DMR's experience, such conflicts have occurred, the potential for them remains a concern, and enhanced coordination can help avoid and minimize them. NOAA's preferred alternative (Alternative B) involves "continuation and an overall increase of all types of the activities and equipment currently used" as well as "more widespread adoption of new techniques and technologies", including some which appear to involve submerging survey instruments in or towing them though the water column and thus an increase in the potential for conflicts with fishing gear and activities.[5]

B. Make enhanced and timely pre-survey coordination with pertinent coastal states a standard element of ocean surveys.

DMR suggests that the final PEIS identify the type of enhanced coordination discussed below as a means to mitigate the potential for conflicts between ocean surveys and commercial fishing activities; include it as an element of its preferred alternative (DPEIS Alternative B); and subsequently make it a routine aspect of coordination with coastal states regarding ocean surveys.

In recent years, DMR has worked cooperatively and well with NOAA's Office of Coast Survey ("NOAA/OCS") to help avoid and minimize such conflicts in state and federal waters off the Maine coast. At DMR's request, using a cooperatively developed standard form, NOAA/OCS has on a case-by-case basis provided DMR activity-specific information prior to initiation of ocean surveys. Using this detailed information, DMR has in turn provided prior notice of ocean surveys to pertinent marine harvesters to enable them to plan for and take timely actions to reduce the potential for gear conflicts.

The Maine Lobstermen's Association has often pointed to coordination regarding the 2016 sand resource survey conducted in Penobscot Bay as a good example of how such communication helps avoid gear conflict, in that case in mid-summer in an area with dense deployment of lobster fishing gear.

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[3] *See* DPEIS, Section 3.12.
[4] See, e.g., DPEIS, p.569-71.
[5] *See* DPEIS, p.2.

DMR's coordination with the United States Army Corps of Engineers ("USACE") in recent years regarding establishment of haul routes for dredged materials from USACE's civil works projects also provides a useful, comparable example of successful federal-state coordination to avoid gear conflicts. Using a process which DMR and USACE are currently developing into a standard practice, the agencies have brought together USACE project managers, DMR Marine Patrol officers and other staff, and groups of area fishermen to discuss designation of a haul route that both minimizes the impact on fishing activity as well as navigational challenges for the contractor hauling the dredged materials. While, occasionally, this has been an iterative process, more commonly the issue has been resolved with one meeting and perhaps a quick follow-up to confirm details. This relatively small investment of time and energy serves to forestall last-minute calls and meetings and related frustrations and tensions when gear conflicts arise or are imminent.

While appreciating NOAA/OCS's openness to coordination on this issue case-by-case in recent years and recognizing its benefits, DMR believes that routinization of such pre-ocean survey coordination would have significant and additional benefits to NOAA/OCS as well as DMR and the state fishing industry. Effective communication with the fishing industry can result in gear being moved out of survey tows and help ensure that ocean surveys can be completed more efficiently and without added private and federal costs due to gear entanglement and lost or damaged survey equipment. DMR acknowledges that such communication is no panacea as it does guarantee fishermen will move their gear. However, notice which provides adequate time (taking weather conditions into account) to move gear makes it more likely, manifests a good faith effort to avoid and minimize potential conflicts, and ideally helps foster cooperation more broadly. This approach is also consistent with and supports other NOAA policies and efforts, including its leadership on regional ocean planning and management, which encourage improved state-federal cooperation and identification and adoption of best practices to facilitate multiple existing and emerging uses of shared ocean space.

DMR-NOAA coordination in the past has helped to build relationships and create lines of communication that have been of great value on various issues. With federal and state resource managers facing a decade of difficult conversations about risk reduction for the protection of the Northern right whale, every small improvement in this relationship could be valuable. It is reasonable to assume that many commercial fishermen, like most other people, understandably do not see the various line offices within NOAA as different agencies with different purposes and missions. Consequently, if they do not receive timely communication about NOAA ocean surveys that may interfere with their commercial activities and thus their livelihood, there is resulting potential for increased tension on multiple issues. In prior years, senior leadership at DMR, including that of the Marine Patrol, have held in-person meetings with the new regional leadership for NOAA/OCS and hope to organize such a meeting in the near future as a way to foster enhanced communication on issues of mutual interest and concern.

II. Improve coordination with coastal states in planning and designing ocean surveys to create synergies and efficiencies.

DMR suggests that the final PEIS include as an aspect of its preferred alternative enhanced consultation with pertinent coastal states in planning and designing the focus and purpose of ocean surveys. Such early coordination may help NOAA better address coastal states' identified ocean data and information needs. In addition, it may help optimize the ocean surveys' efficiency and effectiveness

and increase their overall benefit by identifying opportunities for state-federal collaboration, avoiding duplicative and facilitating synergistic efforts, and obtaining local, place-based information that may be useful for planning, design, or implementation purposes. A meeting of senior leadership at DMR and regional representatives of NOAA/OCS may provide a useful forum or help identify other timely opportunities for such an exchange of ideas. Sharing data from ocean surveys and other NOAA ocean research with the commercial fishing industry and public in more accessible, non-technical ways could also help increase the understanding of and share the benefits of this important work. Identification of ways in which DMR and NOAA/OCS may work together to do so would a useful topic to explore.

III. Capture the value of the living resources economy more accurately.

DMR suggests that NOAA reconsider the estimate of the value of the living resources economy provided in the DPEIS and revise it as needed to ensure that the final PEIS more accurately captures that value for the Northeast and perhaps other regions, particularly if it is intended to include supply chain-related benefits.

The table in the DPEIS which references the value of the living marine resources economy in the Northeast appears to significantly underestimate it.[6] Apparently using 2016 estimates, it notes approximately $1.9 billion in contribution to GDP, a figure which the text seems to indicate includes the related supply chain. Even if it includes only ex-vessel revenues, it appears low. In 2016, the Maine lobster fishery alone contributed approximately about $1.5 billion to the state GDP.[7]

* * *

Thank you for the opportunity to comment on the DPEIS. We look forward to working closely with NOAA on its ocean survey and mapping activities and to helping ensure and enhance their many benefits to Maine's economy and environment.

Respectfully,

Meredith Mendelson
Deputy Commissioner

[6] PDEIS, Table 3.12-6 (Living Resources Economy by Region (2016), p. 428.

[7] *See Lobsters to Dollars: The Economic Impact of the Lobster Distribution Supply Chain in Maine*, p. 1 (landings value) and Table 12, p. 12 (Aggregation of Economic Impacts), - https://www.colby.edu/economics/lobsters/Lobsters2DollarsFinalReport.pdf

2.17.2 NOS Response

Purpose and Need-4: DMR has a direct and significant interest in how NOAA prioritizes and undertakes its ocean survey and mapping activities ("ocean surveys"), and a desire to continue and improve its coordination and cooperation with NOAA regarding those activities.

> **NOS Response:** NOS selects areas to survey based on the need for more accurate data; an area selected for a survey project may have outdated or no previous survey data. We look forward to working with the State of Maine to determine charting and data needs.

Socioeconomic Resources-1: I. Improve Coordination with Coastal States on Planning and Implementing Ocean Surveys to Avoid and Minimize Conflicts with Commercial Fishing Activities.

A. Acknowledge the potential for ocean survey-commercial fishing conflicts.

DMR suggests that the final PEIS's section on socioeconomic resources and related sections as appropriate include discussion of the potential for conflicts between ocean surveys and commercial fishing activities.

DMR agrees with the DPEIS's overall assessment of the vital importance of NOAA's ocean surveys and their many, diverse, and significant socio-economic benefits to commercial fishing and allied industries and many others.4 The DPEIS does not, however, adequately assess the potential for conflicts between ocean surveys and fishing gear and activities as a potential adverse impact. In DMR's experience, such conflicts have occurred, the potential for them remains a concern, and enhanced coordination can help avoid and minimize them. NOAA's preferred alternative (Alternative B) involves "continuation and an overall increase of all types of the activities and equipment currently used" as well as "more widespread adoption of new techniques and technologies", including some which appear to involve submerging survey instruments in or towing them though the water column and thus an increase in the potential for conflicts with fishing gear and activities.

> **NOS Response:** NOS assessed the potential impacts to fisheries, including fish, aquatic macroinvertebrates, EFH, and socioeconomic resources. Socioeconomic resources include commercial fishing, fish hatcheries and aquaculture, seafood processing, and seafood markets industries. All surveying and mapping activities listed in Section 2.0 could impact fisheries. Detailed analysis can be found in the following sections of the Final PEIS: Section 3.7 (Fish), Section 3.8 (Aquatic Macroinvertebrates), Section 3.9 (Essential Fish Habitat), and Section 3.12 (Socioeconomic Resources). Among the impacts assessed, effects to fish include some stress responses without permanent physiological damage, and some disturbance to breeding, feeding, or other activities, but without any impacts on population levels; additionally, there would not be long-term changes in habitat availability and use or in fish behavior. NOS also assessed the impact of interactions with fishing gear and survey equipment on the fishing industry. Effects to commercial and recreational fishing from gear interaction are very unlikely.
>
> Data collected by NOS would have beneficial effects as that data is used to conserve, preserve, and restore ecological resources, including wildlife, fish, and habitat. The data would provide the public and private sectors with nautical charts, benthic habitat condition

maps, current and tide charts, and other products that could support the management of fisheries. These products allow federal, state, and local governments to make informed decisions about fishing areas and other natural resource management issues.

NOS developed mitigation measures in coordination and consultation with expert agencies including NMFS and USFWS to avoid and minimize any potential effects. Mitigation measures to protect fisheries include implementing mandatory invasive species prevention procedures and following MARPOL discharge protocols. NOS communicates with the public on future survey projects through announcements such as the annual Office of Coast Survey story map[2] and, when appropriate, public "Notices to Mariners" to provide general information on timing and locations. This helps minimize interference with commercial and recreational fishing and reduces the potential for interactions with fishing gear like lobster traps.

Overall, the impacts to fishery resources would be adverse, minor and insignificant as defined in the Final PEIS. NOS data collection and the resulting improvements in charting and mapping are expected to have indirect, beneficial, and moderate impacts on the ocean economy.

Future Coordination-4: B. Make enhanced and timely pre-survey coordination with pertinent coastal states a standard element of ocean surveys.

DMR suggests that the final PEIS identify the type of enhanced coordination discussed below as a means to mitigate the potential for conflicts between ocean surveys and commercial fishing activities; include it as an element of its preferred alternative (DPEIS Alternative B); and subsequently make it a routine aspect of coordination with coastal states regarding ocean surveys.

In recent years, DMR has worked cooperatively and well with NOAA's Office of Coast Survey ("NOAA/OCS") to help avoid and minimize such conflicts in state and federal waters off the Maine coast. At DMR's request, using a cooperatively developed standard form, NOAA/OCS has on a case- by-case basis provided DMR activity-specific information prior to initiation of ocean surveys. Using this detailed information, DMR has in turn provided prior notice of ocean surveys to pertinent marine harvesters to enable them to plan for and take timely actions to reduce the potential for gear conflicts…While appreciating NOAA/OCS's openness to coordination on this issue case-by-case in recent years and recognizing its benefits, DMR believes that routinization of such pre-ocean survey coordination would have significant and additional benefits to NOAA/OCS as well as DMR and the state fishing industry. Effective communication with the fishing industry can result in gear being moved out of survey tows and help ensure that ocean surveys can be completed more efficiently and without added private and federal costs due to gear entanglement and lost or damaged survey equipment. DMR acknowledges that such communication is no panacea as it does guarantee fishermen will move their gear. However, notice which provides adequate time (taking weather conditions into account) to move gear makes it more likely, manifests a good faith effort to avoid and minimize potential conflicts, and ideally helps foster cooperation more broadly. This approach is also consistent with and supports other NOAA policies and efforts, including its leadership on regional ocean planning and management,

[2] https://storymaps.arcgis.com/stories/33758b0990bb4e23a7b61323db3ae670

which encourage improved state-federal cooperation and identification and adoption of best practices to facilitate multiple existing and emerging uses of shared ocean space….if they do not receive timely communication about NOAA ocean surveys that may interfere with their commercial activities and thus their livelihood, there is resulting potential for increased tension on multiple issues. In prior years, senior leadership at DMR, including that of the Marine Patrol, have held in-person meetings with the new regional leadership for NOAA/OCS and hope to organize such a meeting in the near future as a way to foster enhanced communication on issues of mutual interest and concern.

> **NOS Response:** NOS communicates with the public on future survey projects through announcements such as the annual Office of Coast Survey story map[3] and, when appropriate, public "Notices to Mariners" to provide general information on timing and locations. This helps minimize interference with commercial and recreational fishing and reduces the potential for interactions with fishing gear like lobster traps. NOS proposes that, going forward, all NOS programs would coordinate with your office using the Notification of Field Work form that has been used by Coast Survey for several years. Discussion of gear interaction is included in the Final PEIS.

Future Coordination-5: II. Improve coordination with coastal states in planning and designing ocean surveys to create synergies and efficiencies.

DMR suggests that the final PEIS include as an aspect of its preferred alternative enhanced consultation with pertinent coastal states in planning and designing the focus and purpose of ocean surveys. Such early coordination may help NOAA better address coastal states' identified ocean data and information needs. In addition, it may help optimize the ocean surveys' efficiency and effectiveness and increase their overall benefit by identifying opportunities for state-federal collaboration, avoiding duplicative and facilitating synergistic efforts, and obtaining local, place-based information that may be useful for planning, design, or implementation purposes. A meeting of senior leadership at DMR and regional representatives of NOAA/OCS may provide a useful forum or help identify other timely opportunities for such an exchange of ideas. Sharing data from ocean surveys and other NOAA ocean research with the commercial fishing industry and public in more accessible, non-technical ways could also help increase the understanding of and share the benefits of this important work. Identification of ways in which DMR and NOAA/OCS may work together to do so would be a useful topic to explore.

> **NOS Response:** Thank you for your comment; however, optimizing ocean surveying efficiency and effectiveness and data sharing is out of scope of this PEIS (environmental compliance) effort. States and the public can reach out to NOAA Navigation Managers to engage in the planning process for future surveying and mapping projects. Contact information for NOAA Navigation Managers can be found at the following website: https://nauticalcharts.noaa.gov/customer-service/regional-managers/index.html. Coordination with the State of Maine on the environmental impact to state resources will be conducted through the CZMA Federal Consistency process.

References and Data-1: III. Capture the value of the living resources economy more accurately.

[3] https://storymaps.arcgis.com/stories/33758b0990bb4e23a7b61323db3ae670

DMR suggests that NOAA reconsider the estimate of the value of the living resources economy provided in the DPEIS and revise it as needed to ensure that the final PEIS more accurately captures that value for the Northeast and perhaps other regions, particularly if it is intended to include supply chain- related benefits.

The table in the DPEIS which references the value of the living marine resources economy in the Northeast appears to significantly underestimate it. Apparently using 2016 estimates, it notes approximately $1.9 billion in contribution to GDP, a figure which the text seems to indicate includes the related supply chain. Even if it includes only ex-vessel revenues, it appears low. In 2016, the Maine lobster fishery alone contributed approximately about $1.5 billion to the state GDP.

> **NOS Response:** The values used to quantify the contribution of living resources to GDP were published by the OCM in the NOAA Report on the U.S. Marine Economy which uses ENOW data. The discrepancy may be the result of the contribution of self-employed workers which are a large part of the living resources sector; however, the referenced ENOW data looks exclusively at the component of the data that focuses on businesses with employees. The purpose of this analysis was to review the economic impact of this programmatic action over the entire action area and the OCM data was the best available data for the entire action area. There may be discrepancies between state-collected data and data collected by NOAA. NOS has updated the information in Table 3.12.1 of the Socioeconomic Section in the Final PEIS.

2.18 Michigan Department of Environment, Great Lakes, and Energy (EGLE) (Matt Smar)

2.18.1 Comment Submission

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

August 24, 2021

VIA E-MAIL

Ms. Giannina DiMaio
DOC/NOAA/NOS Environmental Compliance Coordinator
SSMC4 – Station 13612
1305 East West Highway
Silver Spring, Maryland 20910
nosaa.ec@noaa.gov

Dear Ms. DiMaio:

Staff of the Water Resources Division, Michigan Department of Environment, Great Lakes, and Energy (EGLE) has reviewed the Draft Programmatic Environmental Impact Statement (PEIS) for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition, prepared by the National Oceanic and Atmospheric Administration (NOAA), National Ocean Service and dated June 2021. This letter presents EGLE's comments on the draft PEIS.

The geographic scope for the draft PEIS described in Section 2.3.1 contains waters and associated littoral and riparian lands within the Coastal Zone Boundary for Michigan's Coastal Management Program approved by NOAA pursuant to the Federal Coastal Zone Management Act (CZMA) of 1972 (P.L. 92-583). The area within the Boundary includes all waters and bottomlands of Michigan's Great Lakes and connecting channels, all islands in those waters, and lands and waters on Michigan's mainland within 1,000 feet of the Great Lakes and connecting channels. The Boundary extends further inland in certain areas of the mainland to encompass state-designated Critical Dune Areas and Sand Dune Areas, as well as other coastal features. Federally owned lands are excluded from the Boundary.

Under section 307 of the CZMA and 15 CFR Part 930, Michigan has the authority to review federal actions proposed within the Boundary that may have reasonably foreseeable effects on coastal resources and uses. The purpose of the review is to ensure that the proposed action is consistent with the enforceable policies of Michigan's Coastal Management Program. Michigan's enforceable policies are contained in more than 30 state statutes and administrative rules promulgated pursuant to those statutes.

Michigan's Enforceable Policies and Surveying and Mapping Activities

Collectively, the activities described in Section 2.4 of the draft PEIS, Activities Common to All Alternatives, are subject or may be subject to several of Michigan's enforceable policies. The relevant enforceable policies are parts of Michigan's environmental code,

the Natural Resources and Environmental Protection Act (NREPA), Public Act 451 of 1994, as amended. Generally, the enforceable policies that apply to a federal surveying and mapping project in Michigan's Coastal Zone depend on the details of the proposed project, including the specific activities to be conducted and location. Where the project may impact a plant or animal species protected under state law, the time of year may be an additional factor. Consultation with EGLE is recommended to identify the enforceable policies applicable to a proposed federal surveying and mapping project.

Many of the relevant enforceable policies include requirements to obtain a state permit or authorization prior to conducting a regulated activity. Surveying and mapping projects described in the draft PEIS may be subject to state permit or authorization requirements, specifically:

- Activities to be conducted below the ordinary high watermark of an inland lake, river, or stream, including the St. Marys River, St. Clair River, and Detroit River, that are subject to regulation under Part 301, Inland Lakes and Streams, of NREPA must be authorized by a permit required under section 324.30102 of the Michigan Compiled Laws (MCL).
- Activities to be conducted in a wetland that are subject to regulation under Part 303, Wetlands Protection, of NREPA must be authorized by a permit required under MCL 324.30304.
- Activities to be conducted in a designated Environmental Area or High-Risk Erosion Area that are subject to regulation under Part 323, Shorelands Protection and Management, of NREPA must be authorized by a permit required under MCL 324.32312.
- Activities to be conducted below the ordinary high watermark of a Great Lake or Lake St. Clair that are subject to regulation under Part 325, Great Lakes Submerged Lands, of NREPA must be authorized by a permit required under MCL 324.32512.
- The following activities are prohibited under Part 761, Aboriginal Records and Antiquities, of NREPA unless authorized under MCL 324.76105, 324.76107, 324.76108, and 324.76109: The recovery, alteration, or destruction of an abandoned vessel or other abandoned property, as defined in MCL 324.76101(a), which is in, on, under, or over the bottomlands of the Great Lakes, including those within a Great Lakes Bottomlands Preserve. Great Lakes Bottomland Preserves are established in administrative rules R 299.6001, R 299.6002, R 299.6003, R 299.6004, R 299.6005, R 299.6006, R 299.6007, R 299.6008, R 299.6009, R 299.6010, R 299.6011, R 299. 6012, and R 299.6013 of the Michigan Administrative Code.

Activities that result in a discharge to Michigan's Great Lakes and all other surface waters must comply with the water quality standards promulgated pursuant to Part 31, Water Resources Protection, of NREPA, comprising administrative rules R 323.1041 to R 323.1117 of the Michigan Administrative Code. Generally, EGLE permits for activities below the ordinary high watermark of the Great Lakes and other surface waters include conditions for compliance with state water quality standards.

The following activities are prohibited under Michigan's enforceable policies:

- The discharge of any litter, sewage, oil, or other liquid or solid pollutants from any vessel, boat, or floating craft is prohibited pursuant to section 9502 of Part 95, Watercraft Pollution Control, of NREPA (MCL 324.9502).
- The following activities are prohibited pursuant to section 36505 of Part 365, Endangered Species Protection, of NREPA: Harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting of an animal subject to regulation under Part 365 or the attempt to engage in such activity; and the collecting, picking, cutting, digging up, or destroying in any manner of a plant subject to regulation under Part 365. (MCL 324.36505) Lists of animal and plant species subject to regulation are contained in administrative rules R 299.1021, R 299.1022, R 299.1023, R 299.1024, R 299.1025, R 299.1026, R 299.1027, and R 299.1028 of the Michigan Administrative Code.

Thank you for the opportunity to review the draft PEIS. If you have questions regarding these comments, please contact me at 517-230-7849; SmarM@Michigan.gov; or EGLE, P.O. Box 30458, Lansing, Michigan 48909-7958.

Sincerely,

Matt Smar, Federal Consistency Specialist
Field Operations Support Section
Water Resources Division

2.18.2 NOS Response

CZMA-7: Generally, the enforceable policies that apply to a federal surveying and mapping project in Michigan's Coastal Zone depend on the details of the proposed project, including the specific activities to be conducted and location. Where the project may impact a plant or animal species protected under state law, the time of year may be an additional factor. Consultation with EGLE is recommended to identify the enforceable policies applicable to a proposed federal surveying and mapping project.

> **NOS Response:** Under the CZMA implementing regulations, "the amount of detail in the evaluation of the enforceable policies, activity description and supporting information shall be commensurate with the expected coastal effects of the activity." 15 CFR 930.39(a). All effects are insignificant, and the adverse effects on the coastal resources or uses are anticipated to be of a similar nature and scale regardless of where or when the activity is conducted. The mitigation measures are designed to avoid or minimize impacts when conducting work in certain habitats or to avoid impacts on protected species.

CZMA-8: Many of the relevant enforceable policies include requirements to obtain a state permit or authorization prior to conducting a regulated activity. Surveying and mapping projects described in the draft PEIS may be subject to state permit or authorization requirements, specifically:

•Activities to be conducted below the ordinary high watermark of an inland lake, river, or stream, including the St. Mary's River, St. Clair River, and Detroit River, that are subject to regulation under Part 301, Inland Lakes and Streams, of NREPA must be authorized by a permit required under section 324.30102 of the Michigan Compiled Laws (MCL).

- Activities to be conducted in a wetland that are subject to regulation under Part 303, Wetlands Protection, of NREPA must be authorized by a permit required under MCL 324.30304.
- Activities to be conducted in a designated Environmental Area or High-Risk Erosion Area that are subject to regulation under Part 323, Shorelands Protection and Management, of NREPA must be authorized by a permit required under MCL 324.32312.
- Activities to be conducted below the ordinary high watermark of a Great Lake or Lake St. Clair that are subject to regulation under Part 325, Great Lakes Submerged Lands, of NREPA must be authorized by a permit required under MCL 324.32512.

- The following activities are prohibited under Part 761, Aboriginal Records and Antiquities, of NREPA unless authorized under MCL 324.76105, 324.76107, 324.76108, and 324.76109: The recovery, alteration, or destruction of an abandoned vessel or other abandoned property, as defined in MCL 324.76101(a), which is in, on, under, or over the bottomlands of the Great Lakes, including those within a Great Lakes Bottomlands Preserve. Great Lakes Bottomland Preserves are established in administrative rules R 299.6001, R 299.6002, R 299.6003, R 299.6004, R 299.6005, R 299.6006, R 299.6007, R 299.6008, R 299.6009, R 299.6010, R 299.6011, R 299. 6012, and R 299.6013 of the Michigan Administrative Code.

NOS Response: Under the CZMA, federal agency activities with coastal effects are required to be consistent to the maximum extent practicable with federally approved enforceable policies of a State's Coastal Management Program. NOAA regulations at 15 CFR 930.39(e) clarify that unless required by a Federal law, neither the CZMA nor OCM's approval of state enforceable policies authorize the application of state permit requirements to federal agencies. The federal agency activities must be consistent to the maximum extent practicable with the standards that underlie a state's permit, but do not have to apply for or obtain a state permit (2020 OCM Federal Consistency Overview and 65 FR 77123, 77140 (2000)).

NOS provided CD letters to all coastal states and territories with approved CMPs. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under the CZMA.

NOS evaluated consistency with relevant enforceable policies including regulation under Part 301, 303, 323, 325, and 761 of the Michigan CMP.

CZMA-9: Activities that result in a discharge to Michigan's Great Lakes and all other surface waters must comply with the water quality standards promulgated pursuant to Part 31, Water Resources Protection, of NREPA, comprising administrative rules R 323.1041 to R 323.1117 of the Michigan Administrative Code. Generally, EGLE permits for activities below the ordinary high watermark of the Great Lakes and other surface waters include conditions for compliance with state water quality standards.

NOS Response: NOS vessels would discharge treated sanitary domestic wastes from United States Coast Guard-approved Marine Sanitation Devices (MSDs), but could potentially spill oil, fuel, or chemicals into the water. The potential impacts to water quality from wastewater discharges and accidental spills would be minimized through compliance with MARPOL Annexes I, IV, and V. NOS adheres to NOAA's environmental procedures which comply with the MARPOL annexes and relevant water quality implementing legislation, regulations, and guidance listed in Section 3.14.1 of the Final PEIS. In addition, NOS projects are dispersed throughout the action area, which would minimize any impact from wastewater discharges or spills from a single vessel. NOS vessels also represent only a negligible portion of total oceanic vessel traffic, and any resulting impacts produced would be indistinguishable from those produced by all other vessels within the action area.

NOS evaluated consistency with relevant enforceable policies including regulation under Part 31 of the Michigan CMP. These determinations are described in the CD for National Ocean Service Mapping and Surveying Activities Undertaken in the Michigan Coastal Zone, 2023 – 2027.

CZMA-10: The following activities are prohibited under Michigan's enforceable policies:

- The discharge of any litter, sewage, oil, or other liquid or solid pollutants from any vessel, boat, or floating craft is prohibited pursuant to section 9502 of Part 95, Watercraft Pollution Control, of NREPA (MCL 324.9502).

- The following activities are prohibited pursuant to section 36505 of Part 365, Endangered Species Protection, of NREPA: Harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting of an animal subject to regulation under Part 365 or the attempt to engage in such activity; and the collecting, picking, cutting, digging up, or destroying in any manner of a plant subject to regulation under Part 365. (MCL 324.36505) Lists of animal and plant species subject to regulation are contained in administrative rules R 299.1021, R 299.1022, R 299.1023, R 299.1024, R 299.1025, R 299.1026, R 299.1027, and R 299.1028 of the Michigan Administrative Code.

  NOS Response: Thank you for identifying the applicable federally enforceable policies for Michigan. NOS evaluated the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under CZMA.

2.19 New Jersey Department of Environmental Protection (Megan Brunatti)

2.19.1 Comment Submission

State of New Jersey

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

OFFICE OF PERMITTING AND PROJECT NAVIGATION
P.O. Box 420 Mail Code 401-07J Trenton, New Jersey 08625-0420
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SHAWN M. LATOURETTE
Commissioner

August 24, 2021

Ms. Giannina DiMaio
Environmental Compliance Coordinator
United States Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service
1305 East West Highway
Silver Spring, Maryland 20910

RE: National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS) ***Draft Programmatic Environmental Impact Statement (PEIS) for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition.***

Dear Ms. DiMaio:

The New Jersey Department of Environmental Protection's (Department) Office of Permitting and Project Navigation (OPPN) distributed, for review and comment the draft PEIS for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition. The NOS proposes to analyze the potential environmental impacts of recurring surveying and mapping data collection in United States coastal and marine waters over a period of six years. The analysis covers the use of active acoustic equipment such as sub-bottom profilers, single beam and multibeam echo sounders, and side-scan sonars by NOS to collect data on the depths and shapes of underwater terrain, including the ocean, rivers, and lakes.

Based on the information provided for review, the Department offers the following comments for your consideration:

Division of Land Resource Protection

A Federal Consistency determination is required prior to performing the surveying and mapping activities.

If you have any questions, please contact Colleen Keller at Colleen.Keller@dep.nj.gov.

New Jersey Division of Fish and Wildlife

The NJ Division of Fish and Wildlife (DFW) in coordination with the NJ Endangered & Non-game Species Program (ENSP) agree that there will be some disturbance to birds (seabirds,

shorebirds, coastal birds, waterfowl) caused by aircraft sound, vessel presence/movement and onshore activities. Also, there may be impacts to birds, terrapins and other wildlife from accidental oil, fuel and/or chemical spills, but the document states that the chances are relatively minor for any of these to occur. Installation, maintenance, and removal of tide gauges may impact riparian habitat and may disturb a variety of species, including birds and terrapins. Bottom samplers may disrupt hibernating terrapins (November 1 to March 15) and freshwater mussels, depending on how far up rivers the NOS intends to sample. Many of these impacts can be minimized via timing restrictions. Without knowing exactly where/when surveys will occur, it's difficult to provide more detail at this time. The impacts identified appear to be relatively minor, excluding impacts to marine mammals/sea turtles.

If you have any questions, please contact Kelly Davis at Kelly.Davis@dep.nj.gov.

Historic and Cultural Resources

The Historic Preservation Office (HPO) has reviewed the documentation submitted and concurs with the National Oceanic and Atmospheric Administration's (NOAA) analysis and methodology laid out in the draft Programmatic Environmental Impact Statement. The HPO does not have any concerns at this time and looks forward to further consultation with NOAA, pursuant to Section 106 of the National Historic Preservation Act, as appropriate.

If additional consultation with the HPO is needed for this undertaking, please reference the HPO project number 21-1447 in any future calls, emails, submissions, or written correspondence to help expedite your review and response.

If you have any additional questions, please contact Jesse West-Rosenthal at Jesse.West-Rosenthal@dep.nj.gov.

Marine Fisheries Administration

The Greater Atlantic Region is currently experiencing high rates of disturbance due to global climate change. The impacts from climate change will have unknown effects on all species, including marine mammals and sea turtles. While it is stated in the PEIS that the impacts from surveying and mapping activities will be adverse and minor, an increased vessel presence and the increased use of powerful echo-sounders could disrupt the behaviors of species of concern, such as the endangered North Atlantic right whale. Due to the sensitivity of these species, cumulative impacts introduced by all ocean users must be considered when selecting the best sampling alternative. In addition, submerged vegetation, oyster reefs, and shellfish aquaculture leases should be avoided.

The Marine Fisheries Administration is available to provide the most recent mapping products that document submerged vegetation beds, oyster reefs, aquaculture leases, artificial reefs, and other sensitive marine habitats of New Jersey.

If alterations to the survey and mapping activities are made, timing of proposed activities should avoid migratory pathways where Spring inshore/upriver migrations and spawning of anadromous fishes occurs. Particularly, activities that can negatively impact behavior of fishes that detect

high frequency sounds (e.g., river herrings and shad, as described on page 262-263), should avoid areas where these fish may be present during Spring migrations (listed below).

Anadromous finfish timing restrictions by region in NJ:

Area	Timing Restriction
(Anadromous I) Waters in the Delaware Bay up to the Delaware Memorial bridge, rivers flowing into the Delaware bay south of the Delaware memorial bridge, waters flowing into the Atlantic Ocean and associated bays. This excludes waters that are described as part of the NY/NJ harbor agreement.	March 1 through June 30
(Anadromous II) Waters in the Delaware River from the Delaware Memorial Bridge to the border of NY State and all tributaries flowing into the Delaware River north of the Delaware memorial bridge.	March 15 through June 30
(NY/NJ Harbor Agreement) Waters west of the Sandy Hook, east of the Washington Canal (40º28'19.60 N, 74º22'00.37 W) on the Raritan River, east of the NJ Turnpike on the Rahway River, Newark Bay, water east of NJ Turnpike on the Passaic River, waters south of Route 3 on the Hackensack River, and waters south of the George Washington Bridge on the Hudson River.	February 1 through May 31

If you have any additional questions, please contact Elizabeth Lange at Elizabeth.Lange@dep.nj.gov.

Air Mobile Sources

Based on the information provided in the draft PEIS, the Bureau of Mobile Sources provides the following comments:

For the benefit of emission reductions, Crewed Vessel Operations, ferries, boats, etc. with 800 HP or more should meet EPA Tier 4 engine regulation standards to reduce NOx, PM, and HC.

Regarding actions to reduce diesel exhaust emissions from any and all construction equipment being used at the site, the Bureau of Mobile Sources provides the following comments:

1. Diesel exhaust contributes the highest cancer risk of all air toxics in New Jersey and is a major source of NOx within the state. Therefore, NJ DEP recommends that construction projects involving non-road diesel construction equipment, operating in a small geographic area over an extended period of time, implement the following measures to minimize the impact of diesel exhaust:

2. All on-road vehicles and non-road construction equipment operating at, or visiting, the construction site shall comply with the three-minute idling limit, pursuant to N.J.A.C. 7:27-14 and N.J.A.C. 7:27-15. Consider purchasing "No Idling" signs to post at the site

to remind contractors to comply with the idling limits. Signs are available for purchase from the Bureau of Mobile Sources at 609/292-7953 or http://www.stopthesoot.org/stsno-idle-sign.htm.

3. All non-road diesel construction equipment greater than 100 horsepower used on the project for more than ten days should have engines that meet the USEP A Tier 4 non-road emission standards, or the best available emission control technology that is technologically feasible for that application and is verified by the USEP A or the CARB as a diesel emission control strategy for reducing particulate matter and/or NOx emissions.

4. All on-road diesel vehicles used to haul materials or traveling to and from the construction site should use designated truck routes that are designed to minimize impacts on residential areas and sensitive receptors such as hospitals, schools, daycare facilities, senior citizen housing, and convalescent facilities.

5. In accordance with N.J.A.C. 7:27-14 and 15, diesel vehicles should not idle for more than 15 consecutive minutes when the vehicle has been stopped for 3 or more hours and only if the temperature is <25 deg. F.

6. In accordance with N.J.A.C. 7:27-14 and 15, diesel vehicles can idle if the engine provides power for mechanical operations such as: refrigeration units for perishable goods, hydraulic lifts, "cherry pickers", or similar equipment.

If you have any additional questions, please contact Kris Dahl at Kris.Dahl@dep.nj.gov.

Thank you for giving the New Jersey Department of Environmental Protection the opportunity to comment on the draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition. Please contact Katherine Nolan at (609) 292-3600 if you have any additional questions or concerns.

Sincerely,

Megan Brunatti, Director
Office of Permitting and Project Navigation

2.19.2 NOS Response

CZMA-11: A Federal Consistency determination is required prior to performing the surveying and mapping activities.

> **NOS Response:** NOS provided CD letters to all coastal states and territories with approved CMPs. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under CZMA.

Seabirds, Shorebirds & Coastal Birds, & Waterfowl-1: The NJ Division of Fish and Wildlife (DFW) in coordination with the NJ Endangered & Non- game Species Program (ENSP) agree that there will be some disturbance to birds (seabirds, shorebirds, coastal birds, waterfowl) caused by aircraft sound, vessel presence/movement and onshore activities. Also, there may be impacts to birds, terrapins and other wildlife from accidental oil, fuel and/or chemical spills, but the document states that the chances are relatively minor for any of these to occur.

Many of these impacts can be minimized via timing restrictions. Without knowing exactly where/when surveys will occur, it's difficult to provide more detail at this time

> **NOS Response:** NOS assessed the potential impacts to marine mammals; sea turtles; fish; aquatic macroinvertebrates; essential fish habitat; seabirds, shorebirds and coastal birds, and waterfowl; and their habitats. NOS has initiated consultation with USFWS under Section 7 of the ESA on the potential effects to endangered birds. As part of the consultation process, NOS developed additional mitigation measures in coordination with USFWS to avoid and minimize any potential effects to wildlife. Mitigation measures to protect wildlife, fish, and habitats include implementing mandatory invasive species prevention procedures, maintaining safe distances from protected species, following vessel speed restrictions in specific protected species habitats (e.g., North Atlantic right whale), and avoiding anchoring on sensitive bottoms. The full list of mitigation measures is included as Appendix D to the Final PEIS.
>
> As stated in the comment, these impacts are analyzed in detail in Sections 3.5.2.2.4, 3.6.2.2.4, 3.7.2.2.4, 3.8.2.2.4, 3.9.2.2.4, and 3.10.2.2.4 of the Final PEIS.

Habitats-1: Installation, maintenance, and removal of tide gauges may impact riparian habitat and may disturb a variety of species, including birds and terrapins. Bottom samplers may disrupt hibernating terrapins (November 1 to March 15) and freshwater mussels, depending on how far up rivers the NOS intends to sample. Many of these impacts can be minimized via timing restrictions. Without knowing exactly where/when surveys will occur, it's difficult to provide more detail at this time.

> **NOS Response:** Only very small areas would be disturbed during the installation, maintenance, and removal of tide gauges and GPS reference stations, most of which are affixed to existing docks and piers or secured to rocks in more remote locations. Any affected habitat components would be expected to recover post-installation. Before commencing any installation, NOS considers the presence of protected species. Collection of bottom grab samples typically involves disturbing a negligible amount of sediment from a 6” by 6” grab sampler. NOS would pay particularly close attention to

sensitive bottom habitats and avoid sampling these areas. NOS developed mitigation measures in coordination and consultation with expert agencies including NMFS and USFWS to avoid and minimize any potential effects from bottom grab sampling and the installation, maintenance, and removal of tide gauges and GPS reference stations.

NOS does not expect that a significant percentage of the total future survey effort would take place in freshwater habitat. For each NOS project being proposed in freshwater, an ESA species list would be requested from the USFWS Information for Planning and Consultation (IPaC) report system. From this information, NOS would determine if any ESA-listed species are present in a proposed project area that have not already been addressed in the programmatic consultation. If any such species are identified, NOS would consider possible impacts to ESA-listed species in the context of that specific project. If appropriate, NOS would then initiate a Section 7 consultation with the appropriate USFWS field office(s). Additional mitigation measures may be developed and implemented for these projects through the ESA consultation process with USFWS and through the CZMA process with New Jersey.

Marine Mammals-3: The impacts identified appear to be relatively minor, excluding impacts to marine mammals/sea turtles. Marine mammals in the U.S. face an overwhelming number of direct human-caused threats, including fisheries bycatch, vessel strikes, noise pollution, oil and gas exploration and development, plastics and other pollutants, and habitat destruction and degradation. In addition, evidence suggests that marine mammals are already profoundly impacted by climate change in myriad ways and that these impacts will continue to intensify. In certain circumstances, climate change will exacerbate the risk of direct human threats, essentially placing species in "double jeopardy." Despite decades of federal protection, marine mammal species and stocks at high risk of extinction occur in virtually every region of the U.S. Further, 11 marine mammal species are endemic to the Arctic and the capacity of these species to adapt to ecosystem alteration caused by rapid warming remains an open question; for some species, the level of adaptation necessary to avoid extinction may not be possible.

NOS Response: Thank you for your comment. As summarized in Table ES-1 in the Final PEIS, NOS found the overall impacts to marine mammals and sea turtles to be adverse, negligible to minor, and insignificant under all alternatives. As for Arctic species, adverse, moderate impacts on marine mammals could occur in the very unlikely event of a vessel strike, a walrus stampede, if polar bears are disturbed at denning sites, or if polar bear-human interactions occur. Adverse, moderate impacts on sea turtles could occur in the very unlikely event of an accidental oil, fuel, or chemical spill or a vessel strike.

Section 4.2.2 of the PEIS includes a detailed discussion of cumulative impacts on marine mammals. This discussion includes the effects analysis for cumulative actions including fisheries bycatch, vessel strikes, noise pollution, oil and gas exploration and development, plastics and other pollutants, and habitat destruction and degradation.

The effects analysis for Arctic marine mammals is discussed by species in Section 3.5.2. Climate change is addressed as a cumulative action and the effects analysis is discussed Section 4.1.4.

Cultural and Historic Resources-10: The Historic Preservation Office (HPO) has reviewed the documentation submitted and concurs with the National Oceanic and Atmospheric Administration's (NOAA) analysis and methodology laid out in the draft Programmatic Environmental Impact Statement.

> **NOS Response:** Thank you for your careful consideration and your input.

Future Coordination-6: The HPO does not have any concerns at this time and looks forward to further consultation with NOAA, pursuant to Section 106 of the National Historic Preservation Act, as appropriate.

If additional consultation with the HPO is needed for this undertaking, please reference the HPO project number 21-1447 in any future calls, emails, submissions, or written correspondence to help expedite your review and response.

> **NOS Response:** Thank you for your comment. NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources. The project number 21-1447 will be used for any future coordination with the New Jersey Historic Preservation Office (HPO).

Endangered Species Act-1: While it is stated in the PEIS that the impacts from surveying and mapping activities will be adverse and minor, an increased vessel presence and the increased use of powerful echo-sounders could disrupt the behaviors of species of concern, such as the endangered North Atlantic right whale.

> **NOS Response:** NOS considered behavioral impacts to species of concern in Chapter 3. The analysis in the Final PEIS includes mitigation measures, such as approach restrictions, that would further reduce adverse impacts on all species, including the North Atlantic right whale. NOS would maintain a vessel speed of 10 knots or less when conducting projects onboard a vessel 65 feet or longer in any right whale seasonal management area, when those areas are active. Additionally, NOS would report entry into North Atlantic right whale critical habitat to the Mandatory Ship Reporting System. Sightings of the North Atlantic right whale will also be reported to NMFS within two hours of occurrence when practicable and no later than 24 hours after occurrence. See the mitigation measures required by NMFS at https://www.fisheries.noaa.gov/national/endangered-species-conservation/reducing-vessel-strikes-north-atlantic-right-whales.
>
> Echo sounder use has been modeled in detail as described in Section 3.5.2 and Appendix E of the Final PEIS. For the simulated animals exposed above the 160 decibels (dB) threshold, the average time above threshold is under two minutes, and often under one minute. The disturbances, therefore, are expected to be transient, and surveys, once completed in an area, would not generally be repeated, thus limiting an individual's behavioral disruption. Behavioral exposures need to occur over the timespan of weeks to have a population level effect on marine mammals, including the North Atlantic right whale. Impacts would be very small and further mitigated by mitigation measures.

Also, please note that there would not be a substantial increase in vessel presence or use of echo sounders under the NOS Proposed Action as compared to current ongoing activities.

Cumulative Impacts-2: The Greater Atlantic Region is currently experiencing high rates of disturbance due to global climate change. The impacts from climate change will have unknown effects on all species, including marine mammals and sea turtles. While it is stated in the PEIS that the impacts from surveying and mapping activities will be adverse and minor, an increased vessel presence and the increased use of powerful echo-sounders could disrupt the behaviors of species of concern, such as the endangered North Atlantic right whale. Due to the sensitivity of these species, cumulative impacts introduced by all ocean users must be considered when selecting the best sampling alternative.

NOS Response: The cumulative impact scenario (Section 4.1 in the Final PEIS) considers past, present, and reasonably foreseeable future actions that must be addressed in a cumulative effects analysis because their environmental effects may combine with the effects of the Proposed Action. Due to the high volume and diversity of these cumulative actions across the action area, NOS identified specific projects and programs, both public and private sector, but also relevant environmental and economic trends; however, an exhaustive list of all ocean users would not be feasible to consider. NOS believes that the cumulative effects analysis present in the document is sufficient to consider impacts on all aspects of the human environment. NOS has assessed the potential for cumulative impacts of the proposed action on marine mammals (Section 4.2.2), on sea turtles (Section 4.2.3) from climate change (Section 4.1.4), from vessel presence (discussed throughout Section 4.1 for a wide variety of cumulative actions), and from acoustic sources (Section 4.1.1).

Habitats-2: In addition, submerged vegetation, oyster reefs, and shellfish aquaculture leases should be avoided.

The Marine Fisheries Administration is available to provide the most recent mapping products that document submerged vegetation beds, oyster reefs, aquaculture leases, artificial reefs, and other sensitive marine habitats of New Jersey.

NOS Response: Thank you for the additional information on available mapping products. Impacts to marine and freshwater habitats would be limited to very small-scale bottom disturbance from anchoring, taking bottom grab samples, and installing buoys or moorings. NOS would ensure that all instruments in contact with the sea floor are properly secured to minimize bottom disturbance. NOS would not collect bottom samples for sediment verification on coral reefs, shipwrecks, obstructions, or hard bottom areas. When NOS anchors, it seeks to do so over bottom types like sticky mud or sand, as those characteristics allow the flukes of the anchor to dig into the bottom and hold the chain in place. When working in an un-surveyed area or in an area that has not been surveyed in many years, the ship would try to anchor in bays where data have already been collected, providing the ship with better information on where to drop the anchor. NOS would not anchor in coral critical habitat or other known areas of coral and would avoid anchoring in sea grass.

NOS developed additional mitigation measures in consultation with NMFS for ESA and EFH under Magnuson-Stevens Fishery Conservation and Management Act (MSA). Additional mitigation measures may be developed and implemented for these projects in consultation with New Jersey through the CZMA process.

Fish-1: If alterations to the survey and mapping activities are made, timing of proposed activities should avoid migratory pathways where Spring inshore/upriver migrations and spawning of anadromous fishes occurs. Particularly, activities that can negatively impact behavior of fishes that detect high frequency sounds (e.g., river herrings and shad, as described on page 262-263), should avoid areas where these fish may be present during Spring migrations (listed below).

NOS Response: The hearing frequency range of most fish is below approximately 1,500 Hz with the most sensitive range below 800 Hz. The hearing range of pressure-sensing fish is typically extended to a few kHz (up to about 4 kHz). It should be noted, however, that at least three species of herring-like fishes detect sounds above 20 kHz. NOS expects to use very high frequency (200 kHz+) sources in Delaware Bay and New Jersey Rivers that have not been known to cause direct injury or mortality to fish.

Section 3.7.2 of the PEIS explains that direct injuries (e.g., barotrauma) from sound sources used by NOS are unlikely because of slow rise times, lack of strong shock waves, and relatively low peak pressures. Because the sensory hair cells of the inner ear in fishes are regularly replaced over time when they are damaged, unlike in mammals where sensory hair cell loss is permanent, any hearing loss in fish may be temporary and the fish does not become deaf but requires a louder sound stimulus to detect a sound within the affected frequencies. Adverse effects are possible for the small numbers of individual fish that could occur in close proximity (i.e., within several meters) to an active sound source. These effects on a species can be considered significant if they result in a reduction in the overall health and viability of a population. However, given the localized and transient spatial scale of no more than a few NOS projects occurring at any one time relative to the generally large-scale distribution of fish populations and the considerably narrow beam characteristics of equipment such as echo sounders, no population level effects are expected on marine or freshwater fish.

Vessels used by NOS would likely represent a negligible proportion of all vessel traffic in New Jersey rivers.

Mitigation Measures-5: For the benefit of emission reductions, Crewed Vessel Operations, ferries, boats, etc. with 800 HP or more should meet EPA Tier 4 engine regulation standards to reduce NOx, PM, and HC.

NOS Response: Some NOAA vessels have generators that comply with Tier 4 standards. NOS recognizes the benefits of Tier 4 standards; however, due to project needs, NOS contractors and grantees may use vessels that do not meet them.

Mitigation Measures-6: NJ DEP recommends that construction projects involving non-road diesel construction equipment, operating in a small geographic area over an extended period of time, implement the following measures to minimize the impact of diesel exhaust:

2. All on-road vehicles and non-road construction equipment operating at, or visiting, the construction site shall comply with the three-minute idling limit, pursuant to N.J.A.C. 7:27-14 and N.J.A.C. 7:27-15. Consider purchasing ""No Idling"" signs to post at the site to remind contractors to comply with the idling limits. Signs are available for purchase from the Bureau of Mobile Sources at 609/292-7953 or http://www.stopthesoot.org/stsno-idle-sign.htm.

3. All non-road diesel construction equipment greater than 100 horsepower used on the project for more than ten days should have engines that meet the USEP A Tier 4 non-road emission standards, or the best available emission control technology that is technologically feasible for that application and is verified by the USEP A or the CARB as a diesel emission control strategy for reducing particulate matter and/or NOx emissions.

4. All on-road diesel vehicles used to haul materials or traveling to and from the construction site should use designated truck routes that are designed to minimize impacts on residential areas and sensitive receptors such as hospitals, schools, daycare facilities, senior citizen housing, and convalescent facilities.

5. In accordance with N.J.A.C. 7:27-14 and 15, diesel vehicles should not idle for more than 15 consecutive minutes when the vehicle has been stopped for 3 or more hours and only if the temperature is <25 deg. F.

6. In accordance with N.J.A.C. 7:27-14 and 15, diesel vehicles can idle if the engine provides power for mechanical operations such as: refrigeration units for perishable goods, hydraulic lifts, "cherry pickers", or similar equipment.

> **NOS Response:** NOS does not expect to use terrestrial vehicles or construction equipment in a small area over any extended period of time. All activities included in the PEIS occur on the water, except for a small amount of near-coastal work to install tide gauges. Therefore, these standards for diesel construction do not apply.

2.20 Nottawaseppi Huron Band of the Potawatomi (Douglas R. Taylor)

2.20.1 Comment Submission

Regulations.gov Comment ID

NOAA-NOS-2021-0055-0002

Regulations.gov Tracking Number

kqg-olou-pxih

Comment from Nottawaseppi Huron Band of the Potawatomi - 1301 T Dr. S, Fulton, Michigan 49052

Greetings,

Ref: NOAA-NOS-2021-0055

Thank you for including the Nottawaseppi Huron Band of the Potawatomi in your consultation process. From the description of your proposed project, it does not appear as if any cultural or religious concerns of the Tribe's will be affected. We therefore have no objection to the project. Of course, if the project scope is significantly changed or inadvertent findings are discovered during the course of the project, please contact us for further consultation.

Very Respectfully
Douglas R. Taylor

2.20.2 NOS Response

Cultural and Historic Resources-15: From the description of your proposed project, it does not appear as if any cultural or religious concerns of the Tribe's will be affected. We therefore have no objection to the project.

> **NOS Response:** Thank you for your careful consideration and your input. NOS intends to notify individual tribes pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation at any time for a proposed action that may have tribal implications.

Future Coordination-9: Of course, if the project scope is significantly changed or inadvertent findings are discovered during the course of the project, please contact us for further consultation.

> **NOS Response:** Thank you for your comment, NOS would notify all interested parties if there is a significant change in scope and would notify the Nottawaseppi Huron Band of the Potawatomi if there is an inadvertent finding discovered during the course of a project with connections to the tribe.

2.21 Natural Resources Defense Council (Francine Kershaw)

2.21.1 Comment Submission

Submitted via the Federal e-Rulemaking Portal

November 22, 2021

Ms. Giannina DiMaio
DOC/NOAA/NOS Environmental Compliance Coordinator
SSMC4-Station 13612
1305 East West Highway
Silver Spring, MD 20910

RE: Comments on the Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition

Dear Ms. DiMaio,

On behalf of the Natural Resources Defense Council and Ocean Conservation Research, and our millions of members, we respectfully submit our recommendations on the National Oceanic and Atmospheric Administration ("NOAA") National Ocean Service ("NOS") Draft Programmatic Environmental Impact Statement ("PEIS") for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition. 86 Fed. Reg. 33,633 (Jun. 24, 2021); 86 Fed. Reg. 47,299 (Aug. 24, 2021).

Our comments focus on the implications of the Proposed Action for marine mammals. The Draft PEIS analyzes the potential environmental impacts associated with the NOS's recurring data collection projects to characterize submerged features (*e.g.*, habitat, bathymetry, marine debris).[1] As part of the Proposed Action, NOS may use several types of active acoustic equipment that emit sound within the hearing range of marine mammal taxa, and which could potentially result in injury or harassment.[2] The scope of the "action area" is extensive and encompasses the U.S. rivers, states' offshore waters, the U.S. territorial sea, the contiguous zone, the U.S. Exclusive Economic Zone ("EEZ"), and coastal and riparian lands.[3] Thus, the Proposed Action has the potential to impact *all* marine mammal taxa found in U.S. waters, including acoustically sensitive Arctic species,[4] endangered and threatened species and populations listed under the Endangered Species Act ("ESA"),[5] stocks designated as "depleted" and "strategic" under the Marine Mammal Protection Act ("MMPA"),[6] and small and resident populations disproportionately vulnerable to disturbance.[7]

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[1] 86 Fed. Reg. 47,299 (Aug. 24, 2021)

[2] NOAA NOS, "Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition," June 2021, (hereinafter "Draft PEIS"), at Appendix C, p. 3. Table 1.

[3] Draft PEIS at 32.

[4] Halliday, William D., Matthew K. Pine, and Stephen J. Insley. "Underwater noise and Arctic marine mammals: review and policy recommendations." *Environmental Reviews* 28.4 (2020): 438-448.

[5] 16 U.S.C. 1531-1544, 87 Stat. 884.

[6] 16 U.S.C. §§1361-1383b, 1401-1406, 1411-1421h.

[7] Forney, Karin A., et al. "Nowhere to go: noise impact assessments for marine mammal populations with high site fidelity." *Endangered Species Research* 32 (2017): 391-413.

Marine mammals in the U.S. face an overwhelming number of direct human-caused threats, including fisheries bycatch, vessel strikes, noise pollution, oil and gas exploration and development, plastics and other pollutants, and habitat destruction and degradation.[8] In addition, evidence suggests that marine mammals are already profoundly impacted by climate change in myriad ways and that these impacts will continue to intensify.[9] In certain circumstances, climate change will exacerbate the risk of direct human threats, essentially placing species in "double jeopardy."[10] Despite decades of federal protection, marine mammal species and stocks at high risk of extinction occur in virtually every region of the U.S.[11] Further, 11 marine mammal species are endemic to the Arctic and the capacity of these species to adapt to ecosystem alteration caused by rapid warming remains an open question; for some species, the level of adaptation necessary to avoid extinction may not be possible.[12]

The need for accurate assessment of the additional and cumulative impacts that the Proposed Action will pose for already struggling marine mammal species and stocks, as well as the implementation of effective measures to avoid, minimize, and mitigate impacts to the full extent practicable, is paramount. We note that while consistency across regions is a clear goal of any programmatic permit, differences in data availability, marine mammal vulnerability, and mitigation needs occur between the "operational areas" included within the action area and need to be recognized and accounted for by NOS in the Final PEIS.

The following comments are intended to support NOS in undertaking its data collection projects in a manner that is sufficiently protective of marine mammals, in line with the agency's mandate to meet the requirements of the National Environmental Policy Act ("NEPA"), as well as other relevant statutes, namely the MMPA and the ESA.

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[8] Avila, Isabel C., Kristin Kaschner, and Carsten F. Dormann. "Current global risks to marine mammals: taking stock of the threats." *Biological Conservation* 221 (2018): 44-58.

[9] Albouy, Camille, et al. "Global vulnerability of marine mammals to global warming." *Scientific Reports* 10.1 (2020): 1-12.

[10] *Id*. *See*, *e.g.*, Santora, Jarrod A., et al. "Habitat compression and ecosystem shifts as potential links between marine heatwave and record whale entanglements." *Nature Communications* 11.1 (2020): 1-12; Guilpin, Marie, et al. "Repeated vessel interactions and climate-or fishery-driven changes in prey density limit energy acquisition by foraging blue whales." *Frontiers in Marine Science* 7 (2020): 626; Record, Nicholas R., et al. "Rapid climate-driven circulation changes threaten conservation of endangered North Atlantic right whales." *Oceanography* 32.2 (2019): 162-169.

[11] North Atlantic right whales numbered 336 individuals in 2020; Gulf of Mexico whales (*Balaenoptera ricei*) currently number approximately 50 individuals; in the eastern North Pacific, Southern Resident killer whales currently number 74 individuals, approximately 30-35 individuals remain of the eastern stock North Pacific right whales, and Cook Inlet beluga whales numbered only 279 individuals in 2019; the population of Hawaiian monk seals currently represents only approximately 1,400 individuals and is considered endangered throughout its range. *See* NOAA Fisheries, "Endangered and Threatened Species Directory," available at: https://www.fisheries.noaa.gov/species-directory/threatened-endangered; New England Aquarium Press Release, "Population of North Atlantic right whales continues its downward trajectory," available at: https://www.neaq.org/about-us/news-media/press-kit/press-releases/population-of-north-atlantic-right-whales-continues-its-downward-trajectory/; Marine Mammal Commission, "Southern Resident Killer Whale," available at: https://www.mmc.gov/priority-topics/species-of-concern/southern-resident-killer-whale/.

[12] Moore, Sue E., and Randall R. Reeves. "Tracking arctic marine mammal resilience in an era of rapid ecosystem alteration." *PLoS Biology* 16.10 (2018): e2006708.

We are particularly concerned with the lack of mitigation measures proposed in the Draft PEIS.[13] In order to satisfy NEPA, mitigation measures must be developed as part of the EIS process and not shunted to processes that may be required under other statutes, with their different scopes and standards, some of which, as with the interagency consultation provisions of the ESA, do not provide notice and opportunity for public comment.[14] Mitigation measures should be made available for public comment as a supplemental document to the Draft PEIS *prior* to being incorporated in the Final EIS.

To assist NOS in this task, we recommend the following requirements for active acoustic sources that emit sound levels with the potential to injure or harass marine mammals (<200 kHz):

- Time-area restrictions on survey activities in habitat areas and during times of biological importance to marine mammals, including, at minimum, critical habitat areas designated under the ESA and Biologically Important Areas ("BIAs") designated by NOAA.

- A prohibition on commencing surveys at night and during periods of low visibility to maximize the probability that marine mammals are detected and confirmed clear of the exclusion zone.

- A requirement to establish and monitor an exclusion zone around each sound source with a radial distance that will minimize behavioral disturbance.

- A requirement that a combination of visual monitoring by Protected Species Observers ("PSOs") and passive acoustic monitoring is implemented at all times that survey work is underway.

- A requirement that four PSOs adhere to a two-on/two-off shift schedule to ensure no individual PSO is responsible for visually monitoring more than 180° of the exclusion zone at any one time.

- A requirement that the developer selects sub-bottom profiling systems, and operates those systems at power settings, that achieve the lowest practicable source level for the objective.

- A requirement that all vessels associated with the Proposed Action, regardless of size, observe a mandatory 10 knot speed restriction at all times.

I. The National Environmental Policy Act

Enacted by Congress in 1969, NEPA establishes a national policy to "encourage productive and enjoyable harmony between man and his environment" and promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man." 42 U.S.C. § 4321. In

[13] Draft PEIS at 58. "Additionally, this analysis concludes that the Proposed Action is not anticipated to result in significant impacts for any resource. As such, NOS has not proposed a discrete set of additional mitigation measures for this Draft PEIS … Additional mitigation measures would likely be identified through these consultations. Mitigation measures and BMPs developed through consultation, as well as measures suggested through public comment, will be considered as part of the analysis in the Final PEIS."

[14] 43 C.F.R. § 1502.14; see also *id.* at § 1507.4 (noting that "NEPA requires consideration of mitigation").

order to achieve its broad goals, NEPA mandates that "to the fullest extent possible" the "policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with [NEPA]." 42 U.S.C. § 4332. As the Supreme Court explained,

> NEPA's instruction that all federal agencies comply with the impact statement requirement – and with all the requirements of § 102 – "to the fullest extent possible" [cit. omit.] is neither accidental nor hyperbolic. Rather the phrase is a deliberate command that the duty NEPA imposes upon the agencies to consider environmental factors not be shunted aside in the bureaucratic shuffle.

Flint Ridge Development Co. v. Scenic Rivers Ass'n, 426 U.S. 776, 787 (1976). Central to NEPA is its requirement that, before any federal action that "may significantly degrade some human environmental factor" can be undertaken, agencies must prepare an environmental impact statement. *Steamboaters v. F.E.R.C.*, 759 F.2d 1382, 1392 (9th Cir. 1985) (emphasis in original).

The fundamental purpose of an EIS is to force the decision-maker to take a "hard look" at a particular action – at the agency's need for it, at the environmental consequences it will have, and at more environmentally benign alternatives that may substitute for it – before the decision to proceed is made. *See* 40 C.F.R. §§ 1500.1(b), 1502.1; *Baltimore Gas & Electric v. NRDC*, 462 U.S. 87, 97 (1983). This "hard look" requires agencies to obtain high-quality information and accurate scientific analysis. *See* 40 C.F.R. § 1500.1(b). "General statements about possible effects and some risks do not constitute a hard look absent a justification regarding why more definitive information could not be provided." *Klamath-Siskiyou Wilderness Center v. Bureau of Land management*, 387 F.3d 989,994 (9th Cir. 2004) (quoting *Neighbors of Cuddy Mountain v. United States Forest Service*, 137 F.3d 1372, 1380 (9th Cir. 1998)). The law is clear that the EIS must be a pre-decisional, objective, rigorous, and neutral document, not a work of advocacy to justify an outcome that has been foreordained.

To comply with NEPA, an EIS must *inter alia* include a "full and fair discussion" of direct and indirect environmental impacts (40 C.F.R. § 1502.1), consider the cumulative effects of reasonably foreseeable activities in combination with the proposed action (*id.* § 1508.7), analyze all reasonable alternatives that would avoid or minimize the action's adverse impacts (*id.* § 1502.1), address measures to mitigate those adverse effects (*id.* § 1502.14(f)), and assess possible conflicts with other federal, regional, state, and local authorities (*id.* § 1502.16(c)).

In addition to NEPA, NOS is obligated under both the ESA and the MMPA to protect marine mammals from additional harmful impacts of human activities and required by the MMPA to consider the full range of potential impacts on all marine mammal species that are known to utilize the action area. Further, appropriate avoidance, minimization, mitigation, and monitoring measures are required. NOS must use the best available scientific information on marine mammal presence, density, and population status, as

required by law.[15] NOS must also ensure that any potential stressors and cumulative impacts posed by the proposed surveys are mitigated to effectuate the least practicable impact on affected species and stocks.[16]

II. Effects of the Proposed Action on Marine Mammals in U.S. Waters

The Draft PEIS identifies several potential impact producing factors that may have consequences for marine mammals in the action area.[17] While we note that NEPA requires all identified impact producing factors be analyzed and mitigated, we focus our comments on the factors that represent, in our view, the greatest risk to marine mammals posed by the Proposed Action: impacts of underwater noise on cetaceans; and vessel strike risk to large whales.

A. Impacts of underwater noise generated by the Proposed Action on cetaceans

The NOS proposes to use up to forty different active acoustic equipment sources that emit sound within the hearing range of cetaceans when conducting the oceanographic surveys included in the Proposed Action, including echo sounders, acoustic doppler current profilers (ADCPs), and acoustic communication systems.[18] Equipment operated at or below 200 kHz overlaps with the hearing range of marine mammals and potentially pose a risk of injury or harassment (*see* Figure 1).

Exposure to noise from geophysical surveys used for oceanographic surveys can damage the hearing and sensory abilities of some species, cause stress and negative health effects, disrupt vital behaviors, or displace marine mammals from habitat.[19] These effects are particularly concerning for acoustically sensitive species, such as those endemic to the Arctic and deep-diving cetaceans,[20] as well as those taxa coping with climate-driven shifts in prey distribution, including endangered and threatened large whales, for which displacement from preferred feeding areas or known migratory paths could have a disproportionately negative effect on their energy budget.[21] Moreover, extensive high resolution geophysical ("HRG") surveys associated with the Proposed Action will take place concurrently with other sources of noise occurring in marine mammal habitat,[22] making the cumulative impacts posed by these activities a significant concern.

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[15] 16 U.S.C. § 1362(19), § 1362(27).

[16] 16 U.S.C. § 1371(a)(5)(D)(ii)(I).

[17] Draft PEIS at 145.

[18] Draft PEIS, Appendix C, at 3, Table 1.

[19] Erbe, Christine, Rebecca Dunlop, and Sarah Dolman. "Effects of noise on marine mammals." *Effects of anthropogenic noise on animals*. Springer, New York, NY, 2018. 277-309.

[20] Halliday, William D., et al., *supra*; Simonis, Anne E., et al. "Co-occurrence of beaked whale strandings and naval sonar in the Mariana Islands, Western Pacific." *Proceedings of the Royal Society B* 287.1921 (2020): 20200070.

[21] Meyer-Gutbrod, Erin L., et al. "Ocean regime shift is driving collapse of the North Atlantic right whale population." *Oceanography* 34.3 (2021): 22-31; NOAA Fisheries, "Gray Whale Unusual Mortality Event along the West Coast and Alaska," available at: https://www.fisheries.noaa.gov/national/marine-life-distress/2019-2021-gray-whale-unusual-mortality-event-along-west-coast-and.

[22] Duarte, Carlos M., et al. "The soundscape of the Anthropocene ocean." *Science* 371.6529 (2021).

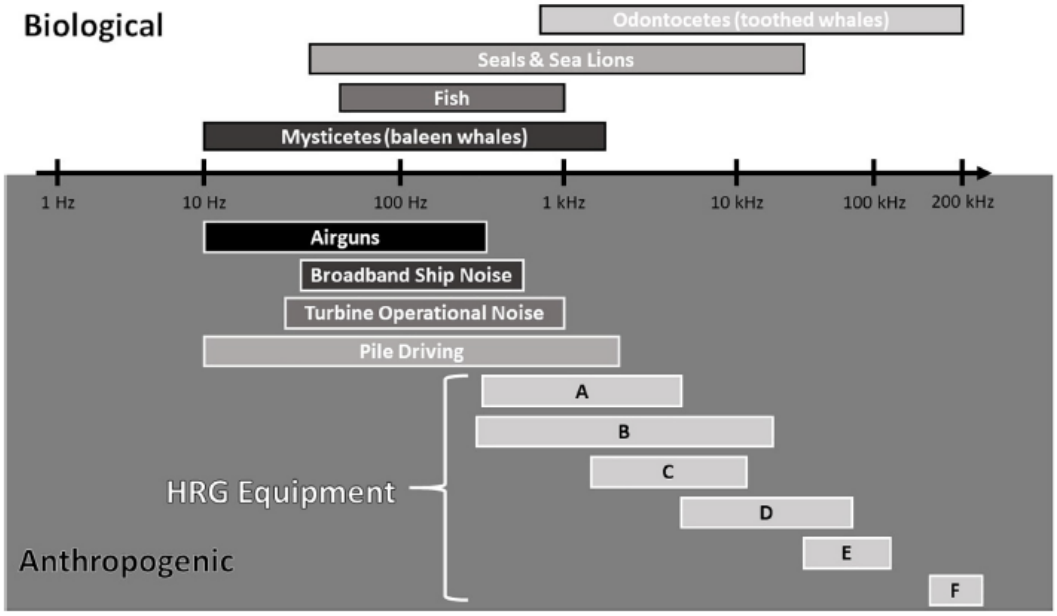

Figure 1. Frequency ranges over which groups of marine mammals call (top) and the primary frequency ranges over which some anthropogenic sound sources (bottom) overlap. The bracketed boxes correspond to the following HRG survey equipment sound sources: A) Sparkers/Boomers; B) Non-parametric sub-bottom profilers; C) Acoustic corers; D) Acoustic positioning systems; E) Parametric sub-bottom profilers; and F) Multibeam echosounders and sidescan sonar. Figure adapted from van Parijs et al. (2021).[23]

B. Vessel strike risk to large whales from the Proposed Action

Vessel strikes are a leading cause of large whale injury and mortality, and a direct driver of the current decline of several endangered large whales species and stocks in U.S. waters.[24] The number of recorded vessel collisions of large whales each year is likely a significant underestimate of the actual number of animals struck, as animals struck, but not recovered or thoroughly examined, cannot be accounted for.[25] Mortality or serious injury—considered by NOAA Fisheries to be an injury from which the animal is not

[23] Van Parijs, Sofie. "NOAA and BOEM Minimum Recommendations for Use of Passive Acoustic Listening Systems in Offshore Wind Energy Development Monitoring and Mitigation Programs." *Frontiers in Marine Science* (2021): 1575.

[24] NOAA Fisheries, "2017-2021 North Atlantic Right Whale Unusual Mortality Event," available at: https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2021-north-atlantic-right-whale-unusual-mortality-event; NOAA Fisheries, "2016-2021 Humpback Whale Unusual Mortality Event Along the East Coast," available at: https://www.fisheries.noaa.gov/national/marine-life-distress/2016-2021-humpback-whale-unusual-mortality-event-along-atlantic-coast; Rockwood, R. Cotton, et al. "Estimating effectiveness of speed reduction measures for decreasing whale-strike mortality in a high-risk region." *Endangered Species Research* 43 (2020): 145-166.

[25] Pace III, Richard M., et al. "Cryptic mortality of North Atlantic right whales." *Conservation Science and Practice* 3.2 (2021): e346. Observed carcasses of North Atlantic right whales from all causes of death may have only accounted for 36 percent of all estimated death during 1990-2017, with detection rates dropping to 29 percent for the period of 2010-2017. Detection rates may be similarly low for other large whale species, and even lower for species that receive relatively less surveillance effort.

expected to recover[26]—can occur from a collision with a vessel traveling above 10 knots, irrespective of length,[27] and vessels of any length travelling below this speed can still inflict lethal harm.[28]

The survey vessels associated with the Proposed Action pose a risk of collision to large whales that must be mitigated. The Draft PEIS states that vessel transit speeds vary by location, but are typically lower than 25 knots, and that vessels are typically limited to speeds of 13 knots during survey activities.[29] These speeds far exceed the 10-knot limit that best available scientific information indicates is necessary to reduce the probability of mortality and serious injury resulting from a vessel strike when it does occur.

The Draft PEIS also states that vessel transits and project activities may occur at either day or night.[30] Nighttime transits and survey activities increase vessel strike risk to all large whales due to the reduced probability of detection during periods of darkness, and particularly for those large whale species that exhibit nighttime behaviors that further increase their risk level. For example, the North Atlantic right whale and the Gulf of Mexico whale (*Balaenoptera ricei*)—two of the nation's most critically endangered species and for which vessel strikes are a major driver of their current decline—spend the majority of their time at night residing just beneath the surface within the uppermost few meters of the water column.[31] This behavior places these species in the direct path of a vessel's hull during periods of darkness, when they would be virtually impossible to detect by the vessel captain or other visual observer.

III. Recommended Improvements to the Impact Analysis

Fundamental to satisfying NEPA's requirement of fair and objective review, agencies must ensure the "professional integrity, including scientific integrity," of the discussions and analyses that appear in environmental impact statements. 40 C.F.R. § 1502.24. To this end, they must make every attempt to obtain and disclose data necessary to their analysis. The simple assertion that "no information exists" will not suffice; unless the costs of obtaining the information are exorbitant, NEPA requires that it be obtained. *See* 40 C.F.R. § 1502.22(a). Agencies are further required to identify their methodologies, indicate when necessary information is incomplete or unavailable, acknowledge scientific disagreement and data gaps, and evaluate indeterminate adverse impacts based upon approaches or methods "generally accepted in the scientific community." 40 C.F.R. §§ 1502.22(2), (4), 1502.24. Further, it is not enough, for purposes of this discussion, to consider the proposed action in isolation, divorced from other public and private activities that impinge on the same resource; rather, it is incumbent on NOS to assess cumulative impacts as well, including the "impact on the environment which results from the

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[26] NOAA Fisheries, "Process for distinguishing serious from non-serious injury for marine mammals," July 2014, available at: https://media.fisheries.noaa.gov/dam-migration/02-238.pdf.

[27] Conn, P. B., and G. K. Silber. "Vessel speed restrictions reduce risk of collision-related mortality for North Atlantic right whales." *Ecosphere* 4.4 (2013): 1-16.

[28] Kelley, D.E., Vlasic, J.P. and Brilliant, S.W., "Assessing the lethality if ship strikes on whales using simple biophysical models," *Marine Mammal Science*, vol. 37, pp. 251-267 (2020).

[29] Draft PEIS at 34.

[30] *Id*.

[31] Soldevilla, Melissa S., et al. "Spatial distribution and dive behavior of Gulf of Mexico Bryde's whales: potential risk of vessel strikes and fisheries interactions." *Endangered Species Research* 32 (2017): 533-550; Parks, Susan E., et al. "Dangerous dining: surface foraging of North Atlantic right whales increases risk of vessel collisions." *Biology Letters* 8.1 (2012): 57-60.

incremental impact of the action when added to other past, present, and reasonably foreseeable future significant actions." *Id.* § 1508.7.

A. NOS should be more precautionary in the assessment of acoustic impacts

NOS should be more precautionary in its assessment of potential acoustic impacts from the survey activities in the Proposed Action on marine mammals and incorporate the following into its impact analyses: *First*, the potential for concurrent impulsive exposures to be experienced by the animal as continuous exposure should be accounted for.[32] We note that potential exposure to continuous noise would set the regulatory acoustic impact threshold at 120dB.[33] *Second*, NOS should not underestimate the potential for high frequency exposures due to higher attenuation rates over distance, as attenuation rates may be less efficient when propagation characteristics are accounted for.[34] Exposures should be modeled for each operational area using region-specific information on propagation conditions.

In addition, NOAA should acknowledge the limitations of current NOAA Fisheries' acoustic thresholds for behavioral impacts and develop and use updated guidelines on thresholds for marine mammal behavioral disturbance (*i.e.,* Level B take)[35] that are sufficiently protective and consistent with the best available scientific information. Multiple marine mammal species have been observed to exhibit strong, and in some cases, lethal, behavioral reactions to sound levels well below the 160 dB threshold defined by NOAA Fisheries for Level B take,[36] leading to calls from the scientific community for the agency to revise its guidelines.[37] Acceptance of the current NOAA Fisheries' acoustic threshold for Level B take will result in NOS's significant underestimation of the impacts to marine mammals and potentially the permitting, recommendation, or prescription of ineffective mitigation measures (*e.g.*, under protective exclusion zones).

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[32] Hastie, Gordon, et al. "Effects of impulsive noise on marine mammals: investigating range-dependent risk." *Ecological Applications* 29.5 (2019): e01906.

[33] NOAA Fisheries, "Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts." U.S. Dept. of Commerce, NOAA. NOAA Technical Memorandum NMFS-OPR-59, 167 p (2018).

[34] *See*, *e.g*., Shapiro, G., F. Chen, and R. Thain. "The effect of ocean fronts on acoustic wave propagation in the Celtic Sea." *Journal of Marine Systems* 139 (2014): 217-226.

[35] As defined pursuant to the Marine Mammal Protection Act "any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild." 50 C.F.R. § 216.3.

[36] Gomez, Catalina, et al. "A systematic review on the behavioural responses of wild marine mammals to noise: the disparity between science and policy." *Canadian Journal of Zoology* 94.12 (2016): 801-819.

[37] *E.g.,* England, Gordon R., et al. "Joint interim report Bahamas marine mammal stranding event of 15-16 March 2000." US Department of Commerce, US Secretary of the Navy (2001); Nowacek, Douglas P., Mark P. Johnson, and Peter L. Tyack. "North Atlantic right whales (*Eubalaena glacialis*) ignore ships but respond to alerting stimuli." *Proceedings of the Royal Society of London. Series B: Biological Sciences* 271.1536 (2004): 227-231; Parsons, E. C. M., et al. "Navy sonar and cetaceans: Just how much does the gun need to smoke before we act?." *Marine Pollution Bulletin* 56.7 (2008): 1248-1257; Tougaard, Jakob, Andrew J. Wright, and Peter T. Madsen. "Cetacean noise criteria revisited in the light of proposed exposure limits for harbour porpoises." *Marine Pollution Bulletin* 90.1-2 (2015): 196-208; Wright, Andrew J. "Sound science: maintaining numerical and statistical standards in the pursuit of noise exposure criteria for marine mammals." *Frontiers in Marine Science* 2 (2015): 99.

B. NOS must incorporate additional data sources into calculations of marine mammal density and take

In determining the proportion of marine mammal species and stocks taken by the proposed activities, NOS relies on information on species abundance and distribution obtained from NOAA and U.S. Fish and Wildlife Service Stock Assessment Reports ("SARs").[38] Species and stock densities within the NOS operational areas were derived by distributing SARs abundance estimates over the portion of the operational area that coincides with the habitat preference and associated depth category for the species or stock. If a species or stock occupied an area larger than the operational area, the conservative assumption was made that the abundance of the species or stock occurred wholly within the operational areas under assessment.[39] Densities derived from information provided by the SARs were compared with habitat-based density estimates when available but were not found to correspond in a consistent manner.[40]

The simple approach of averaging abundance estimates over the extent of a species' or stock's distribution or depth preference does not bring to bear the best available scientific information for the purposes of impact assessment. Our concerns are threefold:

First, NOS does not consider important habitat areas where marine mammal density may be elevated relative to other areas either year-round or seasonally, and where concomitant survey activities would result in disproportionately higher impacts and number of takes. Multiple data sources describe important habitat areas for marine mammals (*see* Section IV.A. for further discussion) and this information should be incorporated into the impact analysis.

Second, the habitat-based density models produced by Duke University for marine mammals from several regions of the U.S. (*i.e.*, the "Roberts et al." models), while still requiring improvement, represent a more sophisticated methodology for density estimation compared with NOS's approach of averaging abundance estimates from the SARs. NOS should not default to the lowest common denominator in selecting a single methodology to estimate take across all operational areas. Rather, for those operational areas where improved density estimates are available, NOS should use those estimates in the impact assessment.

Third, a number of marine mammal species and stocks in the U.S. are considered data poor and have uncertain or outdated abundance estimates. It is not precautionary to assume that density and take levels can be reliably estimated for these species and stocks. Rather, NOS should explicitly note which species are data deficient in the Draft PEIS and, based on this, indicate that potential impacts on these species and stocks cannot be evaluated at this time.

NOS should update the impact assessment based on these recommendations to ensure that the PEIS aligns with the requirements set forth under NEPA, and other relevant statutes, including the MMPA and ESA.

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[38] Draft PEIS, Appendix C, at 10.
[39] *Id.*
[40] *Id.*

C. NOS must afford special consideration to potential direct and cumulative impacts on Arctic species and stocks

The Arctic is a unique acoustic environment and maintaining its acoustic integrity should be a primary goal of NOS. Ambient sound levels in the Arctic are some of the lowest on Earth and Arctic marine species have had limited exposure to ocean noise pollution caused by human activities.[41] This naivete means Arctic marine mammals, and their prey, will likely be disproportionately impacted by any increase in ocean noise.[42] Many Arctic marine mammals are in serious jeopardy from additional seemingly intractable climate change impacts, including the diminishment of sea ice habitat,[43] and impacts from noise will further undermine the possibility of their survival.

The strong international interest in developing an increasingly ice-free Arctic means that Arctic marine mammals may face significant and rapid increases in ocean noise pollution.[44] For example, noise from shipping increased substantially in multiple locations across the Arctic between 2013 and 2019, and some areas of the Arctic are now twice as loud as they were in 2013.[45] Climate change is also changing the Arctic acoustic environment in other ways. Loss of sea ice reduces propagation loss and increases ambient sound levels due to increased interaction between the surface and the atmosphere. The Arctic is also becoming stormier during the ice-free season and increased wind speeds may lead to greater ambient sound levels.[46]

NOS must take these considerations into account when analyzing impacts of the Proposed Action on endemic Arctic species. In doing so, NOS must revise its take estimates for Arctic species based on the increased sensitivity to noise of those species relative to species in other regions. Further, NOS must fully evaluate the disproportionate impacts of climate change on Arctic marine mammal species and stocks and their habitat, as well as the unprecedented foreseeable industrial development, as part of the cumulative impacts analysis. For mitigation purposes, and in addition to the recommendations outlined in Section IV, NOS should consider limiting survey activities in the Arctic region overall and set more protective noise limits and stricter procedural mitigation measures for any survey activities that are undertaken.

IV. Recommendations for Mitigation and Monitoring

At bottom, an EIS must "inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment." 40 C.F.R. §

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[41] PAME, "Underwater noise in the Arctic: A state of knowledge report," Roveniemi (May 2019), Protection of the Arctic Marine Environment (PAME) Secretariat, Akureyri.

[42] *Id*.

[43] Moore and Reeves, *supra*.

[44] Halliday, et al., *supra*.

[45] PAME, "Underwater noise pollution from shipping in the Arctic report," Submitted by the Protection of the Arctic Marine Environment Working Group of the Arctic Council to the Chairman of the SAOs and the Arctic Council SAOs, Reykjavik, Iceland (Feb. 18, 2021).

[46] Halliday et al. *supra*.

1502.1. This requirement has been described in regulation as "the heart of the environmental impact statement." *Id.* § 1502.14. The courts describe the alternatives requirement equally emphatically, citing it early on as the "linchpin" of the EIS. *Monroe County Conservation Council v. Volpe*, 472 F.2d 693 (2d Cir. 1972). The agencies must therefore "[r]igorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated." *Id.* § 1502.14(a). Consideration of alternatives is required by (and must conform to the independent terms of) both sections 102(2)(C) and 102(2)(E) of NEPA. In addition, agencies must discuss measures designed to mitigate their action's impact on the environment. *See* 42 C.F.R. § 1502.14(f).

No mitigation measures for marine mammals are included in the Draft PEIS. Rather, as the "analysis concludes that the Proposed Action is not anticipated to result in significant impacts for any resource […] NOS has not proposed a discrete set of mitigation measures…"[47] Additional mitigation measures and best management practices ("BMPs") are expected to be developed through various interagency consultation as well as through public comment and "will be considered as part of the analysis in the Final EIS."[48]

The predetermination by NOS that the Proposed Action is "not anticipated to result in significant impacts for any resource" prior to consultation and public comment, as well as the lack of inclusion of *any* mitigation measures in the Draft PEIS for evaluation by the public, fails to satisfy the requirement for sufficient notice and comment set forth under NEPA.[49]

In order to satisfy NEPA, mitigation measures must be developed as part of the EIS process and not shunted to processes that may be required under other statutes, with their different scopes and standards, some of which, as with the interagency consultation provisions of the ESA, do not provide notice and opportunity for public comment.[50] **Mitigation measures should be made available for public comment as a supplemental document to the Draft PEIS *prior* to being incorporated in the Final EIS**.

We recommend the following mitigation measures be considered for acoustic sources that could injure or harass endangered and protected species and stocks of marine mammals (*i.e.*, <200 kHz).

A. Restrict survey activities in areas and during times of year when marine mammals have higher relative vulnerability

It is most protective to avoid and reduce impacts in the first instance by separating harmful activities from the species and stocks potentially affected. **NOS should define and implement time-area restrictions to limit survey activities involving survey equipment with the potential to injure or harass marine mammals in areas and/or during times of highest risk to endangered and protected species and stocks.**

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[47] Draft PEIS at 58.

[48] *Id*.

[49] 43 C.F.R. § 1502.14; see also *id.* at § 1507.4 (noting that "NEPA requires consideration of mitigation").

[50] *Id*.

Time-area restrictions should be informed, at minimum, by critical habitat designated under the ESA and BIAs designated by NOAA, which comprise reproductive areas, feeding areas, migratory corridors, and areas in which small and resident populations are concentrated.[51] BIAs offer a necessary complement to habitat-based density models (*e.g.*, NOAA CetMap); in addition to high density areas, BIAs may capture areas of critical importance to the survival of a species or stock where density of individuals may be low. BIA designations are not comprehensive, however, and are intended to be periodically reviewed and updated to reflect the best available scientific information.[52] Indeed, BIAs are currently undergoing review, a process that may yield new or revised BIAs for several species and stocks in December 2021.[53] NOS should incorporate the revised BIAs into the necessary development of mitigation measures for the Proposed Action. We further recommend NOS synthesize multiple data sources when making determinations about the importance of marine mammal habitat (*e.g.,* aerial survey data, acoustic detections, opportunistic data), rather than relying solely designated ESA critical habitat and BIAs.

When implementing time-area restrictions, it is also imperative that NOS fully account for the consequences of those restrictions on other protected species and stocks not the original target of the restriction (*i.e.*, the potential for displacing or concentrating survey activities in other areas or during times of year that may elevate risk to other species and stocks must be fully considered).

We also recommend NOS, and NOAA Fisheries, work to advance a robust and effective near real-time monitoring and mitigation system for endangered and protected species and stocks of large whales that will be more responsive to ongoing dynamic distributional shifts resulting from climate change,[54] as well as provide more flexibility in the survey window. There are several technologies in various of stages of development that would allow near real-time detection of large whales and convey that information to decision-makers,[55] and near real-time monitoring systems are already being deployed to mitigate risks to some species, including the North Atlantic right whale.[56] We recommend NOS invest in and coordinate with NOAA Fisheries and other relevant agencies, experts, and stakeholders, to develop a near real-time large whale monitoring and mitigation system. The system should be capable of detecting and alerting vessels, stationary platforms, and enforcement agencies of the location of large whales on a near real-time basis, informing sector-specific mitigation protocols that can effectively reduce take of large whales, and continually integrate improved technology. The development of the system could begin with a pilot program that incorporates all the necessary precautions (*e.g*., vessel speed limit of 10 knots) focused on

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[51] Van Parijs, Sofie M. "Letter of introduction to the biologically important areas issue." *Aquatic Mammals* 41.1 (2015): 1-2.

[52] *Id*.

[53] *See* https://oceannoise.noaa.gov/biologically-important-areas.

[54] van Weelden, Celine, Jared R. Towers, and Thijs Bosker. "Impacts of climate change on cetacean distribution, habitat and migration." *Climate Change Ecology* (2021): 100009.

[55] *E.g*., Woods Hole Oceanographic Institution, *Robots4Whales*, available at http://dcs.whoi.edu/; Seatrac Systems Inc., available at https://www.seatrac.com/; Mysticetus, LLC., available at https://www.mysticetus.com/

[56] *See, e.g., Underwater glider helps save North Atlantic Right Whales from Ship Strikes,* CBC News (Aug. 30, 2020), available at https://www.cbc.ca/news/canada/new-brunswick/nb-north-atlantic-right-whales-underwater-glider-1.5701984. An unmanned acoustic glider capable of auto-detecting North Atlantic right whale calls is currently informing decisions being made by Transport Canada on when to impose vessel speed restrictions in the Laurentian Channel. Ten-knot speed restrictions can be issued within an hour of North Atlantic right whales being detected.

the critically endangered North Atlantic right whale and then be expanded to other whales and geographies once the approach is tested and proven.

B. Commence survey activities during daylight and good visibility conditions

NOS should require that work commence, with ramp up, only during daylight hours and periods of good visibility to maximize the probability that marine mammals are detected and confirmed clear of any exclusion zone before activities begin. The activity can then continue into periods of darkness and low visibility if monitoring technologies effective in low visibility conditions are used (*see* Section IV.C. for more discussion of the use of infrared technologies for monitoring).[57] If the activity is halted or delayed because of documented or suspected presence of protected species and stocks in the area, NOS should wait until daylight hours and good visibility conditions to recommence survey activities.

C. Require an exclusion zone that will minimize behavioral disturbance with both visual and acoustic monitoring

As discussed in Section III.A., the 160 dB threshold for behavioral harassment is not supported by best available scientific information[58] and grossly underestimates Level B take. **NOS should establish and monitor an exclusion zone around the sound source with a radial distance that will minimize behavioral disturbance to the species expected to be present in the operational area.**

NOS must also adequately monitor the exclusion zones. Studies suggest that marine mammals exhibit behaviors that reduce their likelihood of detection by PSOs. These behavioral responses may be heightened when whales are in the proximity of the acoustic disturbance, meaning that animals may be less detectable by observers during the survey period relative to other times.[59] There are also sighting condition limitations. For even the most conspicuous large whale species, estimates of relative detection probability for a Beaufort Sea State of six is less than half that for a Beaufort Sea State of zero.[60] Given

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[57] Verfuss, Ursula K., et al. "Comparing methods suitable for monitoring marine mammals in low visibility conditions during seismic surveys." *Marine Pollution Bulletin* 126 (2018): 1-18.

[58] Blackwell, Susanna B., et al. "Effects of airgun sounds on bowhead whale calling rates: evidence for two behavioral thresholds." *PloS One* 10.6 (2015): e0125720.

[59] Robertson, Frances C., et al. "Seismic operations have variable effects on dive-cycle behavior of bowhead whales in the Beaufort Sea." *Endangered Species Research* 21.2 (2013): 143-160.

[60] Barlow, Jay. "Inferring trackline detection probabilities, g (0), for cetaceans from apparent densities in different survey conditions." *Marine Mammal Science* 31.3 (2015): 923-943; Baumgartner, Mark F., et al. "North Atlantic right whale habitat in the lower Bay of Fundy and on the SW Scotian Shelf during 1999-2001." *Marine Ecology Progress Series* 264 (2003): 137-154. Sea state has been demonstrated to have a direct effect on the sighting probability of North Atlantic right whales in the Lower Bay of Fundy and in Roseway Basin of the Southwest Scotian Shelf (Baumgartner et al. 2003). In line with Barlow (2015), the probability of sighting a North Atlantic right whale in this area changed by a factor of 0.628 (95% CI: 0.428-0.921) for every unit increase in sea state. These studies indicate the effect of increasing Beaufort Sea State in reducing the probability of detection of large whales, including the North Atlantic right whale. From the findings of Baumgartner et al. (2003), a reduction in detection probability of North Atlantic right whales by up to 84.5 percent based on an average Beaufort Sea State of 4 would be expected, relative to ideal sighting conditions (*i.e.*, Beaufort sea state = 0). Notably, the detectability of North Atlantic right whales even under ideal sighting conditions is likely to be significantly less than 100 percent given availability and perception biases other than those involving sea state.

these data, observers alone are certain to underestimate the total number of marine mammals in the mitigation area based on sea state.

At minimum, NOS should require a combination of agency-approved PSOs to visually detect marine mammals and passive acoustic monitoring to detect vocalizations in near-real time when noise levels that could result in injury or harassment to the species are being conducted. Specifically, NOS should require a minimum of four PSOs following a two-on, two-off rotation, each responsible for scanning no more than 180° of the horizon, and require the use of infrared equipment to support visual monitoring by PSOs during periods of darkness;[61] we also recommend the use of infrared technology during daylight hours to help maximize probability of detection.[62] NOS should also require passive acoustic monitoring *at all times* to maximize the probability of detection for endangered and protected species and stocks, including during periods of fog, precipitation, and high sea states, when PSOs and infrared technologies are less effective. The passive acoustic protocol should be designed so the hydrophone is not masked by vessel or survey noise, and in line with other minimum requirements developed by agency scientists.[63]

D. Underwater noise levels should be minimized to the full extent practicable

The Draft PEIS sets no requirement to minimize the impacts of underwater noise through the use of best available technology and other methods to minimize sound levels from geophysical surveys.

According to NOAA's "Ocean Noise Strategy Roadmap:"

> "[W]here noise is concerned, mitigation should be broadly designed to do one of two things: (1) reduce the temporal or spatial overlap of ensonified areas with marine taxa (or acoustic habitat) in particular times, places or circumstances, and/or (2) reduce the sound level at the source (which may include replacing the source with a different type of source capable of the same function)."[64]

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[61] Lathlean, Justin, and Laurent Seuront. "Infrared thermography in marine ecology: methods, previous applications and future challenges." *Marine Ecology Progress Series* 514 (2014): 263-277; Smith, Heather R., et al. "A field comparison of marine mammal detections via visual, acoustic, and infrared (IR) imaging methods offshore Atlantic Canada." *Marine Pollution Bulletin* 154 (2020): 111026; Zitterbart, Daniel P., et al. "Scaling the Laws of Thermal Imaging–Based Whale Detection." *Journal of Atmospheric and Oceanic Technology* 37.5 (2020): 807-824. In addition, NMFS must consider the limitations of the infrared system proposed and ensure that the detection of marine mammals is possible at distances out to and beyond the exclusion zones, in the geographic region in question, and for all relevant endangered and protected species. These technologies have not been well tested for detection of North Atlantic right whales, and may be relatively ineffective for detecting minke whales, both species of concern in light of the current UMEs declared for the Atlantic coast. Further, NMFS should encourage developers to partner with scientists and collect data that increases our understanding of the effectiveness of infrared technologies, with a view towards greater reliance on these technologies to commence surveys during nighttime hours in the future.

[62] Smith, H.R., et al., *id*.

[63] Van Parijs, Sofie, et al., *supra*,

[64] Gedamke, Jason., et al., "Ocean Noise Strategy Roadmap," NOAA Fisheries, (2016), at 23, available at: https://cetsound.noaa.gov/Assets/cetsound/documents/Roadmap/ONS_Roadmap_Final_Complete.pdf.

In addition, simulation studies comparing the level of risk reduction associated with technologies that allow for reduced source levels and current exclusion zone mitigation practices indicate that there will be very few instances where mitigation using visual observers can achieve a greater risk reduction than would be achieved by a reduction in source level.[65] Thus, reducing sound emissions at the source is one the most effective means of mitigating the impacts of noise on protected species.

NOS should select HRG survey systems, and operate those systems at power settings, that achieve the lowest practicable source level for the objective. NOS should also minimize sound levels from the proposed survey activities to the fullest extent feasible using best available technologies and methods.

E. A 10-knot speed restriction should be required for all vessels at all times

As discussed in Section II.B., vessel strikes pose an unacceptable risk of mortality and serious injury for large whales. In some operational areas, activities associated with the proposed action will increase the risk of vessel strike to species for which any additional human-caused mortality or serious injury will lead to population-level consequences and directly increase extinction risk.[66] While the number of vessels associated with the Proposed Action will be low relative to other sources of U.S. vessel traffic (the Draft PEIS notes that compared to AIS data for commercial vessels in 2017, vessels used or funded by NOS account for 0.3 percent of all nautical miles travelled within the EEZ[67]), any interaction between a vessel and whale poses a risk of serious injury or mortality, and this is true irrespective of the number of other vessels operating in the same location.

The dire conservation status of several species and stocks of large whale within the action area means that even a single vessel strike may have population-level consequences. Even a single vessel traveling at speeds over 10 knots therefore poses an unacceptable risk. In addition, mariner compliance with voluntary speed reduction measures is extremely low[68] indicating mandatory speed reduction requirements are necessary to provide protection. **NOS should therefore act conservatively and require all vessels associated with the Proposed Action, regardless of size, to observe a 10-knot speed restriction during the entire survey period, including transits to and from the survey area.**

V. Conclusion

Thank you for considering our comments. To comply with its statutory obligations, our organizations urge NOS to revise its impact analysis in the Final PEIS for the reasons stated above, as well as develop

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[65] Leaper, Russell, Susannah Calderan, and Justin Cooke. "A Simulation Framework to Evaluate the Efficiency of Using Visual Observers to Reduce the Risk of Injury from Loud Sound Sources." *Aquatic Mammals* 41.4 (2015).

[66] Examples include the North Atlantic right whale and the Gulf of Mexico whale (*B. ricei*).

[67] Draft PEIS at 34.

[68] NOAA Fisheries, "North Atlantic Right Whale (*Eubalaena glacialis*) Vessel Speed Rule Assessment," June 2020, available at: https://media.fisheries.noaa.gov/2021-01/FINAL_NARW_Vessel_Speed_Rule_Report_Jun_2020.pdf?null; McKenna, Megan F., et al. "Response of commercial ships to a voluntary speed reduction measure: are voluntary strategies adequate for mitigating ship-strike risk?" *Coastal Management* 40.6 (2012): 634-650.

mitigation measures and publish those measures in a supplemental to the Draft PEIS for public notice and comment prior to the issuance of the Final PEIS.

Sincerely,

Francine Kershaw, Ph.D.
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Natural Resources Defense Council

Michael Stocker
Director
Ocean Conservation Research

2.21.2 NOS Response

Marine Mammals-4: We note that while consistency across regions is a clear goal of any programmatic permit, differences in data availability, marine mammal vulnerability, and mitigation needs occur between the "operational areas" included within the action area and need to be recognized and accounted for by NOS in the Final PEIS.

> **NOS Response:** NOS understands that there are local differences in densities and distribution across the action area and the analysis in the PEIS accounts for the differences in data availability, marine mammal vulnerability, and mitigation needs across regions.
>
> Detailed data were used in the acoustic modeling for marine mammal presence, density, and population status using the best available information which inherently contained regional differences. NOS, in consultation with NMFS, has incorporated additional data sources into the calculations of marine mammal density and exposures. The revised exposure numbers are being used for consultation under the MMPA and ESA. These data have been updated for the Final PEIS. For the east coast of the U.S. and the Gulf of Mexico, the acoustic modeling for the Final PEIS uses densities obtained using the Duke University Marine Geospatial Ecology Laboratory model results (i.e., the "Roberts et al." models). For the Pacific and Alaska regions, species abundance and distribution were obtained from the 2021 draft Stock Assessment Reports (SARs) for cetaceans and pinnipeds.
>
> In coordination with NMFS and USFWS, NOS has developed additional mitigation measures. Mitigation measures include maintaining safe distances from marine mammals achieved by decreasing vessel speeds, vessel maneuvering, and observing time-area restrictions in specific protected species habitats (e.g., North Atlantic right whale). The Final PEIS has been updated to include additional mitigation measures in the effects analysis of the applicable resource sections. A complete list of mitigation measures can be found in Appendix D of the Final PEIS.

Mitigation Measures-8: We are particularly concerned with the lack of mitigation measures proposed in the Draft PEIS. In order to satisfy NEPA, mitigation measures must be developed as part of the EIS process and not shunted to processes that may be required under other statutes, with their different scopes and standards, some of which, as with the interagency consultation provisions of the ESA, do not provide notice and opportunity for public comment. Mitigation measures should be made available for public comment as a supplemental document to the Draft PEIS prior to being incorporated in the Final EIS.

> **NOS Response:** The Final PEIS has been updated to include additional mitigation measures developed through interagency coordination and consultations, and information received through public comment. Although the Draft PEIS did not include a discrete set of mitigation measures, NOS did include best management practices as part of the Proposed Action as explained in Section 3.2.3. These BMPs were discussed in the effects analysis where relevant, such as avoiding bottom sampling on coral reefs, shipwrecks, obstructions, or hard bottom areas and ensuring that all instruments placed in contact with the sea floor are properly secured to minimize bottom disturbance.

The Draft PEIS explained that regulatory agencies, including those with jurisdiction over marine mammals, may request or require additional mitigation measures that are necessary or prudent under other laws, such as the ESA or the MMPA.

Following publication of the Draft PEIS, NOS initiated interagency consultations under the ESA, Magnuson-Stevens Fishery Conservation and Management Act (MSA), and the National Marine Sanctuaries Act (NMSA). NOS also submitted applications for incidental take authorization under the MMPA. Through this process, additional mitigation measures were identified to further minimize the impacts of project activities on sensitive species. These additional mitigation measures have been incorporated into the effects analysis in the appropriate resource sections of the Final PEIS. The full list of mitigation measures is included as Appendix D in the Final PEIS.

The incorporation of additional mitigation measures in the Final PEIS as a result of interagency coordination does not represent a significant change to the Proposed Action or new information relevant to environmental concerns and therefore, per 40 CFR 1502.9(d)(4), NOS is not required to publish a supplement to the Draft PEIS. Additional mitigation measures incorporated into the Final PEIS generally result in a reduction of any adverse environmental impacts previously analyzed.

Mitigation Measures-9: To assist NOS in this task, we recommend the following requirements for active acoustic sources that emit sound levels with the potential to injure or harass marine mammals (<200 kHz):

NOS Response: The Final PEIS has been updated to include additional mitigation measures; please see the appropriate resource sections and Appendix D to see the additional mitigation measures that NOS has developed to be implemented on each project as appropriate to minimize the impacts of project activities. The additional mitigation measures in the Final PEIS were developed with subject matter experts and in coordination with field crews and with NMFS, USFWS, and ONMS. Some of the measures suggested by NRDC are included as mitigation measures; however, some of the mitigation measures suggested are not practicable.

Mitigation Measures-10: Time-area restrictions on survey activities in habitat areas and during times of biological importance to marine mammals, including, at minimum, critical habitat areas designated under the ESA and Biologically Important Areas ("BIAs") designated by NOAA…We recommend the following mitigation measures be considered for acoustic sources that could injure or harass endangered and protected species and stocks of marine mammals (i.e., <200 kHz).

A. Restrict survey activities in areas and during times of year when marine mammals have higher relative vulnerability

It is most protective to avoid and reduce impacts in the first instance by separating harmful activities from the species and stocks potentially affected. NOS should define and implement time-area restrictions to limit survey activities involving survey equipment with the potential to injure or harass marine mammals in areas and/or during times of highest risk to endangered and protected species and stocks.

Time-area restrictions should be informed, at minimum, by critical habitat designated under the ESA and BIAs designated by NOAA, which comprise reproductive areas, feeding areas, migratory corridors, and areas in which small and resident populations are concentrated. BIAs offer a necessary complement to habitat-based density models (e.g., NOAA CetMap); in addition to high density areas, BIAs may capture areas of critical importance to the survival of a species or stock where density of individuals may be low. BIA designations are not comprehensive, however, and are intended to be periodically reviewed and updated to reflect the best available scientific information. Indeed, BIAs are currently undergoing review, a process that may yield new or revised BIAs for several species and stocks in December 2021. NOS should incorporate the revised BIAs into the necessary development of mitigation measures for the Proposed Action. We further recommend NOS synthesize multiple data sources when making determinations about the importance of marine mammal habitat (e.g., aerial survey data, acoustic detections, opportunistic data), rather than relying solely designated ESA critical habitat and BIAs.

When implementing time-area restrictions, it is also imperative that NOS fully account for the consequences of those restrictions on other protected species and stocks not the original target of the restriction (i.e., the potential for displacing or concentrating survey activities in other areas or during times of year that may elevate risk to other species and stocks must be fully considered).

NOS Response: When applying significance criteria for the effects analysis, NOS considered the geographic extent of marine mammal exposures and whether the exposures are expected to occur in designated critical habitat or other biologically important areas (BIAs) such as preferred breeding, feeding, and nursery grounds or migratory routes. BIAs are discussed in Section 3.5.1.1.2 of the Final PEIS. NOS agrees that BIAs provide valuable information on locations where particular species engage in biologically important behaviors either year-round or seasonally. BIAs were created to help NOAA, other federal agencies, and the public in the analyses and planning used to characterize and minimize the impacts of anthropogenic activities on cetaceans and to achieve conservation and protection goals. BIAs occur in every region throughout the NOS action area, but they do not present the totality of important habitat throughout the marine mammals' full range. Recognition of an area as biologically important for some species activity does not cause the area to rise to the designation of critical habitat under the ESA. The stated intention is for the BIAs to serve as a resource management tool and for their currently identified boundaries to be considered dynamic and subject to change based on any new information.

NOS has considered the best available information on potential effects of acoustic and other stressors on biologically important behaviors as part of its impact analysis. Marine mammal responses to acoustic stressors from the Proposed Action are anticipated to be minor and temporary, regardless of where the activity is conducted. Time-area restrictions are only effective if there are marine mammals present in an area when and where an activity would otherwise occur. Given the variability in the presence of marine mammals, time-area restrictions would not necessarily be effective in reducing the potential impacts of surveying and mapping activities within BIAs.

NOS has concluded that impacts to marine mammals are primarily limited to minor, temporary behavioral disturbances from active acoustics, and NOS has adopted a suite of

mitigation measures to further minimize exposures. NOS also concludes that vessel strike is unlikely but possible, and employs mitigation measures to avoid strike. In addition, NOS employs additional mitigation measures for particularly vulnerable species like the North Atlantic Right Whale and Rice's Whale. NOS considered the potential effectiveness and practicability of additional mitigation measures in BIAs for those species for which Level A exposure was predicted in the PEIS. Only the harbor porpoise has designated BIAs in regions where Level A exposure was predicted. The BIAs are Morro and Monterey Bay in the West Coast Region, which was identified as two separate small resident populations found year-round in this area. The other BIA for harbor porpoise is a small and resident population in the Greater Atlantic Region, concentrated in waters less than 150 m deep in the Gulf of Maine between July and September. These designations reflect a concentration of marine mammals rather than an area where marine mammals engage in biologically important behaviors that could result in stronger behavioral reactions from Level A exposures. There are no other designated BIAs where Level A exposures were predicted.

NOS determined that avoiding harbor porpoise BIAs entirely would be impracticable. Time-area restrictions for these BIAs would significantly impact NOS' ability to collect data during suitable conditions for using acoustic sources, result in lost survey time, and affect the crew's ability to work safely. In particular, the BIAs for harbor porpoises in Morro and Monterey Bays are year-round, and avoiding these areas would mean that these areas could not be surveyed and important information that supports habitat research and vessel safety would not be collected. NOS also considered the necessity and practicality of additional management measures for these areas. NOS already uses the lowest power appropriate to perform surveys, and employs mitigation measures including protected species observers to ensure that marine mammals are not within the vicinity of the vessel when active acoustics are being used (which is where Level A exposures could occur). During nighttime operations, NOS uses the appropriate lighting to comply with navigation rules and best safety practices. All project areas would be continually monitored for protected species by posted crewmembers during vessel operations. NOS believes that the mitigation measures that will be used during projects will minimize Level A exposures or vessel strikes to harbor porpoises in these BIAs.

In coordination with NMFS and USFWS, NOS has developed additional mitigation measures. Mitigation measures include maintaining safe distances from marine mammals achieved by decreasing vessel speeds, vessel maneuvering, and observing time-area restrictions in specific protected species habitats (e.g., North Atlantic right whale). Any further mitigation, including entirely prohibiting mapping and surveying data collection or time-area restriction within the BIAs as discussed above, is unwarranted and impracticable due to safety concerns. Additionally, time-area restrictions for BIAs affect data collection and continuity and result in lost survey time. For example, surveying in the Arctic is limited to summer and early fall when conditions are safe. NOS believes that the implementation of additional mitigation measures to further reduce the minor and temporary expected impacts will provide substantial protection for marine mammals during NOS surveying and mapping activities.

Mitigation Measures-11: A prohibition on commencing surveys at night and during periods of low visibility to maximize the probability that marine mammals are detected and confirmed clear of the exclusion zone…The Draft PEIS also states that vessel transits and project activities may

occur at either day or night. Nighttime transits and survey activities increase vessel strike risk to all large whales due to the reduced probability of detection during periods of darkness, and particularly for those large whale species that exhibit nighttime behaviors that further increase their risk level…Commence survey activities during daylight and good visibility conditions.

NOS should require that work commence, with ramp up, only during daylight hours and periods of good visibility to maximize the probability that marine mammals are detected and confirmed clear of any exclusion zone before activities begin. The activity can then continue into periods of darkness and low visibility if monitoring technologies effective in low visibility conditions are used (see Section IV.C. for more discussion of the use of infrared technologies for monitoring). If the activity is halted or delayed because of documented or suspected presence of protected species and stocks in the area, NOS should wait until daylight hours and good visibility conditions to recommence survey activities.

NOS Response: Restrictions on nighttime operations are included as necessary and appropriate for the protection of the environment. For example, NOS developed additional mitigation measures in coordination with NMFS for the restriction of nighttime operations in Rice's whale habitat in the Gulf of Mexico.

A blanket prohibition on surveys at night or during periods of low visibility would significantly degrade NOS's ability to gather accurate data in a timely manner as indicated in the purpose and need of the PEIS. NOS believes the additional mitigation measures in the Final PEIS developed with subject matter experts and in coordination with field crews and with NMFS and USFWS are appropriate for reducing potential impacts to the environment. Additional mitigation measures such as equipment ramp-up (i.e., slowly increasing the sound of acoustic equipment to allow animals to exit the area) or use of passive acoustic monitoring would not appreciably reduce the impact to marine mammals.

Ramp-up, which is sometimes used for sources that are omni-directional with a large exposure radius, would do little to reduce impacts from NOS operations because of the directional nature and small exposure radius of NOS sources. It is not practicable for NOS to power-down active acoustic sources upon sighting a marine mammal within a certain radius of the vessel because data continuity would be lost and NOS already employs approach restrictions that are larger than the exposure radius.

Due to the small radius for Level A and B exposures, and the use of approach distances, passive monitoring in addition to PSOs is unnecessary. NOS has adopted a suite of effective mitigation measures that include maintaining safe distances from marine mammals achieved by decreasing vessel speeds, vessel maneuvering, and observing time-area restrictions in specific protected species habitats (e.g., North Atlantic right whale). NOS is continuing to improve its capabilities to detect marine animals, but due to the current state of the technology, it is not effective or practicable for NOS to require passive acoustic monitoring or infrared technologies for the purpose of real-time mitigation.

The full list of mitigation measures can be found in Appendix D of the Final PEIS.

Mitigation Measures-12: A requirement to establish and monitor an exclusion zone around each sound source with a radial distance that will minimize behavioral disturbance…Require an exclusion zone that will minimize behavioral disturbance with both visual and acoustic monitoring.

As discussed in Section III.A., the 160 dB threshold for behavioral harassment is not supported by best available scientific information and grossly underestimates Level B take. NOS should establish and monitor an exclusion zone around the sound source with a radial distance that will minimize behavioral disturbance to the species expected to be present in the operational area…NOS must also adequately monitor the exclusion zones.

> **NOS Response:** As discussed in Appendix E: Technical Acoustic Analysis of Oceanographic Surveys, the radius for Level A and B exposures for multibeam surveys is very small, especially when compared with the ensonification areas for other acoustic sources not used by NOS such as air guns or tactical sonar.
>
> In coordination with NMFS and USFWS, NOS has developed additional mitigation measures. Mitigation measures include maintaining safe distances from marine mammals achieved by decreasing vessel speeds, vessel maneuvering, and observing time-area restrictions in specific protected species habitats (e.g., North Atlantic right whale). The implementation of these mitigation measures makes an exclusion zone unnecessary. Exclusion zones affect data continuity and result in lost survey time.
>
> NOS acknowledges that behavioral responses to sound are complex and nuanced. The 160 dB threshold is what is currently applied by NMFS/NOAA (based on NMFS 2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts), and it is what NOS used to evaluate exposures for this analysis.

Mitigation Measures-13: A requirement that a combination of visual monitoring by Protected Species Observers ("PSOs") and passive acoustic monitoring is implemented at all times that survey work is underway.

A requirement that four PSOs adhere to a two-on/two-off shift schedule to ensure no individual PSO is responsible for visually monitoring more than 180° of the exclusion zone at any one time…Studies suggest that marine mammals exhibit behaviors that reduce their likelihood of detection by PSOs. These behavioral responses may be heightened when whales are in the proximity of the acoustic disturbance, meaning that animals may be less detectable by observers during the survey period relative to other times. There are also sighting condition limitations. For even the most conspicuous large whale species, estimates of relative detection probability for a Beaufort Sea State of six is less than half that for a Beaufort Sea State of zero. Given these data, observers alone are certain to underestimate the total number of marine mammals in the mitigation area based on sea state…At minimum, NOS should require a combination of agency-approved PSOs to visually detect marine mammals and passive acoustic monitoring to detect vocalizations in near-real time when noise levels that could result in injury or harassment to the species are being conducted.

Specifically, NOS should require a minimum of four PSOs following a two-on, two-off rotation, each responsible for scanning no more than 180° of the horizon, and require the use of infrared equipment to support visual monitoring by PSOs during periods of darkness; we also recommend the use of infrared technology during daylight hours to help maximize probability of detection…NOS should also require passive acoustic monitoring at all times to maximize the probability of detection for endangered and protected species and stocks, including during periods of fog, precipitation, and high sea states, when PSOs and infrared technologies are less effective. The passive acoustic protocol should be designed so the hydrophone is not masked by vessel or survey noise, and in line with other minimum requirements developed by agency scientists.

> **NOS Response:** In coordination with NMFS and USFWS, NOS has developed additional mitigation measures that include implementing Protected Species Observer (PSO) requirements for all survey projects, as indicated in the Final PEIS. Vessel crew must maintain at least one PSO at all times. PSOs will use all necessary and appropriate means to enhance visibility (e.g., spotlights, night vision), and will be trained as appropriate. In order to maintain safety of navigation and avoid interactions with marine mammals and other sensitive species during transit, the vessel crew are instructed to remain vigilant to the presence of marine mammals.
>
> PSOs will communicate with the crew to assist in the implementation of the appropriate mitigation measures. Prior to and during deployment of project equipment, PSOs will document occurrences of marine mammals and their behaviors and provide this documentation to regulators, such as NMFS. NOS checks with various communication media for general information regarding avoiding ship strikes and specific information regarding North Atlantic right whale sighting locations. These include NOAA weather radio, U.S. Coast Guard NAVTEX broadcasts and Notices to Mariners
>
> Due to the small radius for Level A and B exposures, the use of PSOs, and the use of approach distances, NOS has determined that adding passive monitoring is unnecessary. NOS has adopted a suite of effective mitigation measures that include maintaining safe distances from marine mammals achieved by decreasing vessel speeds, vessel maneuvering, and observing time-area restrictions in specific protected species habitats (e.g., North Atlantic right whale).
>
> NOS is continuing to improve its capabilities to detect marine animals, but due to the current state of the technology, it is not effective or practicable for NOS to require passive acoustic monitoring or infrared technologies for the purpose of real-time mitigation.
>
> Restrictions on nighttime operations are included as necessary and appropriate for the protection of the environment. For example, NOS developed mitigation measures in coordination with NMFS for the restriction of nighttime operations in Rice's whale habitat in the Gulf of Mexico.

Mitigation Measures-14: A requirement that the developer selects sub-bottom profiling systems, and operates those systems at power settings, that achieve the lowest practicable source level for the objective…In addition, simulation studies comparing the level of risk reduction associated with technologies that allow for reduced source levels and current exclusion zone mitigation

practices indicate that there will be very few instances where mitigation using visual observers can achieve a greater risk reduction than would be achieved by a reduction in source level. Thus, reducing sound emissions at the source is one the most effective means of mitigating the impacts of noise on protected species.

> **NOS Response:** NOS considers the project objectives to determine the best-suited equipment and protocols. NOS has a responsibility to gather data necessary for nautical charts and other public data products, with consideration for the human environment. Surveying vessels and equipment are designed to minimize noise, and NOS uses the lowest appropriate power and ping rate for its acoustic sources while gathering data.

Mitigation Measures-15: A requirement that all vessels associated with the Proposed Action, regardless of size, observe a mandatory 10 knot speed restriction at all times…The survey vessels associated with the Proposed Action pose a risk of collision to large whales that must be mitigated. The Draft PEIS states that vessel transit speeds vary by location, but are typically lower than 25 knots, and that vessels are typically limited to speeds of 13 knots during survey activities. These speeds far exceed the 10-knot limit that best available scientific information indicates is necessary to reduce the probability of mortality and serious injury resulting from a vessel strike when it does occur.…A 10-knot speed restriction should be required for all vessels at all times.

As discussed in Section II.B., vessel strikes pose an unacceptable risk of mortality and serious injury for large whales. In some operational areas, activities associated with the proposed action will increase the risk of vessel strike to species for which any additional human-caused mortality or serious injury will lead to population-level consequences and directly increase extinction risk. While the number of vessels associated with the Proposed Action will be low relative to other sources of U.S. vessel traffic (the Draft PEIS notes that compared to AIS data for commercial vessels in 2017, vessels used or funded by NOS account for 0.3 percent of all nautical miles traveled within the EEZ), any interaction between a vessel and whale poses a risk of serious injury or mortality, and this is true irrespective of the number of other vessels operating in the same location.

The dire conservation status of several species and stocks of large whale within the action area means that even a single vessel strike may have population-level consequences. Even a single vessel traveling at speeds over 10 knots therefore poses an unacceptable risk. In addition, mariner compliance with voluntary speed reduction measures is extremely low indicating mandatory speed reduction requirements are necessary to provide protection. NOS should therefore act conservatively and require all vessels associated with the Proposed Action, regardless of size, to observe a 10-knot speed restriction during the entire survey period, including transits to and from the survey area.

> **NOS Response:** In coordination with NMFS, USFWS, and ONMS, NOS has developed additional mitigation measures. Mitigation measures include maintaining safe distances from marine mammals, decreasing vessel speeds, vessel maneuvering, and observing time-area restrictions in specific protected species habitats (e.g., North Atlantic right whale). Limits on vessel speeds of 10 knots regardless of size and at all times are highly restrictive and unnecessary. Vessel speed limitations would particularly impact the use of smaller vessels because they cannot safely anchor in survey areas overnight. As such, observing a mandatory 10 knot speed restriction or less for all vessels at all times would

be impracticable due to safety and stability concerns. Additionally, reduced vessel speeds would affect data continuity and result in lost survey time.

The mitigation measures in the Final PEIS include limiting vessel speed to 10 knots and steering away when an ESA-listed whale is within 500 yards of the forward path of the vessel, and limiting speed to 10 knots when operating a vessel of 65 ft or larger in an active North Atlantic right whale seasonal management area. If any cetacean is sighted while a vessel is underway, the vessel operator must remain parallel to the animal's course if feasible, and avoid excessive speed or abrupt changes in direction until the cetacean has left the area.

As discussed in Section 3.5.2 of the Final PEIS, animal approach restrictions and decreasing vessel speeds would help reduce the potential for ship strikes of protected species. During NOS projects, waters surrounding the vessel would be visually monitored for any marine mammals as at least one individual observing the area for protected species at all times. While vessel strikes would pose a direct threat to marine mammals, the likelihood of a collision between a project vessel and a marine mammal would be extremely unlikely because relatively low vessel speeds (particularly within seasonally restricted areas and inshore waterways and during data collection) and visual observation during all vessel operations (regardless of size) would avoid vessel strikes with all marine mammal species.

Marine Mammals-5: NOS must use the best available scientific information on marine mammal presence, density, and population status, as required by law. NOS must also ensure that any potential stressors and cumulative impacts posed by the proposed surveys are mitigated to effectuate the least practicable impact on affected species and stocks.

NOS Response: NOS, in consultation with NMFS, has incorporated additional data sources into the calculations of marine mammal density and exposures. The revised exposure numbers are being used for consultation under the ESA and for the LOA application and an ITR request under the MMPA, and have been added to the Final PEIS. The 2021 SARs and Roberts data for cetaceans and pinnipeds represent the best available science.

The Final PEIS has been updated to include additional mitigation measures developed through interagency coordination and consultations, and information received through public comment. Although the Draft PEIS did not include a discrete set of mitigation measures, NOS did include best management practices as part of the Proposed Action as explained in Section 3.2.3. These BMPs were discussed in the effects analysis where relevant, such as avoiding bottom sampling on coral reefs, shipwrecks, obstructions, or hard bottom areas and ensuring that all instruments placed in contact with the sea floor are properly secured to minimize bottom disturbance.

The Draft PEIS explained that regulatory agencies, including those with jurisdiction over marine mammals, may request or require additional mitigation measures that are necessary or prudent under other laws, such as the ESA or the MMPA.

Following publication of the Draft PEIS, NOS initiated interagency consultations under the ESA, MSA, and NMSA. NOS also submitted applications for incidental take authorizations under the MMPA. Through this process, additional mitigation measures were identified to further minimize the impacts of project activities on sensitive species. These additional mitigation measures have been incorporated into the effects analysis in the appropriate resource sections of the Final PEIS. The full list of mitigation measures is included as Appendix D to the Final PEIS.

Cumulative Impacts-3: Moreover, extensive high resolution geophysical ("HRG") surveys associated with the Proposed Action will take place concurrently with other sources of noise occurring in marine mammal habitat, making the cumulative impacts posed by these activities a significant concern.

NOS Response: The cumulative impact scenario (Section 4.1 in the Final PEIS) considers past, present, and reasonably foreseeable future actions that must be addressed in a cumulative effects analysis because their environmental effects may combine with the effects of the Proposed Action. Due to the volume and diversity of these cumulative actions, NOS identified specific projects and programs, both public and private sector, but also relevant environmental and economic trends; however, an exhaustive list of all ocean users would not be feasible to consider.

As discussed in Section 4.2.2, increasing ambient sound levels in the marine environment may steadily erode marine mammals' abilities to communicate, find food, mate, and navigate. If NOS projects occurred at the same time and place as noise from other sources, they could synergistically contribute to adverse cumulative sonic impacts on marine mammals within a small radius of the NOS acoustic source; if they do not occur at the same time and place, they could additively contribute to adverse cumulative impacts. However, the vast majority of impacts expected from underwater noise are behavioral in nature (versus injury), temporary, and relatively infrequent. Other cumulative actions are unlikely to overlap in time and space with NOS projects because these activities are dispersed and the sound sources are intermittent. It is likely that distant shipping sound, which is more universal and continuous, would overlap in time and space with actions under the NOS Proposed Action. However, the NOS Proposed Action would likely only contribute negligible cumulative impacts due to disturbance and behavior modification of marine mammals.

Marine Mammals-6: NOS should be more precautionary in the assessment of acoustic impacts

NOS should be more precautionary in its assessment of potential acoustic impacts from the survey activities in the Proposed Action on marine mammals and incorporate the following into its impact analyses: First, the potential for concurrent impulsive exposures to be experienced by the animal as continuous exposure should be accounted for. We note that potential exposure to continuous noise would set the regulatory acoustic impact threshold at 120dB.

NOS Response: NOS disagrees with the assertion that concurrent impulsive exposures can be experienced by an animal as a continuous exposure. Concurrent impulsive exposures are not equivalent to continuous sound. The exposure analysis does not include an evaluation of either concurrent sources or continuous sound sources (e.g., vessels).

NMFS Office of Protected Resources (OPR) recommended that all NOS active acoustic sources be assessed using the intermittent source criteria (i.e., using a behavioral disruption exposure threshold of 160 dB). If the sources were modeled as continuous sound sources, then the 120 dB threshold would have been used.

Marine Mammals-7: Second, NOS should not underestimate the potential for high frequency exposures due to higher attenuation rates over distance, as attenuation rates may be less efficient when propagation characteristics are accounted for. Exposures should be modeled for each operational area using region-specific information on propagation conditions.

NOS Response: The best available information on region-specific propagation parameters was used in the technical acoustic analysis, including sound speed profiles, geoacoustic parameterization, and regional bathymetry. Sound fields were generated considering the combination of source-specific beam patterns and sound levels, and site-specific transmission loss. A description of region-specific parameters considered is provided in Appendix E: Technical Acoustic Analysis of Oceanographic Surveys.

Marine Mammals-8: NOAA should acknowledge the limitations of current NOAA Fisheries' acoustic thresholds for behavioral impacts and develop and use updated guidelines on thresholds for marine mammal behavioral disturbance (i.e., Level B take) that are sufficiently protective and consistent with the best available scientific information. Multiple marine mammal species have been observed to exhibit strong, and in some cases, lethal, behavioral reactions to sound levels well below the 160 dB threshold defined by NOAA Fisheries for Level B take, leading to calls from the scientific community for the agency to revise its guidelines. Acceptance of the current NOAA Fisheries' acoustic threshold for Level B take will result in NOS's significant underestimation of the impacts to marine mammals and potentially the permitting, recommendation, or prescription of ineffective mitigation measures (e.g., under protective exclusion zones).

NOS Response: NOS acknowledges that behavioral response to sound is complex and nuanced. NMFS OPR recommended that all NOS active acoustic sources be assessed using the intermittent source criteria. The 160 dB threshold is the most current recommended threshold for non-impulsive sources by NMFS based on the NMFS 2018 Technical Guidance. This threshold was used to evaluate exposures for this analysis. Therefore, NOS used the best available science in the technical acoustic analysis. NOS disagrees with the assertion that using this threshold will result in underestimating impacts to marine mammals and adopting ineffective mitigation measures.

Marine Mammals-9: NOS must incorporate additional data sources into calculations of marine mammal density and take

In determining the proportion of marine mammal species and stocks taken by the proposed activities, NOS relies on information on species abundance and distribution obtained from NOAA and U.S. Fish and Wildlife Service Stock Assessment Reports ("SARs"). Species and stock densities within the NOS operational areas were derived by distributing SARs abundance estimates over the portion of the operational area that coincides with the habitat preference and associated depth category for the species or stock. If a species or stock occupied an area larger than the operational area, the conservative assumption was made that the abundance of the species or stock occurred wholly within the operational areas under assessment. Densities

derived from information provided by the SARs were compared with habitat- based density estimates when available but were not found to correspond in a consistent manner.

The simple approach of averaging abundance estimates over the extent of a species' or stock's distribution or depth preference does not bring to bear the best available scientific information for the purposes of impact assessment…the habitat-based density models produced by Duke University for marine mammals from several regions of the U.S. (i.e., the "Roberts et al." models), while still requiring improvement, represent a more sophisticated methodology for density estimation compared with NOS's approach of averaging abundance estimates from the SARs. NOS should not default to the lowest common denominator in selecting a single methodology to estimate take across all operational areas. Rather, for those operational areas where improved density estimates are available, NOS should use those estimates in the impact assessment.

> **NOS Response:** Detailed data were used in the acoustic modeling for marine mammal presence, density, and population status using the best available information which inherently contained regional differences. NOS, in consultation with NMFS, has incorporated additional data sources into the calculations of marine mammal density and exposures. The revised exposure numbers are being used for consultation under the MMPA and ESA. These data have been updated for the Final PEIS. For the east coast of the U.S. and the Gulf of Mexico, the acoustic modeling for the Final PEIS uses densities obtained using the Duke University Marine Geospatial Ecology Laboratory model results (i.e., the "Roberts et al." models). For the Pacific and Alaska regions, species abundance and distribution were obtained from the 2021 SARs for cetaceans and pinnipeds.
>
> In coordination with NMFS and USFWS, NOS has developed additional mitigation measures. Mitigation measures include maintaining safe distances from marine mammals, decreasing vessel speeds, vessel maneuvering, and observing time-area restrictions in specific protected species habitats (e.g., North Atlantic right whale). The Final PEIS has been updated to include additional mitigation measures in the effects analysis of the applicable resource sections.
>
> Although some projects may result in more exposures than others, the exposure estimates represent the average expected exposures from all projects in the program. Natural variability due to seasonal changes is expected.

Marine Mammals-10: NOS does not consider important habitat areas where marine mammal density may be elevated relative to other areas either year-round or seasonally, and where concomitant survey activities would result in disproportionately higher impacts and number of takes. Multiple data sources describe important habitat areas for marine mammals (see Section IV.A. for further discussion) and this information should be incorporated into the impact analysis.

> **NOS Response:** When applying significance criteria for the effects analysis, NOS considered the geographic extent of marine mammal exposures and whether the exposures are expected to occur in designated critical habitat or other biologically important areas (BIAs) such as preferred breeding, feeding, and nursery grounds or migratory routes. BIAs are discussed in Section 3.5.1.1.2 of the Final PEIS. NOS agrees that BIAs provide valuable information on locations where particular species engage in biologically important behaviors either year-round or seasonally. BIAs were created to help

NOAA, other federal agencies, and the public in the analyses and planning used to characterize and minimize the impacts of anthropogenic activities on cetaceans and to achieve conservation and protection goals. BIAs occur in every region throughout the NOS action area, but they do not present the totality of important habitat throughout the marine mammals' full range. Recognition of an area as biologically important for some species activity does not cause the area to rise to the designation of critical habitat under the ESA. The stated intention is for the BIAs to serve as a resource management tool and for their currently identified boundaries to be considered dynamic and subject to change based on any new information.

NOS has considered the best available information on potential effects of acoustic and other stressors on these biologically important behaviors as part of its impact analysis. Marine mammal responses to acoustic stressors from the Proposed Action are anticipated to be minor and temporary, regardless of where the activity is conducted. Time-area restrictions are only effective if there are marine mammals present in an area when and where an activity would otherwise occur. Given the variability in the presence of marine mammals, time-area restrictions would not necessarily be effective in reducing the potential impacts of surveying and mapping activities within BIAs.

NOS has concluded that impacts to marine mammals are primarily limited to minor, temporary behavioral disturbances from active acoustics, and NOS has adopted a suite of mitigation measures to further minimize exposures. NOS also concludes that vessel strike is unlikely but possible, and employs mitigation measures to avoid strike. In addition, NOS employs additional mitigation measures for particularly vulnerable species like the North Atlantic Right Whale and Rice's Whale. NOS considered the potential effectiveness and practicability of additional mitigation measures in BIAs for those species for which Level A exposure was predicted in the PEIS. Only the harbor porpoise has designated BIAs in regions where Level A exposure was predicted. The BIAs are Morro and Monterey Bay in the West Coast Region, which was identified as two separate small resident populations found year-round in this area. The other BIA for harbor porpoise is a small and resident population in the Greater Atlantic Region, concentrated in waters less than 150 m deep in the Gulf of Maine between July and September. These designations reflect a concentration of marine mammals rather than an area where marine mammals engage in biologically important behaviors that could result in stronger behavioral reactions from Level A exposures. There are no other designated BIAs where Level A exposures were predicted.

NOS determined that avoiding harbor porpoise BIAs entirely would be impracticable. Time-area restrictions for these BIAs would significantly impact NOS' ability to collect data during suitable conditions for using acoustic sources, result in lost survey time, and affect the crew's ability to work safely. In particular, the BIAS for harbor porpoises in Morro and Monterey Bays are year-round, and avoiding these areas would mean that these areas could not be surveyed and important information that supports habitat research and vessel safety would not be collected. NOS also considered the necessity and practicality of additional management measures for these areas. NOS already uses the lowest power appropriate to perform surveys, and employs mitigation measures including protected species observers to ensure that marine mammals are not within the vicinity of the vessel when active acoustics are being used (which is where Level A exposures could occur). During nighttime operations, NOS uses the appropriate lighting to comply with navigation

rules and best safety practices. All project areas would be continually monitored for protected species by posted crewmembers during vessel operations. NOS believes that the mitigation measures that will be used during projects will minimize Level A exposures or vessel strikes to harbor porpoises in these BIAs.

In coordination with NMFS and USFWS, NOS has developed additional mitigation measures. Mitigation measures include maintaining safe distances from marine mammals achieved by decreasing vessel speeds, vessel maneuvering, and observing time-area restrictions in specific protected species habitats (e.g., North Atlantic right whale). Any further mitigation, including entirely prohibiting mapping and surveying data collection or time-area restriction within the BIAs as discussed above, is unwarranted and impracticable due to safety concerns. Additionally, time-area restrictions for BIAs affect data collection and continuity and result in lost survey time. For example, surveying in the Arctic is limited to summer and early fall when conditions are safe. NOS believes that the implementation of mitigation measures to further reduce the minor and temporary expected impacts will provide substantial protection for marine mammals during NOS surveying and mapping activities.

Marine Mammals-11: a number of marine mammal species and stocks in the U.S. are considered data poor and have uncertain or outdated abundance estimates. It is not precautionary to assume that density and take levels can be reliably estimated for these species and stocks. Rather, NOS should explicitly note which species are data deficient in the Draft PEIS and, based on this, indicate that potential impacts on these species and stocks cannot be evaluated at this time.

NOS should update the impact assessment based on these recommendations to ensure that the PEIS aligns with the requirements set forth under NEPA, and other relevant statutes, including the MMPA and ESA.

NOS Response: NOS disagrees that the potential impacts on any species and stocks cannot be evaluated at this time. NOS has used the best available scientific information on marine mammal presence, density, and population status in the acoustic modeling for the PEIS.

NOS conducted a quantitative total exposure estimate to determine the type and number of take in order to meet requirements for applying to NMFS for an incidental take authorization and to petition USFWS for incidental take regulations under the MMPA. NOS also relies on an extensive qualitative analysis of the best available science.

Marine Mammals-12: NOS must afford special consideration to potential direct and cumulative impacts on Arctic species and stocks

The Arctic is a unique acoustic environment and maintaining its acoustic integrity should be a primary goal of NOS. Ambient sound levels in the Arctic are some of the lowest on Earth and Arctic marine species have had limited exposure to ocean noise pollution caused by human activities. This naivete means Arctic marine mammals, and their prey, will likely be disproportionately impacted by any increase in ocean noise. Many Arctic marine mammals are in serious jeopardy from additional seemingly intractable climate change impacts, including the

diminishment of sea ice habitat, and impacts from noise will further undermine the possibility of their survival.

> **NOS Response:** NOS understands the unique characteristics of the Arctic environment. The increase in ocean noise in the Arctic region from commercial shipping and recreational boating interests (as discussed in Section 4.1.5) has largely been the result of decreased seasonal sea ice coverage. NOS recognizes that increased commercial shipping, recreational boating, and other vessel traffic is contributing to increased noise in Arctic waters. NOS contributions to ocean noise in the Arctic and the Alaska Region are extremely minimal compared to these other sources.
>
> The acoustic modeling estimated marine mammal exposures to sound by considering each species' hearing range, as well as their population densities, location, and movement through the environment. The best available information on region-specific propagation parameters was also used in the technical acoustic analysis, including sound source characteristics, geoacoustic profiles, and regional bathymetry. Sound fields were generated considering the combination of source-specific beam patterns and sound levels, and site-specific transmission loss.
>
> Timing of a given project may be limited by seasonal environmental conditions of its location, making it impracticable for NOS to adopt time or spatial mitigation in this region For example, projects in the Arctic or Bering Sea typically take place between June and September to avoid dangerous, icy conditions. The effects analysis for Arctic marine mammals is discussed by species in Section 3.5.2.
>
> NOS will adhere to the additional mitigation measures developed in coordination with NMFS and USFWS. Mitigation measures include maintaining safe distances from marine mammals achieved by decreasing vessel speeds, vessel maneuvering, and observing time-area restrictions in specific protected species habitats (e.g., North Atlantic right whale).

Cumulative Impacts-4: The strong international interest in developing an increasingly ice-free Arctic means that Arctic marine mammals may face significant and rapid increases in ocean noise pollution. For example, noise from shipping increased substantially in multiple locations across the Arctic between 2013 and 2019, and some areas of the Arctic are now twice as loud as they were in 2013. Climate change is also changing the Arctic acoustic environment in other ways. Loss of sea ice reduces propagation loss and increases ambient sound levels due to increased interaction between the surface and the atmosphere. The Arctic is also becoming stormier during the ice-free season and increased wind speeds may lead to greater ambient sound levels. NOS must take these considerations into account when analyzing impacts of the Proposed Action on endemic Arctic species. In doing so, NOS must revise its take estimates for Arctic species based on the increased sensitivity to noise of those species relative to species in other regions.

> **NOS Response:** Increased commercial shipping, recreational boating and other vessel traffic in the Alaska region as a result of decreasing seasonal sea ice coverage are considered in the cumulative scenario in Section 4.1.5 of the Final PEIS. The acoustic modeling used to estimate marine mammal exposures to sound considered each species' hearing range and their location and environment. Acoustic propagation was modeled in

57 representative locations, 13 of which were located in the Alaska Region, to account for differences in sound propagation based on location. See Figure 2 of Appendix E: Technical Acoustic Analysis of Oceanographic Surveys for the acoustic modeling locations.

Cumulative Impacts-5: Further, NOS must fully evaluate the disproportionate impacts of climate change on Arctic marine mammal species and stocks and their habitat, as well as the unprecedented foreseeable industrial development, as part of the cumulative impacts analysis.

NOS Response: Increases in commercial shipping, recreational boating, and other vessel traffic in the Alaska region as a result of decreasing seasonal sea ice coverage due to climate change and coastal development are considered in the cumulative scenario in Section 4.1.5 and 4.1.12 of the Final PEIS, with general climate change trends discussed in Section 4.1.4. In the Final PEIS, Section 4.2.2.4, Alteration of Marine Mammal Habitat, has been revised to discuss increased relative cumulative impacts from climate change to marine mammals in the Alaska Region.

Mitigation Measures-16: For mitigation purposes, and in addition to the recommendations outlined in Section IV, NOS should consider limiting survey activities in the Arctic region overall and set more protective noise limits and stricter procedural mitigation measures for any survey activities that are undertaken.

NOS Response: Alaskan and U.S. Arctic waters, more of which are becoming navigable given the changing sea ice conditions, are especially important survey targets. NOS projects in the Arctic collect valuable information on seafloor depths for the development of new and updated nautical charts allowing for safe navigation as well as informing the discovery of historic artifacts and natural resource habitat mapping.

Surveying vessels and equipment are designed to minimize noise, and NOS uses the lowest appropriate power and ping rate for its acoustic sources while gathering data.

NOS will adhere to the additional mitigation measures developed in coordination with NMFS and USFWS. Mitigation measures include maintaining safe distances from marine mammals achieved by decreasing vessel speeds, vessel maneuvering, and observing time-area restrictions in specific protected species habitats (e.g., North Atlantic right whale). Timing of a given project may be limited by seasonal environmental conditions of its location. For example, projects in the Arctic or Bering Sea typically take place between June and September to avoid dangerous, icy conditions.

At the request of NMFS, NOS will contact NMFS Alaska Regional staff prior to using any echosounders under 180 kHz in all areas north of the Forelands in Cook Inlet, Alaska.

NEPA Process-11: No mitigation measures for marine mammals are included in the Draft PEIS. Rather, as the "analysis concludes that the Proposed Action is not anticipated to result in significant impacts for any resource […] NOS has not proposed a discrete set of mitigation measures…"47 Additional mitigation measures and best management practices ("BMPs") are expected to be developed through various interagency consultation as well as through public comment and "will be considered as part of the analysis in the Final EIS." The predetermination by NOS that the Proposed Action is "not anticipated to result in significant impacts for any

resource" prior to consultation and public comment, as well as the lack of inclusion of any mitigation measures in the Draft PEIS for evaluation by the public, fails to satisfy the requirement for sufficient notice and comment set forth under NEPA.

> **NOS Response:** The Final PEIS has been updated to include additional mitigation measures developed through interagency coordination and consultations and information received through public comment. Although the Draft PEIS did not include a discrete set of mitigation measures, NOS did include best management practices as part of the Proposed Action as explained in Section 3.2.3. These BMPs were discussed in the effects analysis where relevant, such as avoiding bottom sampling on coral reefs, shipwrecks, obstructions, or hard bottom areas and ensuring that all instruments placed in contact with the sea floor are properly secured to minimize bottom disturbance.
>
> The Draft PEIS explained that regulatory agencies, including those with jurisdiction over marine mammals, may request or require additional mitigation measures that are necessary or prudent under other laws, such as the ESA or MMPA.
>
> Following publication of the Draft PEIS, NOS initiated interagency consultations under the ESA, MSA, and NMSA. NOS also submitted applications for incidental take authorizations under the MMPA. Through this process, additional mitigation measures were identified to further minimize the impacts of project activities on sensitive species. These mitigation measures have been incorporated into the effects analysis in the appropriate resource sections of the Final PEIS. The full list of mitigation measures is included as Appendix D to the Final PEIS.
>
> The incorporation of additional mitigation measures in the Final PEIS as a result of interagency coordination does not represent a significant change to the Proposed Action or new information relevant to environmental concerns and therefore, per 40 CFR 1502.9(d)(4), NOS is not required to publish a supplement to the Draft PEIS. Additional mitigation measures incorporated into the Final PEIS generally result in a reduction of any adverse environmental impacts previously analyzed.

Mitigation Measures-17: We also recommend NOS, and NOAA Fisheries, work to advance a robust and effective near real-time monitoring and mitigation system for endangered and protected species and stocks of large whales that will be more responsive to ongoing dynamic distributional shifts resulting from climate change, as well as provide more flexibility in the survey window. There are several technologies in various stages of development that would allow near real-time detection of large whales and convey that information to decision-makers, and near real-time monitoring systems are already being deployed to mitigate risks to some species, including the North Atlantic right whale. We recommend NOS invest in and coordinate with NOAA Fisheries and other relevant agencies, experts, and stakeholders, to develop a near real-time large whale monitoring and mitigation system. The system should be capable of detecting and alerting vessels, stationary platforms, and enforcement agencies of the location of large whales on a near real-time basis, informing sector-specific mitigation protocols that can effectively reduce take of large whales, and continually integrate improved technology. The development of the system could begin with a pilot program that incorporates all the necessary precautions (e.g., vessel speed limit of 10 knots) focused on the critically endangered North Atlantic right whale and then be expanded to other whales and geographies once the approach is tested and proven.

NOS Response: NOS agrees that real-time whale detection and notification systems are important tools, particularly for reducing vessel strikes of large whales. NOS checks with various communication media for general information regarding avoiding ship strikes and specific information regarding North Atlantic right whale sighting locations. These include NOAA weather radio, U.S. Coast Guard NAVTEX broadcasts, and Notices to Mariners.

NOS has developed additional mitigation measures through the interagency consultation process. Mitigation measures include maintaining safe distances from marine mammals achieved by decreasing vessel speeds, vessel maneuvering, and observing time-area restrictions in specific protected species habitats (e.g., North Atlantic right whale).

Mitigation Measures-18: Underwater noise levels should be minimized to the full extent practicable

The Draft PEIS sets no requirement to minimize the impacts of underwater noise through the use of best available technology and other methods to minimize sound levels from geophysical surveys.

According to NOAA's "Ocean Noise Strategy Roadmap:"

"[W]here noise is concerned, mitigation should be broadly designed to do one of two things: (1) reduce the temporal or spatial overlap of ensonified areas with marine taxa (or acoustic habitat) in particular times, places or circumstances, and/or (2) reduce the sound level at the source (which may include replacing the source with a different type of source capable of the same function)."

NOS Response: The mapping and surveying program is consistent with NOAA's Ocean Noise Strategy Roadmap because mitigation measures will reduce the temporal or spatial overlap of ensonified areas with marine taxa (or acoustic habitat) in particular times, places, or circumstances, such as pre-survey coordination with the NMFS Alaska Region before conducting projects using HRG sources in all areas north of the Forelands of Cook Inlet, Alaska. NOS considers the project objectives to determine the best-suited equipment and protocols. Additionally, whenever possible, the location and timing of a given project would be purposefully coordinated to ensure that areas are not repeatedly surveyed by NOS. NOS has a responsibility to gather data necessary for nautical charts and other public data products, with consideration for the human environment. Surveying vessels and equipment are designed to minimize noise, and NOS uses the lowest appropriate power and ping rate for its acoustic sources while gathering data. These sources are expected to have minimal impacts on marine mammals and other protected resources. Mitigation measures include the use of PSOs at all times while in transit or on-project.

Proposed Action-3: NOS should select HRG survey systems, and operate those systems at power settings, that achieve the lowest practicable source level for the objective. NOS should also minimize sound levels from the proposed survey activities to the fullest extent feasible using best available technologies and methods.

NOS Response: Appropriate equipment selection is discussed in Section 2.2 of the PEIS. The responsible NOS program office considers the goals and purpose of a given project and determines the specific equipment and protocols which would be best-suited to accomplish the task. NOS has a responsibility to gather data necessary for nautical charts and other public data products, with consideration for the human environment. Surveying vessels and equipment are designed to minimize noise, and NOS uses the lowest appropriate power and ping rate for its acoustic sources while gathering data.

2.22 North Slope Borough (Harry K. Brower, Jr.)

2.22.1 Comment Submission

North Slope Borough

OFFICE OF THE MAYOR

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Phone: 907 852-2611 or 0200
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Harry K. Brower, Jr. Mayor

August 4, 2021

Giannina DiMaio
DOC/NOAA/NOS Environmental Compliance Coordinator
SSMC4-Station 13612
1305 East West Highway
Silver Spring, MD 20910

Re: Notice of Availability of a Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition

Dear Ms. DiMaio:

The North Slope Borough (Borough) requests NOAA to extend the comment period for the Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition (EIS) from August 24, 2021 to November 24, 2021. The Borough is a regional municipal government spanning the North Slope of Alaska, an area covering 89,000 square miles, stretching from the United States-Canadian border across to the western border of Alaska, with a coastline that extends along the Beaufort and Chukchi Seas. Five of our communities are located directly on the Arctic coast, while residents of a sixth, Nuiqsut, access the waters of the Beaufort Sea via the Colville River.

The surveying activities described in this EIS are of great concern to us as our communities participate in, and are dependent upon, the subsistence harvest of bowhead whales and a host of other marine mammals. Marine activities during specific time periods have a high potential to disrupt bowhead whale migrations, the migrations and movements of other species, and to negatively impact subsistence harvests critical to the welfare of our communities and residents. For this reason, most industrial and governmental operations in the Beaufort and Chukchi Seas coordinate closely with the North Slope Borough Department of Wildlife Management (Wildlife Department),the Alaska Eskimo Whaling Commission, and other marine mammal user groups to prevent and reduce the impacts of such activities.

Our Wildlife Department has experts in oceanography, marine mammals and other resources, and the subsistence patterns and needs of our communities. We have substantial experience working with government agencies, industry, academic institutions, and local communities and groups on effective mitigation measures concerning marine activities, including vessel traffic, acoustic monitoring, disaster response and pollution issues. As a result, the Borough has a significant amount of knowledge and expertise to contribute to the analysis in this EIS.

The next few months, August to October, are a particularly busy time for the Borough Wildlife Department and whaling community because the fall whaling season is starting soon. Our residents and many relevant personnel are already busy preparing for this hunting season. The Wildlife Department is involved with scientific activities during these hunts. Therefore, our personnel who would be commenting on this EIS will likely be preoccupied during this period.

Moreover, at this time, it is unclear what activities are planned for our region. We would like more time to consult with National Ocean Service personnel to learn more about this issue in order to provide more useful comments. We also suggest that NOS staff reach out directly to the AEWC and the other potentially impacted marine mammal user groups concerning this planning effort. Accordingly, we believe that additional time is needed to adequately comment on this EIS.

Thank you for your consideration of this request.

Sincerely,

Harry Brower Jr.

Harry K. Brower, Jr.
Mayor

2.22.2 NOS Response

NEPA Process-8: The North Slope Borough (Borough) requests NOAA to extend the comment period for the Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition (EIS) from August 24, 2021 to November 24, 2021.

> **NOS Response:** After receiving your comment, NOS extended the original 60-day public comment period deadline by 90 days from August 24, 2021 to November 22, 2021 to accommodate the Alaskan subsistence hunting and fishing community (86 FR 47299).

Environmental Justice-11: The surveying activities described in this EIS are of great concern to us as our communities participate in, and are dependent upon, the subsistence harvest of bowhead whales and a host of other marine mammals. Marine activities during specific time periods have a high potential to disrupt bowhead whale migrations, the migrations and movements of other species, and to negatively impact subsistence harvests critical to the welfare of our communities and residents. For this reason, most industrial and governmental operations in the Beaufort and Chukchi Seas coordinate closely with the North Slope Borough Department of Wildlife Management (Wildlife Department), the Alaska Eskimo Whaling Commission, and other marine mammal user groups to prevent and reduce the impacts of such activities.

> **NOS Response:** NOS will coordinate with tribes and subsistence hunters and fishers prior to conducting projects in subsistence hunting areas. NOS will also work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses. Through this communication strategy, NOS would minimize the potential for adverse impacts on subsistence communities, food security, and the safety of hunters.
>
> NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request formal government-to-government consultation pursuant to EO 13175 at any time.

Alaska-2: Moreover, at this time, it is unclear what activities are planned for our region.

> **NOS Response:** NOS determined that a programmatic approach was appropriate because NOS conducts, authorizes, permits, and funds a suite of similar, ongoing data collection activities associated with recurring projects across a wide geographic area to characterize underwater features (e.g., habitat, bathymetry, marine debris). This Final PEIS is a comprehensive document that provides detailed programmatic effects analyses for surveying and mapping data collection activities based on regional conditions, habitat types, species, and other factors. However, the Final PEIS does not identify the specific time or place for individual projects or activities over the next five years. The analysis will be used to inform NOS leadership and the public on the environmental impacts of these activities before a decision is made on how to execute each project. All projects will require a project-specific review by NOS before proceeding.

Specific project locations are determined annually for the upcoming surveying season. NOS will coordinate with tribes and subsistence hunters and fishers prior to conducting projects in subsistence hunting and fishing areas. NOS will also work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses. Through this communication strategy, NOS would minimize the potential for adverse impacts on subsistence communities, food security, and the safety of hunters.

NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation at any time for a proposed action that may have tribal implications. NOS will also initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources.

Future Coordination-7: We also suggest that NOS staff reach out directly to the AEWC and the other potentially impacted marine mammal user groups concerning this planning effort.

NOS Response: NOS will also work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses. Through this communication strategy, NOS would minimize the potential for adverse impacts on subsistence communities, food security, and the safety of hunters.

2.23 North Slope Borough and Alaska Eskimo Whaling Commission (Harry K. Brower, Jr. and John Hopson, Jr)

2.23.1 Comment Submission

ALASKA ESKIMO
WHALING COMMISSION

November 22, 2021

Giannina DiMaio
DOC/NOAA/NOS
Environmental Compliance Coordinator
SSMC4-Station 13612
1305 East West Highway
Silver Spring, MD 20910

Via email: nosaa.ec@noaa.gov

Re: Notice of Availability of a Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition

Dear Ms. DiMaio:

Please accept these comments on behalf of the Alaska Eskimo Whaling Commission (AEWC) and the North Slope Borough (NSB or Borough) for the Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition (DPEIS) developed by the National Oceanic and Atmospheric Administration (NOAA) National Ocean Service (NOS).[1] We appreciate that NOAA extended the comment period to allow adequate time for review.

As the regional government for the Alaskan Arctic and as hunters on the water, we understand the importance of having good maps for our region, for the safety of all vessels. However, the surveying activities described in this DPEIS are of great concern to us as our communities participate in, and are dependent, on subsistence hunting of a wide range of marine life, including the bowhead whale. Marine activities that include vessel traffic and noise during specific time periods have a high potential to disrupt bowhead whale migrations. This may put our hunters' safety at risk and negatively impact our food security.

It is particularly challenging to understand the potential impacts when this DPEIS has broad goals,[2] and lack of specifics for our region.[3] It makes it nearly impossible to provide a more

[1] 86 FR 33663.
[2] "Draft PEIS has been prepared to: 1) inform NOS and the public on the physical, biological, economic, and social impacts of NOS mapping and surveying projects; and 2) assist NOS in deciding how to execute its mapping and surveying program over the next six years." National Ocean Service. DPEIS, Executive Summary at 1.
[3] This "would include surveys performed from crewed, remotely operated, or autonomous vessels operated by NOS field crews, other NOAA personnel on behalf of NOS, contractors, grantees, or permit/authorization holders. These

detailed analysis of the impacts to the bowhead whales, to other important marine mammals and to our food security. For these reasons, NSB and AEWC expect continued consultation with NOAA and NOS as this Program is implemented and before any of the surveys or mapping projects move forward in the Arctic.

About The North Slope Borough

The Borough is the recognized unit of local government spanning the North Slope of Alaska, an area covering 89,000 square miles, with a coastline that extends along the Beaufort and Chukchi Seas. Within this area, the Borough is responsible for a variety of municipal activities, including planning, zoning, environmental protection, wildlife management, and the construction, operation, and maintenance of facilities and other infrastructure necessary to provide services to residents in its eight communities.

The Borough's population is comprised primarily (~80%) of Alaska Natives (the Iñupiat), who, for thousands of years, have relied on subsistence resources for their physical and cultural health. Traditional foods are far more nutritious than many types of imported "store-bought" food, and their continued consumption has repeatedly been shown to be critical to the health of our people. Furthermore, the social fabric of the Iñupiat revolves around subsistence and food sharing traditions. All of our communities, whether through direct harvest or extensive sharing networks, utilize the full range of traditional subsistence resources that abound in the Arctic.

The Borough has adopted a Code of Ordinances that explicitly provides for cooperative management of North Slope wildlife resources. The Borough's Department of Wildlife Management (NSB-DWM) facilitates sustainable subsistence harvests and monitors the population and health of fish and wildlife species. This is accomplished through regular research, cooperation and collaboration with Federal land and wildlife management agencies, the State of Alaska, academic institutions, Indigenous co-management organizations, and other stakeholders. As a result, the Borough has a significant amount of knowledge and expertise on conducting Arctic research and providing scientific expertise to land and natural resource managers.

About the AEWC

The AEWC is a non-profit organization representing Alaska Native Subsistence Whaling Captains in Northern coastal Alaska. AEWC represents the 11 bowhead whale subsistence hunting villages of Utqiaġvik (Barrow), Nuiqsut, Kaktovik, Pt. Hope, Kivalina, Wales, Savoonga, Gambell, Little Diomede, Wainwright and Pt. Lay. Our Whaling Captains and communities rely on the subsistence harvest of bowhead whales and other marine mammals in or adjacent to the Beaufort and Chukchi Seas. Importantly, our hunters also share the fruits of our

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crews and vehicles may use echo sounders and other active acoustic equipment and employ other equipment, including bottom samplers and conductivity, temperature, and depth instruments to collect the needed data." *Id.*

harvest beyond our 11 communities, with Alaskan Native families and communities through the state.[4]

On behalf of our Whaling Captains, the AEWC is responsible for protecting the bowhead whale and the bowhead whale subsistence harvest, based on our thousands of years of traditional knowledge about our Arctic ecosystems. The AEWC has many decades of experience partnering directly with Federal agencies, NSB, and offshore and nearshore operators. Through these partnerships, the AEWC works to ensure that oil and gas activities in the Arctic avoid conflicts with our subsistence activities and mitigate potential adverse impacts to the bowhead whale. The AEWC has managed and protected our critical bowhead whale, its habitat, and our subsistence harvest for 40 years, pursuant to the NOAA-AEWC Cooperative Agreement,[5] and under delegated Tribal authority of the Inupiat Community of the Arctic Slope and our 11 federally-recognized Alaska Native Villages.

Work with Federal Agencies, including NOAA

As you know, most industrial and governmental operations in the Beaufort and Chukchi Seas coordinate closely with the AEWC and NSB-DWN to prevent and reduce the impacts of such activities. At times, the AEWC has had great coordination with NOAA and the National Marine Fisheries Service (NMFS) under our Co-Management Agreement for the bowhead whale. The AEWC has also worked well with the Office of Coast Survey at times, such as the recent autonomous sailing vessels, called "Saildrones" project. In 2020, adjustments were made to the surveys based on changed ice conditions to honor buffers around our communities during the fall harvest in Kaktovik, Nuiqsut and Utqiaġvik (Barrow). (more below)

However, at times, we have also been extremely disappointed by our federal agency partners. The DPEIS highlights NOAA's communication and consultation efforts as a means for mitigation of the surveys impacts.[6] And the Biden Administration has announced additional plans for meaningful consultation with Tribes and Native communities. Yet as recently as September 2021, NOAA failed to contact the AEWC to participate in the Alaska Spatial Priorities Survey.

These communication and consultation efforts are necessary and must be mandatory for all phases of these Projects. These surveys and other vessel traffic can impact our lives and

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[4] *See, e.g.*, S. B. BurnSilver, *et al.*, "Are Mixed Economies Persistent or Transitional? Evidence using social networks from Arctic Alaska", American Anthropologist 118(1):121-129 (2016) *available at* https://anthrosource.onlinelibrary.wiley.com/doi/abs/10.1111/aman.12447.

[5] The Agreement was first signed in 1981 and updated every year since. This agreement was won by our Elders through litigation against the Department of Commerce after the U.S.'s initial acquiescence in the IWC's 1977 efforts to deny us our rights to harvest food, in the face of intense pressure from the regulatory regime of the International Whaling Commission (IWC). This organization was founded in 1946 to manage the commercial exploitation of whale stocks. However, since 1977, the IWC has subjected our subsistence harvest to first a moratorium, and currently a politically motivated quota and unfunded mandates that intentionally suppress and complicate our ability to provide food to our communities.

[6] At 469-470

livelihoods. The specific surveys conducted under this Program must be implemented in a way that ensures our continued food security and the safety of our hunters.[7]

Conflict Avoidance Agreement

The AEWC recognizes that NOAA is familiar with our Conflict Avoidance Agreement (CAA), as it is recognized by NMFS and other federal agencies in various regulatory processes.[8] The CAA and the collaborative Process by which it is signed each year are critical to the AEWC's ability to protect the whale, our hunters, and our communities' food security, while facilitating environmentally sound resource development. This CAA Process has worked well, especially for companies that are new to the Arctic. It provides a collaborative process for consultation for the different surveys, enabling us to educate the vessel operators on the need for mitigation measures not needed in other regions, and in many instances, our participation has helped the operator improve the surveys.

These annual consultations and adaptive management approach are particularly important in the Arctic marine environment, where tremendous and unprecedented environmental changes are occurring. With changes in spring ice conditions, fall whaling is becoming more important in some of our villages along the Chukchi and Bering Seas. And vessel traffic is increasing in the Bering Strait and the Arctic. These changing circumstances underscore the need for ongoing reliance on adaptive management. Incorporating an adaptive process provides both the stakeholders and the agency an effective means of addressing new information and changed circumstances in the context of specific industrial operations planned for a given year.

Consultation Must Continue

As NOAA develops this survey program, it must require the same level of in-depth consultation with our communities. Our hunters are the experts in ice condition and location of marine mammals. Our hunters are also on the water, and extra noise from survey vessels can greatly impact our food security.

We encourage NOAA as it develops the Survey programs, and obtains its necessary permits, to include other provisions as mitigation including: the use of communication centers to communicate with our villages; time-area closures to protect subsistence hunting activities in the Beaufort Sea; limitations on discharges in subsistence hunting grounds; vessel transit guidelines, including speed restrictions; and monitoring and reporting requirements. These measures are relatively non-controversial and have relevance to activities throughout the bowhead whale migratory and subsistence hunting areas.

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[7] Executive Order 13175; Presidential Memorandum of Jan. 26, 2021 on "Tribal Consultation and Strengthening Nation-to-Nation Relationships", 86 FR 7491.

[8] It has also been adopted by the Federal Energy Regulatory Commission (FERC) in its permitting. *See, e.g.*, "Order Granting Authorization Under Section 3 of the Natural Gas Act", Alaska Gasline Development Corporation, Docket No. CP17-178-000, 171 FERC ¶ 61,134, ¶ 199, (May 21, 2020), "prior to construction, AGDC would file with the Commission . . . a signed Conflict Avoidance Agreement prepared in coordination with NMFS and the Alaskan Eskimo Whaling Commission."

We would like to highlight one positive incident. In the summer of 2020, the Office of Coast Survey launched Autonomous Sailing Vessels ("Saildrones"). These were monitored by AEWC and NSB-DWM with daily emails on positions. In August, the AEWC formally requested that the instruments be turned off, which was done immediately. The saildrones traversed east past Kaktovik with the sounders turned off, before returning west to complete the survey after the whales had migrated and hunting was completed. The number of vessels was also reduced, in certain areas from four saildrones down to two. These actions showed us that the agency listens and is willing carry out a shutdown upon request and work collaboratively with the hunters. We would like to know whether this type of action will be honored in the future, especially in relation to larger, manned ships? From recent conversations between NSB-DWM and NOS and AEWC and NOS, we believe the answer is "yes"; however, we want to be clear and upfront: are there limits to when, where, and duration of shutdowns that NOS would not comply? We know that is a very general question; however, the DPEIS is general in nature, so we require an answer.

Impacts to Subsistence Harvests from Surveys are Unacceptable

In reviewing the document, the analysis of the Alternatives is very generalized and broad. For each Alternative, NOAA provides some generalized numerical statistics on the impacts to bowhead whales for the analysis.[9] There is additional information in the Appendices. However, without more information on the timing and specific equipment, it is impossible to determine the direct impact to the bowhead whales and other marine mammals of concern, the indirect impacts through deflection from the migration path, and the potential impacts to our subsistence.

The DPEIS specifically notes this difficulty and the potential for impacts to the harvest. In several places, it says the magnitude of impact would depend on vessel speed, size, location, frequency, and pattern of travel, as well as the timing of the activities and the degree of overlap with our hunt. It also specifically states:

> Subsistence harvests in the marine environment could be disrupted, prolonged; or subsistence resources could be unavailable for use. Communities which are primarily dependent on marine mammals for subsistence, such as the bowhead harvesters of northern and western Alaskan villages, would be especially impacted. Subsistence users may be required to travel farther to harvest subsistence foods at a greater cost in terms of time, fuel, wear and tear on equipment and people, and lost wages. A decline in the harvest efficiency of marine resources would likely lead to an increase in hunting pressure on terrestrial wildlife, and to an increase in competition and territorial conflicts among subsistence harvesters (BOEM, 2015b).[10]

This is unacceptable. Our food security cannot be put at risk for these surveys.

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[9] *See*, DPEIS at Table 3.5-10; Table 3.5-17; Table 3.5-24.
[10] Sec. 4.2.10.1, page 572.

From our experience and as discussed above with the CAA, we know there are ways to mitigate the harms. These conversations need to take place **before** any surveys are developed to get input from the communities that will be directly impacted.

Ultimately, without more details on the timing, location and extent of the surveys, it is difficult to see how NOAA has reached the conclusion that impacts on subsistence could be minimal or insignificant.

Hunting Restrictions?

In Section 3.13.2.2.1, the DPEIS refers to our subsistence harvest and talks about "restricted hunting seasons" or "restrictions on hunting seasons." We wish to clarify NOAA's intent. Specifically, it says:

> The magnitude of the impacts would depend on the degree of overlap between the hunting season and the activities, with greater adverse impacts on EJ communities that rely on species with *restricted hunting seasons*. Survey and whaling seasons are bound to overlap due to safety and weather considerations, therefore it would not be practicable for NOS to avoid surveying activities during all subsistence hunting seasons. Increased hunting time coupled with *restrictions on hunting seasons* could potentially decrease harvest numbers.[11]

This language is disturbing, and hopefully inaccurate. The bowhead harvest is highly regulated with a quota allocated from the IWC, and through our work with NOAA as a Co-Management Partner. It is also based on the timing of the migration of the bowhead whale. However, NOAA has not outlined any restrictions on the timing of our harvest. We have fought for decades to maintain our hunting rights and seek adequate numbers to feed our communities across Alaska. We would expect NOAA to adjust its surveys – and not have NOAA place any additional restrictions on the hunters.

Specific comments on the DPEIS

In reviewing the document, we wish to point out a few inaccurate statements regarding our subsistence hunting.

The description on page 443 about Figure 3.13-2 is a bit inaccurate. The first sentence says, "Figure 3.13-2 shows the AEWC spring and fall hunting areas in red." But the red color is defined on the map as "AEWC Hunting and Search Areas", which would be across all seasons. This should be corrected.

We also wish to correct this sentence from the DPEIS which says: "Over the years, bowhead hunters have incorporated modern technologies such as darting and shoulder guns for improved efficiency and humane hunting." Through mandates from the International Whaling Commission, the AEWC has been required to adapt its techniques. However, the darting gun and

[11] DPEIS 3.13.2.2.1 at 467 (emphasis added).

shoulder gun are 19th century technology with only slight modifications since then making this sentence inaccurate.[12]

In the cumulative impacts assessment, NOS should include the impacts from other research traffic in the Arctic. In addition, Table 4.1-7 on current Offshore Oil & Gas Projects in the Arctic may need some revisions to reflect that Hilcorp is operating Northstar, and the Liberty Project may be on hold.[13] Section 4.1.8 on Liquefied Natural Gas projects is missing any reference to the Alaska LNG Project which has secured permits.

NOAA's Preferred Alternative

In the DPEIS, there are three alternatives: 1) No Action Alternative, Alternative A, which is status quo of similar research effort to 2019; 2) Alternative B involves Equipment Upgrades, Improved Hydroacoustic Devices, and New Tide Stations; and 3) Alternative C includes the same Upgrades and Improvements with Greater Funding Support. We appreciate that Alternative B is NOAA's preferred Alternative.

The NSB and AEWC generally want to support the use of newer technologies, that may be more efficient and may achieve greater accuracy. However, NOAA must ensure the choice of equipment is well-suited to the task, and each survey is done in the least disruptive manner to the bowhead whale and our hunts, and is adequately analyzed to ensure proper mitigation measures are in place, including necessary time and area closures around our communities.

We also would appreciate Alternative C, to include additional funding. This funding could help NOAA in its outreach to our communities. We also hope to see a mechanism where this funding would be made available to the impacted communities to support the co-production of knowledge and the amount of time and resources that are required for our organizations to engage in consultation. This could enable our communities and our hunters to participate early in the process, including in developing the studies and answering questions related to the impacts of the technology in our waters.

Freshwater

It has been brought to the attention of AEWC and NSB-DWM that freshwater surveys and mapping will not be conducted in Alaska. We would like confirmation of this.

Density Estimation

Table 3.5-10[14] provides the barest of information on how "Total Exposures" were calculated. In fact, the definition of Total Exposures, noted with an asterisk, is difficult to understand: "Measured as the predicted probability of exposure and interpreted as the percentage of the

[12] To learn more, please visit, AEWC, Weapons Improvement Program, http://www.aewc-alaska.org/wip.html.
[13] https://www.alaskapublic.org/2020/12/07/federal-court-rejects-approval-for-hilcorps-liberty-project/
[14] DPEIS at 162.

population expected to exceed threshold".[15] We would like clearer definition, and in the text, please provide sufficient information on the assumptions used in the model to determine these values. While the overall document refers to Appendices, these are not in the DPEIS.

Upon receiving the appendix entitled Technical Acoustic Analysis of Oceanographic Surveys for the National Ocean Service: Underwater Acoustic Modeling Oceanographic Survey Sounds and Animal Exposure Modeling from Giannina DiMaio, which we appreciate, we note that Table 4 includes many species of concern, including bowhead and beluga whales. Based on the listed publication from which densities are estimated (NOAA and USFWS Stock Assessments Reports, 2014, 2017-2019), we suspect that the authors are assuming that marine mammal densities are equal across their range; however, studies of marine mammal densities indicate that there are core use areas that are occupied seasonally. If the authors of the DPEIS are assuming that marine mammal densities are constant across their range, marine mammal density will be over-estimated across large areas while under-estimated within critical use areas. Hence, it is likely that the density of marine mammals is biased low within their core use areas, leading to an estimate of Total Exposures that is also biased low. We are requesting clarification of how total exposure was estimated and would like to see the density maps used to calculate total exposure. Knowing and recalculating Total Exposures will not only assist in your successful completion of this laudable project but also provide further evidence to us of your willingness to listen and use local and traditional knowledge. Data based on tagged species should be evaluated by NOS. A recent resource to consult is George, John C., and J.G.M. 'Hans' Thewissen, ed. *The bowhead whale: Balaena mysticetus: Biology and human interactions*. Academic Press, 2020. See also Citta et al. (2018) A multi-species synthesis of satellite telemetry data in the Pacific Arctic (1987–2015): Overlap of marine mammal distributions and core use areas. Deep-Sea Research Part II 152:132–153. https://doi.org/10.1016/j.dsr2.2018.02.006.

Conclusion

Thank you for the opportunity to provide these comments. NOAA must engage in further consultation and communication with the NSB and AEWC as it develops the Final Programmatic EIS, through the development of Incidental Take Regulations and Letters of Authorization, and as the Program is implemented with surveys in Alaska. The Alternative selected and the Program as implement must enable NOAA to achieve its goals, with minimal disruption to our subsistence hunt, and maximum participation by our communities in the process.

Sincerely,

Harry K. Brower, Jr. Mayor
North Slope Borough

John Hopson, Jr., Chairman
Alaska Eskimo Whaling Commission

[15] *Id.* at 165.

cc: AEWC Commissioners
Taqulik Hepa, NSB Department of Wildlife Management
Gordon Brower, NSB Department of Planning & Community Services
Voice of the Arctic Inupiat
Inupiat Community of the Arctic Slope

2.23.2 NOS Response

NEPA Process-1: We appreciate that NOAA extended the comment period to allow adequate time for review.

> **NOS Response:** Thank you for your support of the extended comment period.

Environmental Justice-1: As the regional government for the Alaskan Arctic and as hunters on the water, we understand the importance of having good maps for our region, for the safety of all vessels. However, the surveying activities described in this DPEIS are of great concern to us as our communities participate in, and are dependent, on subsistence hunting of a wide range of marine life, including the bowhead whale. Marine activities that include vessel traffic and noise during specific time periods have a high potential to disrupt bowhead whale migrations. This may put our hunters' safety at risk and negatively impact our food security.

> **NOS Response:** Thank you for your comment. NOS understands the NSB and AEWC concerns for possible effects on subsistence, food security, and safety. NOS activities are conducted with the highest regard to health and safety, including the safety of subsistence hunters. NOS understands that protecting Alaska Native subsistence resources is vital and is committed to ongoing communication with NSB and AEWC about projects that are proposed in bowhead whale habitat and subsistence hunting areas.
>
> Specific project locations are determined annually for the upcoming surveying season. NOS will coordinate with tribes and subsistence hunters and fishers prior to conducting projects in subsistence hunting areas. NOS will also work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses. Through this communication strategy, NOS would minimize the potential for adverse impacts on subsistence communities, food security, and the safety of hunters.
>
> NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request formal government-to-government consultation pursuant to EO 13175 at any time.

Proposed Action-1: It is particularly challenging to understand the potential impacts when this DPEIS has broad goals, and lack of specifics for our region. It makes it nearly impossible to provide a more detailed analysis of the impacts to the bowhead whales, to other important marine mammals and to our food security.

> **NOS Response:** NOS recognizes the importance of subsistence hunting of marine mammal species such as the bowhead whale. NOS will work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses.
>
> Federally recognized tribes and ANCs may request formal government-to-government consultation pursuant to EO 13175 at any time.

NOS determined that a programmatic approach under NEPA was appropriate because NOS conducts, authorizes, permits, and funds a suite of similar, ongoing data collection activities associated with recurring projects across a wide geographic area, including Alaskan and U.S. Arctic waters, to characterize underwater features (e.g., habitat, bathymetry, marine debris).

Future Coordination-1: For these reasons, NSB and AEWC expect continued consultation with NOAA and NOS as this Program is implemented and before any of the surveys or mapping projects move forward in the Arctic.

NOS Response: NOS is committed to continued engagement with the AEWC and NSB. Specific project locations are determined annually for the upcoming surveying season. NOS will coordinate with tribes and subsistence hunters and fishers prior to conducting projects in subsistence hunting and fishing areas. NOS will also work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses. Through this communication strategy, NOS would minimize the potential for adverse impacts on subsistence communities, food security, and the safety of hunters.

NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request formal government-to-government consultation pursuant to EO 13175 at any time.

Environmental Justice-2: At times, the AEWC has had great coordination with NOAA and the National Marine Fisheries Service (NMFS) under our Co-Management Agreement for the bowhead whale. The AEWC has also worked well with the Office of Coast Survey at times, such as the recent autonomous sailing vessels, called "Saildrones" project. In 2020, adjustments were made to the surveys based on changed ice conditions to honor buffers around our communities during the fall harvest in Kaktovik, Nuiqsut and Utqiagvik (Barrow). (more below)

However, at times, we have also been extremely disappointed by our federal agency partners. The DPEIS highlights NOAA's communication and consultation efforts as a means for mitigation of the surveys impacts. 6 And the Biden Administration has announced additional plans for meaningful consultation with Tribes and Native communities. Yet as recently as September 2021, NOAA failed to contact the AEWC to participate in the Alaska Spatial Priorities Survey.

These communication and consultation efforts are necessary and must be mandatory for all phases of these Projects.

NOS Response: NOS is committed to continued engagement with the AEWC and NSB. Specific project locations are determined annually for the upcoming surveying season. NOS will coordinate with tribes and subsistence hunters and fishers prior to conducting projects in subsistence hunting and fishing areas. NOS will also work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses. Through this communication strategy, NOS would minimize

the potential for adverse impacts on subsistence communities, food security, and the safety of hunters.

NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request formal government-to-government consultation pursuant to EO 13175 at any time.

Environmental Justice-3: These surveys and other vessel traffic can impact our lives and livelihoods. The specific surveys conducted under this Program must be implemented in a way that ensures our continued food security and the safety of our hunters…Our hunters are also on the water, and extra noise from survey vessels can greatly impact our food security.

NOS Response: NOS is committed to continued engagement with the AEWC and NSB. Specific project locations are determined annually for the upcoming surveying season. NOS will coordinate with tribes and subsistence hunters and fishers prior to conducting projects in subsistence hunting and fishing areas. NOS will also work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses. Through this communication strategy, NOS would minimize the potential for adverse impacts on subsistence communities, food security, and the safety of hunters.

NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request formal government-to-government consultation pursuant to EO 13175 at any time.

Future Coordination-2: The AEWC recognizes that NOAA is familiar with our Conflict Avoidance Agreement (CAA), as it is recognized by NMFS and other federal agencies in various regulatory processes. The CAA and the collaborative Process by which it is signed each year are critical to the AEWC's ability to protect the whale, our hunters, and our communities' food security, while facilitating environmentally sound resource development. This CAA Process has worked well, especially for companies that are new to the Arctic. It provides a collaborative process for consultation for the different surveys, enabling us to educate the vessel operators on the need for mitigation measures not needed in other regions, and in many instances, our participation has helped the operator improve the surveys.

These annual consultations and adaptive management approach are particularly important in the Arctic marine environment, where tremendous and unprecedented environmental changes are occurring. With changes in spring ice conditions, fall whaling is becoming more important in some of our villages along the Chukchi and Bering Seas. And vessel traffic is increasing in the Bering Strait and the Arctic. These changing circumstances underscore the need for ongoing reliance on adaptive management. Incorporating an adaptive process provides both the stakeholders and the agency an effective means of addressing new information and changed circumstances in the context of specific industrial operations planned for a given year.

As NOAA develops this survey program, it must require the same level of in-depth consultation with our communities. Our hunters are the experts in ice condition and location of marine mammals.

NOS Response: NOS will coordinate with tribes and subsistence hunters and fishers prior to conducting projects in subsistence hunting and fishing areas. NOS will also work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses. Through this communication strategy, NOS would minimize the potential for adverse impacts on subsistence communities, food security, and the safety of hunters. If after engaging in this communication process it appears that a formal protocol is needed, NOS will consider the AEWC Conflict Avoidance Agreement (CAA).

NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request formal government-to-government consultation pursuant to EO 13175 at any time.

NOS recognizes the changing circumstances of the Arctic. NOS supports the AEWC CAA and agrees that the process and adaptive management is constructive and helpful. The Proposed Action is to continue NOS's ongoing surveying and mapping program which could occur anywhere in U.S. waters, including state waters, MPAs, and other special status areas. NOS will continue to facilitate involvement with subsistence communities related to planned projects throughout the action area.

Mitigation Measures-1: We encourage NOAA as it develops the Survey programs, and obtains its necessary permits, to include other provisions as mitigation including: the use of communication centers to communicate with our villages; time-area closures to protect subsistence hunting activities in the Beaufort Sea; limitations on discharges in subsistence hunting grounds; vessel transit guidelines, including speed restrictions; and monitoring and reporting requirements. These measures are relatively non-controversial and have relevance to activities throughout the bowhead whale migratory and subsistence hunting areas.

NOS Response: The Final PEIS has been updated to include additional mitigation measures that NOS has developed to be implemented on each project as appropriate to minimize the impacts of project activities, including reducing impacts on sensitive species and subsistence hunting and fishing. The additional mitigation measures in the Final PEIS were developed with subject matter experts and in coordination with field crews and with NMFS and USFWS. The full list of mitigation measures is included as an appendix to the Final PEIS. Mitigation measures include maintaining safe distances from protected and subsistence species and following vessel speed restrictions in specific protected species habitats.

Regarding your request to consider measures specifically for surveys in subsistence hunting areas, NOS will work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses.

NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes and ANCs may request formal government-to-government consultation pursuant to EO 13175 at any time.

Regarding your request to consider additional discharge restrictions in subsistence hunting areas, NOS assessed the potential impacts to water quality from vessel operations and equipment used during NOS projects. NOS vessels would discharge treated sanitary domestic wastes from United States Coast Guard-approved MSDs. The assessment of these impacts can be found in Section 3.14.1 of the Final PEIS. The potential impacts to air and water quality from air emissions, vessel discharges, and accidental spills would be minimized through compliance with MARPOL Annexes I, IV, V, and VI. NOS adheres to NOAA's environmental procedures which comply with the MARPOL annexes and relevant implementing legislation, regulations, and guidance.

Mitigation Measures-2: We would like to highlight one positive incident. In the summer of 2020, the Office of Coast Survey launched Autonomous Sailing Vessels (""Saildrones""). These were monitored by AEWC and NSB-DWM with daily emails on positions. In August, the AEWC formally requested that the instruments be turned off, which was done immediately. The saildrones traversed east past Kaktovik with the sounders turned off, before returning west to complete the survey after the whales had migrated and hunting was completed. The number of vessels was also reduced, in certain areas from four saildrones down to two. These actions showed us that the agency listens and is willing carry out a shutdown upon request and work collaboratively with the hunters. We would like to know whether this type of action will be honored in the future, especially in relation to larger, manned ships? From recent conversations between NSB-DWM and NOS and AEWC and NOS, we believe the answer is ""yes""; however, we want to be clear and upfront: are there limits to when, where, and duration of shutdowns that NOS would not comply? We know that is a very general question; however, the DPEIS is general in nature, so we require an answer.

NOS Response: Thank you for your comment, NOS appreciates the assistance of subsistence hunters in project planning. NOS is committed to continued coordination with Alaskan communities on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses.

In coordination with NMFS and USFWS, NOS has developed additional mitigation measures. Mitigation measures include maintaining safe distances from marine mammals achieved by decreasing vessel speeds, vessel maneuvering, and observing time-area restrictions in specific protected species habitats (e.g., North Atlantic right whale). In order to maintain safety of navigation and avoid interactions with marine mammals and other sensitive species during transit, the vessel crew are instructed to remain vigilant to the presence of marine mammals. The full list of mitigation measures is included as Appendix D to the Final PEIS.

This PEIS contains a programmatic effects analysis, meaning it provides an effects analysis for activities as they are typically conducted, with impacts assessed based on regional conditions, habitat types, species, and other factors. However, the PEIS does not identify the specific time or place for individual projects or activities over the next five years. As such, NOS cannot provide details on the specific situations where Alaskan communities

may request a shutdown of vessel operations. NOS is willing to discuss these requests and work closely with the subsistence community to ensure concerns are addressed.

NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes and ANCs may request formal government-to-government consultation pursuant to EO 13175 at any time.

Marine Mammals-1: In reviewing the document, the analysis of the Alternatives is very generalized and broad. For each Alternative, NOAA provides some generalized numerical statistics on the impacts to bowhead whales for the analysis. There is additional information in the Appendices. However, without more information on the timing and specific equipment, it is impossible to determine the direct impact to the bowhead whales and other marine mammals of concern, the indirect impacts through deflection from the migration path, and the potential impacts to our subsistence.

NOS Response: NOS recognizes the importance of subsistence hunting of marine mammal species such as the bowhead whale. NOS will work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses.

Federally recognized tribes and ANCs may request formal government-to-government consultation pursuant to EO 13175 at any time.

NOS determined that a programmatic approach was appropriate because NOS conducts, authorizes, permits, and funds a suite of similar, ongoing data collection activities associated with recurring projects across a wide geographic area to characterize underwater features (e.g., habitat, bathymetry, marine debris). This Final PEIS is a comprehensive document that provides detailed programmatic effects analyses for surveying and mapping data collection activities based on regional conditions, habitat types, species, and other factors. However, the Final PEIS does not identify the specific time or place for individual projects or activities over the next five years. The analysis will be used to inform NOS leadership and the public on the environmental impacts of these activities before a decision is made on how to execute each project. All projects will require a project-specific review by NOS before proceeding. Before conducting any survey, NOS will work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses.

Please note that the impacts from underwater acoustic equipment used detailed modeling data, as discussed in Section 3.5.2 of the PEIS, and NOS does not consider this data to be "generalized numerical statistics." The acoustic modeling predicts 58.89 total potential exposures of sound at levels associated with behavioral disruption in bowhead whales in the Alaska Region over five years. Similar data is provided for other marine mammals of concern in the region. As discussed in Section 3.5.2, behavioral disturbances are expected to be transient and surveys, once completed in a given area, would not generally be repeated for years, thus limiting an individual's behavioral disruption to a few minutes.

Environmental Justice-4: The DPEIS specifically notes this difficulty and the potential for impacts to the harvest. In several places, it says the magnitude of impact would depend on vessel speed, size, location, frequency, and pattern of travel, as well as the timing of the activities and the degree of overlap with our hunt. It also specifically states:

Subsistence harvests in the marine environment could be disrupted, prolonged; or subsistence resources could be unavailable for use. Communities which are primarily dependent on marine mammals for subsistence, such as the bowhead harvesters of northern and western Alaskan villages, would be especially impacted. Subsistence users may be required to travel farther to harvest subsistence foods at a greater cost in terms of time, fuel, wear and tear on equipment and people, and lost wages. A decline in the harvest efficiency of marine resources would likely lead to an increase in hunting pressure on terrestrial wildlife, and to an increase in competition and territorial conflicts among subsistence harvesters (BOEM, 2015b).

This is unacceptable. Our food security cannot be put at risk for these surveys.

> **NOS Response:** NOS understands the importance of Alaska Native subsistence resources; therefore, NOS ensured that the full range of potential direct and indirect impacts to subsistence harvests are considered in the PEIS. The effects analysis in the PEIS provided NOS with important information to support the development of mitigation measures in coordination with NMFS and USFWS for the Alaska Region. NOS is committed to ongoing communication with subsistence communities to avoid impacts that could directly or indirectly affect subsistence resources.
>
> NOS would minimize the potential for adverse impacts on subsistence communities, food security, and the safety of hunters through communication with Alaskan communities on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses.
>
> NOS would like to note that the impacts described in the comment are the potential adverse effects of the cumulative impact of all actions occurring in the action area such as other surveying and mapping efforts undertaken by the U.S. Geological Survey, the Bureau of Ocean Energy Management (BOEM), and the National Science Foundation (Section 4.1). The NOS contribution to these adverse, cumulative impacts would be minor, and every effort will be made to coordinate with subsistence communities to minimize these impacts.

Mitigation Measures-3: From our experience and as discussed above with the CAA, we know there are ways to mitigate the harms. These conversations need to take place before any surveys are developed to get input from the communities that will be directly impacted.

> **NOS Response:** NOS will work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses.
>
> NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes and ANCs may request formal government-to-government consultation pursuant to EO 13175 at any time.

Environmental Justice-5: Ultimately, without more details on the timing, location and extent of the surveys, it is difficult to see how NOAA has reached the conclusion that impacts on subsistence could be minimal or insignificant.

> **NOS Response:** NOS is committed to continued engagement with the AEWC and NSB. NOS determined that a programmatic approach was appropriate because NOS conducts, authorizes, permits, and funds a suite of similar, ongoing data collection activities associated with recurring projects across a wide geographic area to characterize underwater features (e.g., habitat, bathymetry, marine debris). This Final PEIS is a comprehensive document that provides detailed programmatic effects analyses for surveying and mapping data collection activities based on regional conditions, habitat types, species, and other factors. However, the Final PEIS does not identify the specific time or place for individual projects or activities over the next five years. The analysis will be used to inform NOS leadership and the public on the environmental impacts of these activities before a decision is made on how to execute each project. All projects will require a project-specific review by NOS before proceeding.
>
> In areas where subsistence hunting and fishing activities could occur, NOS analyzed the potential impacts of all surveying and mapping data collection activities that could occur and determined impacts would be insignificant using the significance criteria presented in Table 3.13-4.
>
> NOS will coordinate with tribes and subsistence hunters and fishers prior to conducting projects in subsistence hunting and fishing areas. NOS will also work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses. Through this communication strategy, NOS would minimize the potential for adverse impacts on subsistence communities, food security, and the safety of hunters.
>
> NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request formal government-to-government consultation pursuant to EO 13175 at any time.

Environmental Justice-6: In Section 3.13.2.2.1, the DPEIS refers to our subsistence harvest and talks about “restricted hunting seasons” or “restrictions on hunting seasons.” We wish to clarify NOAA’s intent. Specifically, it says:

The magnitude of the impacts would depend on the degree of overlap between the hunting season and the activities, with greater adverse impacts on EJ communities that rely on species with restricted hunting seasons. Survey and whaling seasons are bound to overlap due to safety and weather considerations, therefore it would not be practicable for NOS to avoid surveying activities during all subsistence hunting seasons. Increased hunting time coupled with restrictions on hunting seasons could potentially decrease harvest numbers.

This language is disturbing, and hopefully inaccurate. The bowhead harvest is highly regulated with a quota allocated from the IWC, and through our work with NOAA as a Co-Management

Partner. It is also based on the timing of the migration of the bowhead whale. However, NOAA has not outlined any restrictions on the timing of our harvest. We have fought for decades to maintain our hunting rights and seek adequate numbers to feed our communities across Alaska. We would expect NOAA to adjust its surveys – and not have NOAA place any additional restrictions on the hunters.

> **NOS Response:** The Final PEIS has been revised for clarity. NOS intended the phrase "Restricted hunting seasons" to refer to hunts that are limited to specific seasons due to animal migration patterns and seasonal changes in weather and ice, not restrictions imposed by NOS. The Proposed Action would not place any additional restrictions on the bowhead whale quota allocated by the International Whaling Commission (IWC) or on hunting seasons. NOS understands the importance of Alaska Native subsistence resources. NOS understands that even small disruptions could cause adverse impacts; as such, NOS is committed to ongoing communication with subsistence communities to avoid impacts that could directly or indirectly affect subsistence resources.

Environmental Justice-7: The description on page 443 about Figure 3.13-2 is a bit inaccurate. The first sentence says, "Figure 3.13-2 shows the AEWC spring and fall hunting areas in red." But the red color is defined on the map as "AEWC Hunting and Search Areas", which would be across all seasons. This should be corrected.

> **NOS Response:** Thank you for your suggested revision, NOS has revised the description of Figure 3.13-2 in the Final PEIS.

Environmental Justice-8: We also wish to correct this sentence from the DPEIS which says: ""Over the years, bowhead hunters have incorporated modern technologies such as darting and shoulder guns for improved efficiency and humane hunting."" Through mandates from the International Whaling Commission, the AEWC has been required to adapt its techniques. However, the darting gun and shoulder gun are 19th century technology with only slight modifications since then making this sentence inaccurate.

> **NOS Response:** Thank you for your suggested revision, NOS has revised the sentence "over the years, bowhead hunters have incorporated modern technologies such as darting and shoulder guns for improved efficiency and humane hunting" to indicate that the technology has only slightly changed since the 19th century.

Cumulative Impacts-1: In the cumulative impacts assessment, NOS should include the impacts from other research traffic in the Arctic. In addition, Table 4.1-7 on current Offshore Oil & Gas Projects in the Arctic may need some revisions to reflect that Hilcorp is operating Northstar, and the Liberty Project may be on hold.1 3 Section 4.1.8 on Liquefied Natural Gas projects is missing any reference to the Alaska LNG Project which has secured permits.

> **NOS Response:** The cumulative impacts section has been revised for the Final PEIS to include the information the commenter has provided on offshore oil and gas projects in Alaskan waters.

Alternatives-1: The NSB and AEWC generally want to support the use of newer technologies that may be more efficient and may achieve greater accuracy. However, NOAA must ensure the

choice of equipment is well-suited to the task, and each survey is done in the least disruptive manner to the bowhead whale and our hunts, and is adequately analyzed to ensure proper mitigation measures are in place, including necessary time and area closures around our communities.

NOS Response: Thank you for your comment, appropriate equipment selection is discussed in Section 2.2 of the Draft PEIS. The responsible NOS program office considers the goals and purpose of a given project and determines the specific equipment and protocols which would be best suited to accomplish the task. NOS has a responsibility to gather data necessary for nautical charts and other public data products, with consideration for the human environment. Surveying vessels and equipment are designed to minimize noise, and NOS uses the lowest appropriate power and ping rate for its acoustic sources while gathering data.

The Final PEIS has been updated to include additional mitigation measures that NOS has developed to be implemented on each project as appropriate to minimize the impacts of project activities, including reducing impacts on sensitive species and subsistence hunting and fishing. The additional mitigation measures in the Final PEIS were developed with subject matter experts and in coordination with field crews and with NMFS, USFWS, and ONMS. The complete list of mitigation measures is included as Appendix D to the Final PEIS.

NOS will work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses.

Federally recognized tribes and ANCs may request formal government-to-government consultation pursuant to EO 13175 at any time.

Alternatives-2: We also would appreciate Alternative C, to include additional funding. This funding could help NOAA in its outreach to our communities. We also hope to see a mechanism where this funding would be made available to the impacted communities to support the co-production of knowledge and the amount of time and resources that are required for our organizations to engage in consultation. This could enable our communities and our hunters to participate early in the process, including in developing the studies and answering questions related to the impacts of the technology in our waters.

NOS Response: Thank you for your support of Alternative C.

Alternative C includes the adoption of new techniques and technologies for activities related to data collection for NOS surveying and mapping projects. It does not include additional funding for communities to cover time and resources spent by federally recognized tribes to engage in the consultation process. NOS is not aware of any current federal funding opportunities to support tribal or subsistence communities' time spent consulting with Federal agencies.

All data collected by NOS is made publicly available to the extent allowed by federal law. NOS will work with the NOAA Alaska Regional Navigation Manager to provide Alaskan

communities with information on upcoming surveying projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses.

Federally recognized tribes and ANCs may request formal government-to-government consultation pursuant to EO 13175 at any time.

Scope-1: It has been brought to the attention of AEWC and NSB-DWM that freshwater surveys and mapping will not be conducted in Alaska. We would like confirmation of this.

NOS Response: Freshwater projects may occur in the Alaska Region; however, the majority of projects would be in the marine environment.

Marine Mammals-2: Table 3.5-10 provides the barest of information on how "Total Exposures" were calculated. In fact, the definition of Total Exposures, noted with an asterisk, is difficult to understand: "Measured as the predicted probability of exposure and interpreted as the percentage of the population expected to exceed threshold". We would like clearer definition, and in the text, please provide sufficient information on the assumptions used in the model to determine these values. While the overall document refers to Appendices, these are not in the DPEIS.

NOS Response: Calculations were made available with the Draft PEIS in Appendix C and are also available in Appendix E of the Final PEIS which contains an updated version of the same report, Technical Acoustic Analysis of Oceanographic Surveys.

Acoustic Modeling-1: Upon receiving the appendix entitled Technical Acoustic Analysis of Oceanographic Surveys for the National Ocean Service: Underwater Acoustic Modeling Oceanographic Survey Sounds and Exposure Modeling from Giannina DiMaio, which we appreciate, we note that Table 4 includes many species of concern, including bowhead and beluga whales. Based on the listed publication from which densities are estimated (NOAA and USFWS Stock Assessments Reports, 2014, 2017-2019), we suspect that the authors are assuming that marine mammal densities are equal across their range; however, studies of marine mammal densities indicate that there are core use areas that are occupied seasonally. If the authors of the DPEIS are assuming that marine mammal densities are constant across their range, marine mammal density will be overestimated across large areas while under-estimated within critical use areas. Hence, it is likely that the density of marine mammals is biased low within their core use areas, leading to an estimate of Total Exposures that is also biased low. We are requesting clarification of how total exposure was estimated and would like to see the density maps used to calculate total exposure. Knowing and recalculating Total Exposures will not only assist in your successful completion of this laudable project but also provide further evidence to us of your willingness to listen and use local and traditional knowledge. Data based on tagged species should be evaluated by NOS. A recent resource to consult is George, John C., and J.G.M. 'Hans' Thewissen, ed. The bowhead whale: Balaena mysticetus: Biology and human interactions. Academic Press, 2020. See also Citta et al. (2018) A multi-species synthesis of satellite telemetry data in the Pacific Arctic (1987-2015): Overlap of marine mammal distributions and core use areas. Deep-Sea Research Part II 152:132-153. https://doi.org/10.10l6 j.dsr2.2018.02.006.

NOS Response: Thank you for the comment. NOS, in consultation with NMFS, has incorporated additional data sources into the calculations of marine mammal density and

exposures. The revised exposure numbers are being used for consultation under the MMPA and ESA, and have been incorporated in the Final PEIS. For Alaska, species abundance and distribution were obtained from the 2021 SARs for cetaceans and pinnipeds which represent the best available science.

NOS has reviewed the referenced studies provided in the comment. These additional data sources are based on tagged species. NOS understands that there are local differences in densities and distribution in the Alaskan Region. For the purposes of modeling total exposure estimates, the SARs data is appropriate for estimating population level effects under the MMPA and ESA. However, NOS agrees that this higher resolution information is helpful for understanding localized impacts to subsistence hunting. As such, NOS has considered this higher resolution data for beluga and bowhead whales in the qualitative assessment in the Final PEIS.

NOS considered several data sets when determining what density data set was most appropriate for use in estimating total exposures including the Navy Marine Species Database. As stated in the acoustic modeling report (Appendix E in the Final PEIS): "The Navy Marine Species Database was considered for use in the Pacific Ocean and Gulf of Alaska (DoN 2017, 2018, 2019). The coverage of this database, however, is less than the extent of the NOS operational areas, meaning SAR data would still have been needed to fill in large data gaps. While density estimates from SAR abundance may have lower spatial resolution than the Navy Marine Species Database, use of the SAR data is appropriate because they are broadly accurate over the operational area and surveys may occur anywhere within those operational areas." As described in the referenced appendix, NOS used average population densities because the proposed activities may occur anywhere within the action area. Although some projects may result in more exposures than others, the exposure estimates represent expected exposures averaged across all projects in the program. Natural variability due to seasonal changes is expected.

Although there are no associated density maps for the SAR data used by NOS to estimate total exposures, NMFS annually prepares marine mammal stock assessment reports by region and species. This information can be found on the NMFS Marine Mammal Stock Assessments website at https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments.

NEPA Process-2: NOAA must engage in further consultation and communication with the NSB and AEWC as it develops the Final Programmatic EIS, through the development of Incidental Take Regulations and Letters of Authorization, and as the Program is implemented with surveys in Alaska. The Alternative selected and the Program as implemented must enable NOAA to achieve its goals, with minimal disruption to our subsistence hunt, and maximum participation by our communities in the process.

NOS Response: Comments and recommendations received on the Draft PEIS from the public during the 90-day public comment period were considered by NOS in the development of the Final PEIS. Federally recognized tribes and ANCs may request formal government-to-government consultation pursuant to EO 13175 at any time.

NOS will work with the NOAA Alaska Regional Navigation Manager to provide Alaskan communities with information on upcoming NOS surveying and mapping projects to avoid or minimize interference with traditional hunting and fishing for subsistence uses.

NOS has submitted an application for a Letter of Authorization to NMFS and a petition for Incidental Take Regulations to USFWS for marine mammal species. The development of regulations pertaining to these consultations will provide the public with additional opportunities to comment.

2.24 Pokagon Band of Potawatomi Indians Tribal Historic Preservation Officer (Matthew J.N. Bussler)

2.24.1 Comment Submission

Pokégnek Bodéwadmik
POKAGON BAND OF POTAWATOMI
LANGUAGE & CULTURE

August 2nd, 2021

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Comments on NOAA Draft PEIS for Surveying and Mapping Projects

Dear Responsible Party:

Migweth for your inquiry for comments regarding the National Oceanic and Atmospheric Administration's (NOAA) draft Programmatic Environmental Impact Statement (PEIS) for Surveying and Mapping Projects. I am writing to inform you that I have reviewed the Cultural and Historic Resources section (3.11) of the PEIS referenced above and would like to provide the following comments for your consideration. Should you have any questions, please don't hesitate to contact me at your earliest convenience.

Comments on Section 3.11.2.1 Methodology

1. It is of utmost importance that the NOAA undergoes in-depth discussion with Tribes who exercise Traditional fishing and hunting practices to ensure that surveying and mapping work is not performed during peak fishing seasons and timeframes. The Significance Conclusion, within *Table 3.11-1. Significance Criteria for the Analysis of Impacts to Cultural Resources,* "Insignificant" claims, under Impact Descriptor "Moderate" that "The action would temporarily interfere with traditional subsistence hunting and fishing practices during peak seasons or times." To satisfy Tribes' concerns of the disruption of their Traditional fishing and hunting practices, detailed discussion and consultation must be conducted to guarantee that an annual season's hunting and fishing harvest is not compromised due to actions taken by NOAA.
2. If an action were to be performed by NOAA that is constituted as "Major", detailed discussion and ongoing, meaningful consultation must be conducted to allow for tribes to review possible adverse effects to historic and cultural resources and guarantee that a Tribe's annual season's hunting and fishing harvest is not compromised. Actions that obtain a

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"Major" Impact Descriptor status will require NOAA to halt all work and contact Tribes immediately.

I appreciate the NOAA for reaching out to the Pokagon Band of Potawatomi Indians for our input and comments on your Draft Programmatic Environmental Impact Statement. If questions, comments or concerns may arise in the future, the Pokagon Band will make contact with the NOAA to address them.

Sincerely,

Matthew J.N. Bussler
Tribal Historic Preservation Officer
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2.24.2 NOS Response

Socioeconomic Resources-2: 1. It is of utmost importance that the NOAA undergoes in-depth discussion with Tribes who exercise Traditional fishing and hunting practices to ensure that surveying and mapping work is not performed during peak fishing seasons and timeframes. The Significance Conclusion, within Table 3.11-1. Significance Criteria for the Analysis of Impacts to Cultural Resources, "Insignificant" claims, under Impact Descriptor "Moderate" that "The action would temporarily interfere with traditional subsistence hunting and fishing practices during peak seasons or times." To satisfy Tribes' concerns of the disruption of their Traditional fishing and hunting practices, detailed discussion and consultation must be conducted to guarantee that an annual season's hunting and fishing harvest is not compromised due to actions taken by NOAA.

> **NOS Response:** Executive Order 13175 of November 6, 2000 (Consultation and Coordination With Indian Tribal Governments), charges all executive departments and agencies with engaging in regular, meaningful, and robust consultation with tribes on Federal policies or activities that have tribal implications. On June 28, 2021, NOS sent letters to tribes notifying them of the availability of the PEIS and inviting them to seek government-to-government consultation under EO 13175.
>
> NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation at any time for a proposed action that may have tribal implications.
>
> NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources.

Cultural and Historic Resources-11: 2. If an action were to be performed by NOAA that is constituted as "Major", detailed discussion and ongoing, meaningful consultation must be conducted to allow for tribes to review possible adverse effects to historic and cultural resources and guarantee that a Tribe's annual season's hunting and fishing harvest is not compromised. Actions that obtain a "Major" Impact Descriptor status will require NOAA to halt all work and contact Tribes immediately.

> **NOS Response:** Overall, impacts on cultural resources under all alternatives were found to range from negligible to moderate and insignificant under the impact criteria NOS established pursuant to NEPA. While the Final PEIS will be used to inform NOS responsibilities under NHPA, NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources.
>
> NOS intends to notify individual tribes pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation at any time for a proposed action that may have tribal implications.

2.25 Public (Anonymous)

2.25.1 Comment Submission

Comment on, "Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition, Extension of Public Comment Period."

The agencies involved in this plan (National Ocean Service (NOS), National Oceanic and Atmospheric Administration (NOAA), and Department of Commerce (DOC)) have provided ample information relating to their proposed action, and they show that they have a clear understanding of the environmental impacts it may have. The site provided by NOAA for the "Surveying and Mapping Draft PEIS" provides the need/purpose for action, scope, methods for surveying and mapping, draft PEIS, FAQ's, fact sheets, and an area for public comments. The proposed action is said to, "provide the public and private sectors with nautical charts, benthic habitat condition maps, current and tide charts, and other products necessary to ensure safe navigation, economic security, and environmental sustainability." The agencies proved clear, organized information regarding their methods of surveying and mapping with user-friendly video explanations, supporting images, and simple, yet effective, wording for the proposed plan. The information provided was easily accessible to the public and covered every area of concern with regards to the plan. For instance, there is notable consideration of environmental sustainability and environmental justice. Furthermore, the agencies have closely followed the necessary processes required by NEPA, providing alternative plans, all environmental regulations and other compliances, and executive orders among more information. After reviewing this plan, it can be concluded that the proposed action is necessary and beneficial to society as a whole and should go forth in being implemented. The plan is closely aligned with the mission statement of NOAA's that is focused on, "...Protecting America's ocean, coastal, and living marine resources while promoting sustainable economic development." It is a complex process to be able to ensure that all of these variables synchronize.

With this being said, it is noted how NOS plans to engage federally recognized tribes in areas of the Hawaiian region and Alaskan Region. It is stated in the plan that, "Although NOS does not anticipate any effects on historical or cultural resources, if there is a potential for adverse impacts NOS will engage with federally recognized tribes to develop agreements to avoid or minimize those effects." While it is clear that NOS is committed to considering any tribes concerns, it is still unclear how exactly they plan to mitigate any discrepancies. Will the agencies be willing to put a halt to their actions if there are high concerns with local tribes? Or will the concerned tribe be provided compensation for their compliance? We feel it is important to note their consideration but there is still a lack of more in depth research concerning the social and cultural impacts this plan may have. Since this is an integral part of the sustained mission of The National Oceanic and Atmospheric Administration (NOAA) and the National Ocean Service (NOS) collectively, we believe more detail should be provided for the general concern.

2.25.2 NOS Response

NEPA Process-6: The agencies involved in this plan (National Ocean Service (NOS), National Oceanic and Atmospheric Administration (NOAA), and Department of Commerce (DOC)) have provided ample information relating to their proposed action, and they show that they have a clear understanding of the environmental impacts it may have. The site provided by NOAA for the "Surveying and Mapping Draft PEIS" provides the need/purpose for action, scope, methods for surveying and mapping, draft PEIS, FAQ's, fact sheets, and an area for public comments. The proposed action is said to, "provide the public and private sectors with nautical charts, benthic habitat condition maps, current and tide charts, and other products necessary to ensure safe navigation, economic security, and environmental sustainability." The agencies proved clear, organized information regarding their methods of surveying and mapping with user-friendly video explanations, supporting images, and simple, yet effective, wording for the proposed plan. The information provided was easily accessible to the public and covered every area of concern with regards to the plan. For instance, there is notable consideration of environmental sustainability and environmental justice. Furthermore, the agencies have closely followed the necessary processes required by NEPA, providing alternative plans, all environmental regulations and other compliances, and executive orders among more information.

> **NOS Response:** Thank you for your support of the analysis in the PEIS and the outreach material provided to the public.

Cultural and Historic Resources-9: With this being said, it is noted how NOS plans to engage federally recognized tribes in areas of the Hawaiian region and Alaskan Region. It is stated in the plan that, "Although NOS does not anticipate any effects on historical or cultural resources, if there is a potential for adverse impacts NOS will engage with federally recognized tribes to develop agreements to avoid or minimize those effects." While it is clear that NOS is committed to considering any tribes concerns, it is still unclear how exactly they plan to mitigate any discrepancies.

Will the agencies be willing to put a halt to their actions if there are high concerns with local tribes? Or will the concerned tribe be provided compensation for their compliance? We feel it is important to note their consideration but there is still a lack of more in depth research concerning the social and cultural impacts this plan may have. Since this is an integral part of the sustained mission of The National Oceanic and Atmospheric Administration (NOAA) and the National Ocean Service (NOS) collectively, we believe more detail should be provided for the general concern.

> **NOS Response:** Executive Order 13175 of November 6, 2000 (Consultation and Coordination With Indian Tribal Governments), charges all executive departments and agencies with engaging in regular, meaningful, and robust consultation with tribes on Federal policies or activities that have tribal implications. On June 28, 2021, NOS sent letters to tribes notifying them of the availability of the PEIS and inviting them to seek government-to-government consultation under EO 13175.
>
> NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation at any time for a proposed action that may have tribal implications.

NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources.

2.26 Public (Jean Public)

2.26.1 Comment Submission

From: NOSAA Environmental Compliance - NOAA Service Account
To: Michelle.Smyk@solvllc.com
Subject: Fwd: unnecessary spending
Date: Thursday, October 14, 2021 6:36:05 PM

NOS PEIS Comment

v/r
Giannina DiMaio
NOS Environmental Compliance Coordinator
Pronouns: she/her/hers

NOAA, National Ocean Service
Office of the Assistant Administrator
1305 East-West Hwy, SSMC4 13th Floor
Silver Spring, MD 20910
V: 240-533-0918
nosaa.ec@noaa.gov

---------- Forwarded message ---------
From: **jean public** <jeanpublic1@gmail.com>
Date: Tue, Aug 24, 2021 at 1:50 PM
Subject: Fwd: unnecessary spending
To: <nosaa.ec@noaa.gov>, INFO <INFO@taxpayer.net>, media <media@cagw.org>, <INFO@njtaxes.org>, <info@afphq.org>

public comment on federal register unnecessary spending
shut down this completely unnecesary spending. there is no need also to "accommodate" hunters or fishers. do not fund this completely wasteful and unnecessary program. this commetn is for the public record. please receipt. jean publiee jeanpublic1@gmail.com

[Federal Register Volume 86, Number 161 (Tuesday, August 24, 2021)]
[Notices]
[Pages 47299-47300]
From the Federal Register Online via the Government Publishing Office
[www.gpo.gov]
[FR Doc No: 2021-18207]

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition, Extension of Public Comment Period

AGENCY: National Ocean Service (NOS), National Oceanic and Atmospheric Administration (NOAA), Department of Commerce (DOC).

ACTION: Notice; extension of comment period.

SUMMARY: The National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS) is extending the public comment period by 90 days for the Draft Programmatic Environmental Impact Statement (PEIS) for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition. The end of the public comment period is extended from August 24, 2021 to November 22, 2021.

DATES: The public comment period is extended by 90 days to November 22, 2021. Comments must be received by November 22, 2021, as specified under ADDRESSES. Comments received after this date may not be accepted.

ADDRESSES: The Draft PEIS can be viewed or downloaded from the NOS website at https://oceanservice.noaa.gov/about/environmental-compliance/surveying-mapping.html. Written comments on NOS's Draft PEIS may be submitted by one of the following methods:

Electronic Submission: Submit all electronic public comments via the Federal e-Rulemaking Portal. Go to https://www.regulations.gov and enter NOAA-NOS-2021-0055 in the Search box. Click on the ``Comment'' icon, complete the required fields, and enter or attach your comments.

Mail: Please direct written comments to DOC/NOAA/NOS Environmental Compliance Coordinator, SSMC4-Station 13612, 1305 East West Highway, Silver Spring, MD 20910.

Email: nosaa.ec@noaa.gov.

Instructions: Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered by NOAA. All comments received are a part of the public record and will generally be posted for public viewing on www.regulations.gov without change. All personal identifying information (e.g., name, address, etc.), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NOAA will accept anonymous comments (enter ``N/A'' in the required fields if you wish to remain anonymous).

FOR FURTHER INFORMATION CONTACT: Giannina DiMaio, DOC/NOAA/NOS, Environmental Compliance Coordinator, SSMC4-Station 13612, 1305 East West Highway, Silver Spring, MD 20910; Phone: 240-533-0918; or Email nosaa.ec@noaa.gov.

SUPPLEMENTARY INFORMATION: On June 25, 2021, NOS published a Notice of Availability of a Draft PEIS for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition. 86 FR 33663 (June 25, 2021). The Draft PEIS was prepared in accordance with the National Environmental Policy Act of 1969, as amended (NEPA), to analyze the potential environmental impacts associated with NOS's recurring data collection projects to characterize submerged features (e.g., habitat, bathymetry, marine debris). The ``action area'' for these projects encompasses United States (U.S.) rivers, states' offshore waters, the U.S. territorial sea, the contiguous zone, the U.S. Exclusive Economic Zone (U.S. EEZ), and coastal and riparian lands. As a part of the Proposed Action, NOS may use active acoustic equipment such as sub-bottom profilers, single beam and multibeam echo sounders, side-scan sonars, and Acoustic Doppler Current Profilers. The Draft PEIS analyzes NOS data collection projects for a time period of six years. Please refer to the original Notice of Availability for additional summary information.

[[Page 47300]]

The original public comment period for the Draft PEIS was scheduled to close on August 24, 2021. In response to written and verbal requests from members of the public including representatives of the Alaska whaling community, NOS is extending the public comment period by 90 days to November 22, 2021. The comment period extension will ensure adequate time for review of the Draft PEIS by all interested parties and will accommodate the Alaskan subsistence hunting and fishing community which is particularly busy during the start of the fall whaling season from August to October. NOS recognizes that Alaskan communities have valuable regional expertise in oceanography, marine mammals and other resources, and the subsistence patterns and needs of their community.

NOS invites affected government agencies, non-governmental

organizations, tribes and tribal organizations, and interested members of the public to participate in the Draft PEIS process and provide comments on the structure, contents, and analysis in the Draft PEIS. Please visit the project web page for additional information regarding the program: https://oceanservice.noaa.gov/about/environmental-compliance/surveying-mapping.html.

Authority: The preparation of the Draft PEIS was conducted in accordance with the requirements of NEPA, the Council on Environmental Quality's Regulations (40 CFR 1500 et seq. (1978)), other applicable regulations, and NOAA's policies and procedures for compliance with those regulations. While the CEQ regulations implementing NEPA were revised as of November 14, 2020 (85 FR 43304, Jul. 16, 2020), NOS prepared this Draft PEIS using the 1978 CEQ regulations because this environmental review began on December 19, 2016, when NOS published a Notice of Intent to conduct scoping and prepare a Draft Programmatic Environmental Assessment. Written comments must be received on or before November 22, 2021.

Nicole R. LeBoeuf,
Assistant Administrator, National Ocean Service, National Oceanic and Atmospheric Administration.

[FR Doc. 2021-18207 Filed 8-23-21; 8:45 am]
BILLING CODE 3510-JE-P

2.26.2 NOS Response

Environmental Justice-10: there is no need also to ""accommodate"" hunters or fishers.

> **NOS Response:** Executive Order 13175 of November 6, 2000 (Consultation and Coordination With Indian Tribal Governments), charges all executive departments and agencies with engaging in regular, meaningful, and robust consultation with Tribal officials on Federal policies or activities that have tribal implications. Additionally, EO 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires that federal agencies consider as a part of their action any disproportionately high and adverse human health or environmental effects to minority and low-income populations. Agencies are required to ensure that these potential effects are identified and addressed. Several tribes and Alaska subsistence communities sought additional time to review the EIS due to the timing of its release that coincided with the subsistence hunting and fishing season in Alaska. NOS found this request reasonable and as such, NOS extended the original 60-day public comment period deadline by 90 days from August 24, 2021 to November 22, 2021.

Purpose and Need-3: public comment on federal register unnecessary spending shut down this completely unnecessary spending... do not fund this completely wasteful and unnecessary program.

> **NOS Response:** Thank you for your comment. Projects under the Proposed Action provide the public and private sectors with nautical charts, benthic habitat condition maps, current and tide charts, and other products necessary for safe navigation, economic security, and environmental sustainability. The public and decision-makers need these products to ensure safety at sea, economic well-being, and the efficient stewardship of public trust resources.

2.27 South Carolina State Historic Preservation Officer (Elizabeth Johnson)

2.27.1 Comment Submission

SOUTH CAROLINA DEPARTMENT OF
ARCHIVES & HISTORY

July 20, 2021

Giannina DiMaio
NOS Environmental Compliance Coordinator
NOAA, National Ocean Service
Silver Spring, MD 20910
Nosaa.ec@noaa.gov

Re: Surveying and Mapping Projects in U.S. Coastal Waters for Coastal and Marine Data Acquisition
South Carolina
SHPO Project No. 21-EJ0219

Dear Giannina DiMaio:

Our office has received the letter dated June 25, 2021 and link to the *Draft Programmatic Environmental Impact Statement (PEIS)* that you submitted as part of your agency's National Environmental Policy Act (NEPA) process for the project referenced above. This letter is for preliminary, informational purposes only and does not constitute consultation or agency coordination with our office as defined in 36 CFR 800: "Protection of Historic Properties" or by any state regulatory process. If NOAA chooses to substitute the NEPA process for the process outlined in Section 106 of the National Historic Preservation Act, your agency must notify our office of the proposed substitution.

Our office maintains several resources for identifying historic properties (for links please see our online research resources at https://scdah.sc.gov/historic-preservation/historic-properties-research. These resources in particular should assist your agency in identifying historic properties for NEPA scoping.

- ArchSite is an online Geographic Information System (GIS) mapping program that includes all known historic and archaeological sites in South Carolina. Information on both the Public View Map and Subscriber View Map of ArchSite can be found here: http://www.scarchsite.org.
- SC Historic Properties Record (SCHPR) includes information on all National Register of Historic Places listings, and historic property surveys (in process) at http://schpr.sc.gov/.
- Additional historic contexts, survey reports, and related historic property documents can be found here https://scdah.sc.gov/historic-preservation/historic-properties-research/historic-contexts-survey-reports.

Please note that in South Carolina, records of submerged cultural resources are maintained by the SC Institute of Archaeology and Anthropology, Maritime Research Division (MRD), http://artsandsciences.sc.edu/sciaa/mrd/welcome. Our office defers to the expertise of the Maritime Research Division (MRD), under the direction of the State Underwater Archaeologist, for undertakings that may include submerged resources. Please contact Athena Van Overschelde at 803-576-6565 or

athenav@mailbox.sc.edu or Jim Spirek at 803-576-6566 or spirek@sc.edu if you have any questions or require additional information about submerged cultural resources.

The State Historic Preservation Office will provide comments regarding historic properties and effects to them once the federal or state agency initiates consultation. Project Review Forms and additional guidance regarding our office's role in the compliance process and historic preservation can be found on our website at: https://scdah.sc.gov/historic-preservation/programs/review-compliance.

Thank you for providing information about the PEIS. Please refer to SHPO Project Number 21-EJ0219 in any future correspondence regarding this project. If you have any questions, please contact me at (803) 896-6168 or at ejohnson@scdah.sc.gov.

Sincerely,

Elizabeth M. Johnson

Elizabeth M. Johnson
Director, Historical Services, D-SHPO
State Historic Preservation Office

2.27.2 NOS Response

Cultural and Historic Resources-31: If NOAA chooses to substitute the NEPA process for the process outlined in Section 106 of the National Historic Preservation Act, your agency must notify our office of the proposed substitution.

> **NOS Response:** While the Final PEIS will be used to inform NOS responsibilities under NHPA, NOS will comply with Section 106 of the NHPA for any activity that has the potential to affect cultural or historic resources as described in the regulations at 36 CFR 800.8, regardless of the NEPA impact category. NOS will conduct project-specific NHPA consultations before commencing any project with the potential to affect cultural or historic resources.

Scope-8: These resources in particular should assist your agency in identifying historic properties for NEPA scoping.

- ArchSite is an online Geographic Information System (GIS) mapping program that includes all known historic and archaeological sites in South Carolina. Information on both the Public View Map and Subscriber View Map of ArchSite can be found here: http://www.scarchsite.org.

- SC Historic Properties Record (SCHPR) includes information on all National Register of Historic Places listings, and historic property surveys (in process) at http://schpr.sc.gov/.

- Additional historic contexts, survey reports, and related historic property documents can be found here https://scdah.sc.gov/historic-preservation/historic-properties-research/historic-contexts- survey-reports.

> **NOS Response:** Thank you for providing these resources, NOS looks forward to working with the South Carolina State Historic Preservation Officer (SHPO) for the protection of cultural resources. NOS will use this information when initiating consultation with the SC SHPO under Section 106 of the NHPA.

Cultural and Historic Resources-12: Please note that in South Carolina, records of submerged cultural resources are maintained by the SC Institute of Archaeology and Anthropology, Maritime Research Division (MRD), http://artsandsciences.sc.edu/sciaa/mrd/welcome. Our office defers to the expertise of the Maritime Research Division (MRD), under the direction of the State Underwater Archaeologist, for undertakings that may include submerged resources. Please contact Athena Van Overschelde at 803-576-6565 or athenav@mailbox.sc.edu or Jim Spirek at 803-576-6566 or spirek@sc.edu if you have any questions or require additional information about submerged cultural resources.

> **NOS Response:** Thank you for this additional information.

Cultural and Historic Resources-13: The State Historic Preservation Office will provide comments regarding historic properties and effects to them once the federal or state agency initiates consultation.

> **NOS Response:** Thank you. NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources.
>
> NOS looks forward to hearing your future comments.

Cultural and Historic Resources-14: Please refer to SHPO Project Number 21-EJ0219 in any future correspondence regarding this project.

> **NOS Response:** Thank you. Any future correspondence with the South Carolina SHPO will refer to SHPO Project Number 21-EJ0219.

2.28 Seneca Nation (Anna Carr)

2.28.1 Comment Submission

From:	Anna Carr
To:	Jay Nunenkamp - NOAA Federal; Rosalind Ground
Cc:	Giannina DiMaio - NOAA Federal; msmyk; Greatlakes Navmanager - NOAA Service Account; Cliff Redeye III
Subject:	RE: External: Follow-up from the National Ocean Service regarding this morning"s presentation
Date:	Monday, November 15, 2021 1:46:18 PM

Good afternoon All,

Thank you for taking the time to meet with Rosalind and I today to discuss the Draft PEIS and the potential implications of this proposed work (if they shall arise).

Rosalind and I will work on preparing a formal response to the NOS PEIS with the below recommended/requested information; however, we may not be able to get a response to you by November 22, per our current workload.

Thank you once again for your time.

Respectfully submitted,

Anna Carr
Water Program Manager

Seneca Nation
Environmental Protection Department
84 Iroquois Drive
Irving, NY 14081
Phone: (716) 532-2546 Ext. 5474
Email: anna.carr@sni.org

From: Jay Nunenkamp - NOAA Federal <jay.nunenkamp@noaa.gov>
Sent: Monday, November 15, 2021 11:44 AM
To: Anna Carr <Anna.Carr@sni.org>; Rosalind Ground <Rosalind.Ground@sni.org>
Cc: Giannina DiMaio - NOAA Federal <giannina.dimaio@noaa.gov>; msmyk <Michelle.Smyk@solvllc.com>; Greatlakes Navmanager - NOAA Service Account <greatlakes.navmanager@noaa.gov>
Subject: External: Follow-up from the National Ocean Service regarding this morning's presentation

Ms. Carr, Ms. Ground:

Thank you again for your time today. As we discussed, I wanted to summarize the information that we've requested, in order to better coordinate with your tribe regarding upcoming projects.

1. We most urgently need an indication of the geographic areas (both on land and in the

water) where we should coordinate with you for individual projects. This would not only be your reservations and other owned land, but also any areas where your tribe has concerns about impacts to your tribal resources. If possible, we would request GIS shapefiles for these areas, but if that's not available we can certainly accept images. As discussed, NOS would email the two of you and Mr. Stahlman (in addition to the relevant State Historic Preservation Officer) for relevant future projects located in these areas, per the normal NHPA Section 106 process.

2. We would appreciate information regarding your review and approval process for projects that might require entrance onto Seneca lands. so that we can incorporate this information into our planning procedures.

3. If you have any other questions or concerns regarding hydrographic survey projects, (i.e., the use of vessels and echo sounders in the waters of the Great Lakes) please contact Mr. Tom Loeper, our Great Lakes Navigation Manager. He can be reached at greatlakes.navmanager@noaa.gov, and is cc'd here.

It was a pleasure meeting you both, and NOS looks forward to working with the Seneca Nation in the future.

Sincerely,

Jay Nunenkamp (he/his)
Environmental Compliance Coordinator
Office of Coast Survey
National Oceanic and Atmospheric Administration

If this email was received outside of your work hours, there is no expectation that you will reply until you are on duty.

From: NOSAA Environmental Compliance - NOAA Service Account
To: Michelle.Smyk@solvllc.com; Wendy Grome
Subject: Fwd: NOS Surveying and Mapping Projects in US
Date: Monday, November 8, 2021 9:05:38 AM

See comment below from the Seneca Nation.

v/r
Giannina DiMaio
NOS Environmental Compliance Coordinator
Pronouns: she/her/hers

NOAA, National Ocean Service
Office of the Assistant Administrator
1305 East-West Hwy, SSMC4 13th Floor
Silver Spring, MD 20910
V: 240-533-0918
nosaa.ec@noaa.gov

---------- Forwarded message ---------
From: **Anna Carr** <Anna.Carr@sni.org>
Date: Fri, Nov 5, 2021 at 12:37 PM
Subject: NOS Surveying and Mapping Projects in US
To: nosaa.ec@noaa.gov <nosaa.ec@noaa.gov>
Cc: Cliff Redeye III <clifford.redeye@sni.org>, Rosalind Ground <Rosalind.Ground@sni.org>

To Whom It May Concern,

I'm writing this email in regard to a notification that the Seneca Nation received on October 28th with regard to the National Ocean Service (NOS) *Draft Programmatic Environmental Impact Statement* (PEIS) *for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition*. I've called and left two messages for Ms. DiMaio over the last week and have yet to receive a response.

In an effort to determine if the Seneca Nation should prepare comments in response to this NOS PEIS/request a government-to-government consultation, I have the following question:

My understanding is that this proposed work will be to survey coastal areas in an effort to address possible threats to coastal areas due to climate change, population growth, contaminants in the environment, and etc. The maps associated with the NOS PEIS show the coastlines along Lake Erie as being an "action area". Since a portion of the Cattaraugus Territory of the Seneca Nation (Nation) bounds Lake Erie, I would like to know if the NOS PEIS Mapping Projects will be performed in proximity to the Nation's shoreline, as shown as the map point (green tag) with the associated latitude/longitude on the below Figure?

Please let us know at your earliest convenience, so that we may prepare an appropriate response, if necessary.

Thank you,

Anna Carr

Water Program Manager

Seneca Nation

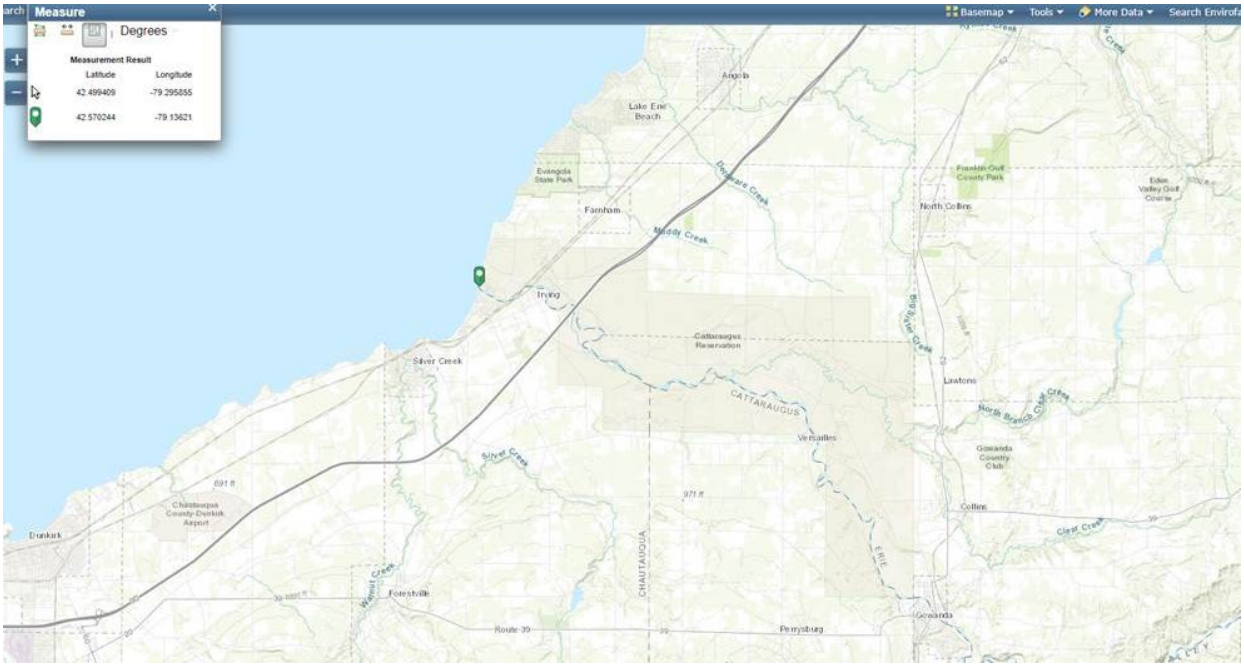
Environmental Protection Department

84 Iroquois Drive

Irving, NY 14081

Phone: (716) 532-2546 Ext. 5474

Email: anna.carr@sni.org



From: NOSAA Environmental Compliance - NOAA Service Account <nosaa.ec@noaa.gov>
Sent: Thursday, October 28, 2021 6:41 PM
Subject: External: Government-to-Government: NOS Surveying and Mapping Projects in US

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi!

I am reaching out to you again regarding the National Ocean Service (NOS) *Draft Programmatic Environmental Impact Statement (PEIS) for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition*. Following the publication of the Draft PEIS on June 25, 2021, we invited Federally Recognized Tribes to participate in the Draft PEIS process and provide comments on the Draft PEIS. In response to written and verbal requests from members of the public including representatives of the Alaska whaling community, NOS extended the public comment period by 90 days from August 24, 2021 to November 22, 2021. The comment period was extended to ensure adequate time for review of the Draft PEIS by all interested parties including the Alaskan subsistence hunting and fishing community which is particularly busy during the start of the fall whaling season from August to October.

NOS wants to reassure you that the Draft PEIS public comment deadline does not apply to any government-to-government consultations that would be conducted for this action. It is important to ensure any tribal views or concerns expressed during a government-to-government consultation are fully considered, and we kindly ask that you make a request for consultation before November 22, 2021.

Attached is a follow-up letter inviting government-to-government consultation for future NOS surveying and mapping projects. For your information, I have again attached the Draft PEIS Executive Summary and an overview fact sheet.

NOS recognizes tribal communities have valuable regional expertise in oceanography, marine mammals and other resources, and the subsistence patterns and needs of their community. If you have any questions, please feel free to contact me by phone at 240-533-0918 or email at nosaa.ec@noaa.gov

v/r

Giannina DiMaio

NOS Environmental Compliance Coordinator

Pronouns: she/her/hers

NOAA, National Ocean Service

Office of the Assistant Administrator

1305 East-West Hwy, SSMC4 13th Floor

Silver Spring, MD 20910

V: 240-533-0918

nosaa.ec@noaa.gov

2.28.2 NOS Response

Future Coordination-8: Rosalind and I will work on preparing a formal response to the NOS PEIS with the below recommended/requested information; however, we may not be able to get a response to you by November 22, per our current workload.

> **NOS Response:** Additional comments from the Seneca Nation have been received and considered by NOS.

Scope-9: My understanding is that this proposed work will be to survey coastal areas in an effort to address possible threats to coastal areas due to climate change, population growth, contaminants in the environment, and etc. The maps associated with the NOS PEIS show the coastlines along Lake Erie as being an "action area". Since a portion of the Cattaraugus Territory of the Seneca Nation (Nation) bounds Lake Erie, I would like to know if the NOS PEIS Mapping Projects will be performed in proximity to the Nation's shoreline, as shown as the map point (green tag) with the associated latitude/longitude on the below Figure?

> **NOS Response:** The Proposed Action could occur anywhere in U.S. waters, including Cattaraugus Territory of the Seneca Nation that bounds Lake Erie. NOS intends to notify individual tribes pursuant to EO 13175 before conducting any project that may have tribal implications.
>
> Federally recognized tribes may request government-to-government consultation at any time for a proposed action that may have tribal implications.

2.29 Seneca Nation (Matthew B. Pagels)

2.29.1 Comment Submission

Seneca Nation of Indians

President - Matthew B. Pagels
Clerk - Marta L. Kettle

12837 ROUTE 438
CATTARAUGUS TERRITORY
SENECA NATION
IRVING, NY 14081

Tel. (716) 532-4900
FAX (716) 532-6272

Treasurer - Rickey L. Armstrong Sr.

90 OHI:YO' WAY
ALLEGANY TERRITORY
SENECA NATION
SALAMANCA, NY 14779

Tel. (716) 945-1790
FAX (716) 945-1565

PRESIDENT'S OFFICE

January 25, 2022

Ms. Giannina DiMaio
NOAA, National Ocean Service
Environmental Compliance Coordinator
Office of the Assistant Administrator
1305 East-West Hwy, SSMC4 13th Floor
Silver Spring, MD 20910
Email: nosaa.ec@noaa.gov

RE: National Oceanic and Atmospheric Administration, National Ocean Service, Notice of a Draft Programmatic Environmental Impact Statement of Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition, on or near the Seneca Nation

Dear Ms. Giannina DiMaio,

The Seneca Nation (Nation) has had the opportunity to review and offer comments, in response to the *Notice of Availability of a Draft Programmatic Environmental Impact Statement* (PEIS) *for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition,* published by the National Ocean Service (NOS), an office within the National Oceanic and Atmospheric Administration (NOAA). The Seneca Nation appreciates the opportunity to meet with you on November 15, 2021, to discuss this draft PEIS. In response to the draft PEIS, the Nation is providing you with the following background information and comments as they pertain to the PEIS.

Background:

The Seneca Nation (SN) is a federally recognized tribe that consists of five Territories: Allegany, Cattaraugus, Oil Springs, Buffalo Creek and Niagara Falls in Western New York, as shown on the attached "Locational Map of the Territories" Figure. Three of the five Territories are connected to extensive and measureless water resources, contain water features that are of tremendous value

and significance to the Seneca Nation, but vary in form and feature. The Allegany Territory consists of 31,180.9 acres which surrounds the Ohi:yo' (Allegany River/Reservoir) (110 miles of shoreline) and other streams/creeks (116 miles) which has a total of 226 miles of water bodies. In 1960, the United States Army Corps of Engineers was authorized by the United States Government to build the Kinzua Dam (Dam) for flood control for the City of Pittsburgh, Pennsylvania. As a result, approximately 10,000 acres of land was taken by the U.S. for that work on a permanent easement for the construction of the Kinzua Dam and Reservoir. The resulting impact of the Kinzua Dam and Reservoir lead to the inundation of that land after the construction of the Dam. The Cattaraugus Territory consists of 22,060.8 acres and surrounds 16.64 miles of the Ga:dages:geo (Cattaraugus Creek) along with other streams/creeks for a total of 56.6 miles. The western most limits of the Cattaraugus Territory, including the Nation's water boundary, extends into Lake Erie, where the Nation holds reserved rights, with specific regard to the particular resources of this portion of the lake. Oil Spring Territory consists of 641.9 acres of land, which includes at least 2.3 miles of water resources, including a percentage of Cuba Lake a portion of shoreline along that lake.

Information:

Per NOAAs November 15, 2021 written request, the Nation is sending the attached "Locational Map of the Territories" Figure for your information, so that you may have a greater understanding of the territorial boundaries of the Seneca Nation. With that being said, the Seneca Nation requests NOAA to contact the Nation prior to surveying and/or mapping projects that are to be performed within the following areas (as identified using the NOAA Electronic Navigational Charts (ENC) [https://nauticalcharts.noaa.gov/charts/noaa-enc.html]):

US4NY32M (North to Buffalo)
US4NY33M (Sturgeon Point to Twenty Mile Creek)
US4NY38M (Buffalo to Erie, Dunkirk, Barcelona Harbor)
US5NY34M (Niagara Falls to Buffalo)
US5NY34M (Grand Island)
US5NY35M (Buffalo Harbor)

While federal law regarding water has significant aspects, that at times incorporate and also preempt state law, Congress has often deferred to state law when Indian rights are not at issue. However, Indian water rights generally have superior legal standing in relation to state rights based on original tribal ownership of what is now the United States. This legal standing is further supported with treaties, statutes and Executive Orders that preempt state law. The United States has a trust responsibility to recognize and protect tribal lands, assets and resources, which include the water that flows over and through tribal lands and the natural resources that depend on that water. Outside entities shall follow the Seneca Nation Council Resolution, "*To Establish a Policy Governing Access to Nation Territories and Facilities by Officials of Foreign Governments*[1]",

[1] CN: R-04-11-15-17, *Policy Governing Access to Nation Territories and Facilities by Officials of Foreign Governments.*

where it has always been custom and tradition of the Seneca Nation that all non-Seneca, desiring to maintain a presence within Nation Territory to first receive permission from the Nation, prior to the visitation and inquiry at least twenty-four (24) hours advance notice of such intent. Additionally, if NOS/NOAA seeks to enter any of the Seneca Nation Territories to conduct surveying and/or mapping activities, then a request should be made in writing, by electronic means, or through the mail to the President of the Seneca Nation at the following addresses:

12837 Route 438
Cattaraugus Territory
Seneca Nation
Irving, NY 14081

90 Ohi:yo' Way
Allegany Territory
Seneca Nation
Salamanca, NY 14779

Note that a failure to comply with the provisions of the said Council Resolution may result in denial of entry of such officials or agents into Nation Territory. The Nation also requests notification of future projects that are referenced in the above ENCs, prior to the initiation of the project through the National Historic Preservation Act, Section 106. Additionally, the Nation shall be immediately notified of the discovery of archaeological resources during the installation of tide gauges, buoys, GPS reference stations or any other activities.

Additionally, the protection of our water will sustain our culture and our way of viewing life. For the people of the Seneca Nation, it starts with the creation story that defines who we are as Ogwe'o:weh (the Original Beings). It speaks generally and symbolically about the events that led to our creation on "Etinö'ëh Yöëdzade" (Mother Earth). From the time we first hear this story as children through the voices of our own Mothers and Grandmothers, we are given direction and understanding of our place in the world and our relationship to the other elements of Creation. We give thanks to the "Oneganos" the Waters of the World, for fulfilling their responsibilities given by the creator. These responsibilities are many. Central to them is to quench the thirst of all life. Our Creator made those rivers and lakes and he said, "Whenever you're dry and thirsty, go there, any river, any stream and it will quench your thirst for that is the way I make the world." The Oneganos are the bloodlines of our "Etinö'ëh Yöëdzade", Mother Earth. As such, they have important responsibilities to carry sustenance to the rest of Creation. The Waters also have a responsibility to cleanse and purify Mother Earth, to keep the people clean and healthy. Finally, "Ganö:nyök", known as the Thanksgiving Address reminds us that it is our responsibility to take care of all life, including the Waters of the World. We recognize that all life is interrelated. If the Waters are to fulfil their responsibilities, then we must ensure that they have the opportunity to do so. To fulfil a component of this responsibility, the Nation requests that any data collected of the territorial lands must also be shared freely with the Seneca Nation, whether it is mapping, archeological, environmental, or as otherwise related.

With regard to concerns of the effects of hydrographic surveying projects, including the use of vessels and echo sounders in the waters of the Great Lakes, the Seneca Nation requests that NOAA follow appropriate protocol for work in areas of sensitive habitat and in locations where Endangered, Threatened, Special Concern or High Priority Species of Greatest Conservation within New York State and Federally are listed. Note that the Seneca Nation also has species listings and areas of special protection with regard to cultural and traditional uses, as well as natural resources that are of great value to the Seneca Nation. The protection of those irreplaceable resources is and will always be of the utmost priority for the Seneca Nation.

Conclusion:

In closing, outside government staff should be aware that many Native Americans already feel a strong commitment to respect "Etinö'ëh Yöëdzade", our mother earth, and that many Native Nations are cautious when considering actions that may harm her. Outside governmental staff should be cognizant of the Seneca Nation's respect of "Etinö'ëh Yöëdzade" and reciprocate it.

Sincerely,

Matthew B. Pagels
Seneca Nation President

Seneca Nation of Indians

12837 ROUTE 438
CATTARAUGUS TERRITORY
SENECA NATION
IRVING 14081

Tel. (716) 532-4900
FAX (716) 532-9132

90 OHI:YO' WAY
ALLEGANY TERRITORY
SENECA NATION
SALAMANCA 14779

Tel. (716) 945-1790
FAX (716) 945-0150

AT THE REGULAR SESSION OF COUNCIL OF THE SENECA NATION OF INDIANS HELD ON APRIL 11, 2015 AT THE WILLIAM SENECA ADMINISTRATION BUILDING ON THE CATTARAUGUS TERRITORY, IRVING, NEW YORK, 14081.

CN: R-04-11-15-17

EXECUTIVES PRESENT:

PRO TEMPORE - RICKEY ARMSTRONG SR.
DEPUTY CLERK - LENITH WATERMAN
TREASURER - TODD GATES

LEGAL DEPARTMENT

TO ESTABLISH A POLICY GOVERNING ACCESS TO NATION TERRITORIES AND FACILITIES BY OFFICIALS OF FOREIGN GOVERNMENTS

MOTION: by Richard Jemison, seconded by remaining Council that the Nation's Council approves the following resolution, as amended;

WHEREAS, the Seneca Nation of Indians is a sovereign nation possessing inherent powers of self-government within and over its Territories which are original, absolute, and exclusive; and

WHEREAS, from time to time the Nation has been subject to visitation and inquiry by officials and agents of Foreign Governments and their local governments and agencies; and

WHEREAS, it is the custom and tradition of the Nation that all non-Seneca desiring to maintain a presence within Nation territory must first receive permission from the Nation.

NOW THEREFORE BE IT

RESOLVED, that the Council hereby orders that all officials and agents of Foreign Governments and their local governments and agencies that seek to enter Nation territory, to visit or inquire about the activities or facilities of the Nation or any of its subdivisions shall adhere to the following:

1. Provide at least seventy-two (72) hours advanced notice of such intent to enter the Territory of the Seneca Nation to the President of the Nation, whereas such notice shall be in writing and may be delivered by a third party, electronic means or in person.

2. Provide clear and authorized identification that specifically identifies the Foreign Government agency that they are representing.

3. Provide a reasonable purpose to enter Nation territory that serves the best interest of the Seneca people.

4. Upon written request from the President of the Nation, or a Nation designated representative, provide a written report on all activities undertaken by the official or agent within thirty (30) days to the President of the Nation.

RESOLVED, that the President of the Nation is hereby authorized to develop and implement Seneca Nation protocols specifically for agents of Foreign Governments to comply with this this resolution, and be it further

RESOLVED, that failure to comply with the provisions of this resolution may result in denial of entry of such officials or agents onto Nation territory by the President of the Nation.

RESOLVED, that the Seneca Nation is requesting Foreign Governments that desire to enter Nation territory, to visit or inquire about the activities or facilities of the Nation or any of its subdivisions shall designate a liaison from their government and this liaison shall register with the Seneca Nation

RESOLVED, all documents developed pursuant to this resolution shall be brought back to Council for final approval.

ALL IN FAVOR MOTION CARRIED

CERTIFICATION

I hereby certify the foregoing extract is a true and correct copy from the minutes of the Regular Session of Council of the Seneca Nation of Indians held on April 11, 2015 on the Cattaraugus Territory, original of which is on file in the Clerk's Office of the Seneca Nation of Indians

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and caused the seal to be affixed at the William Seneca Administration Building, on the Cattaraugus Territory, on the 15th day of April, 2015.

ATTEST:

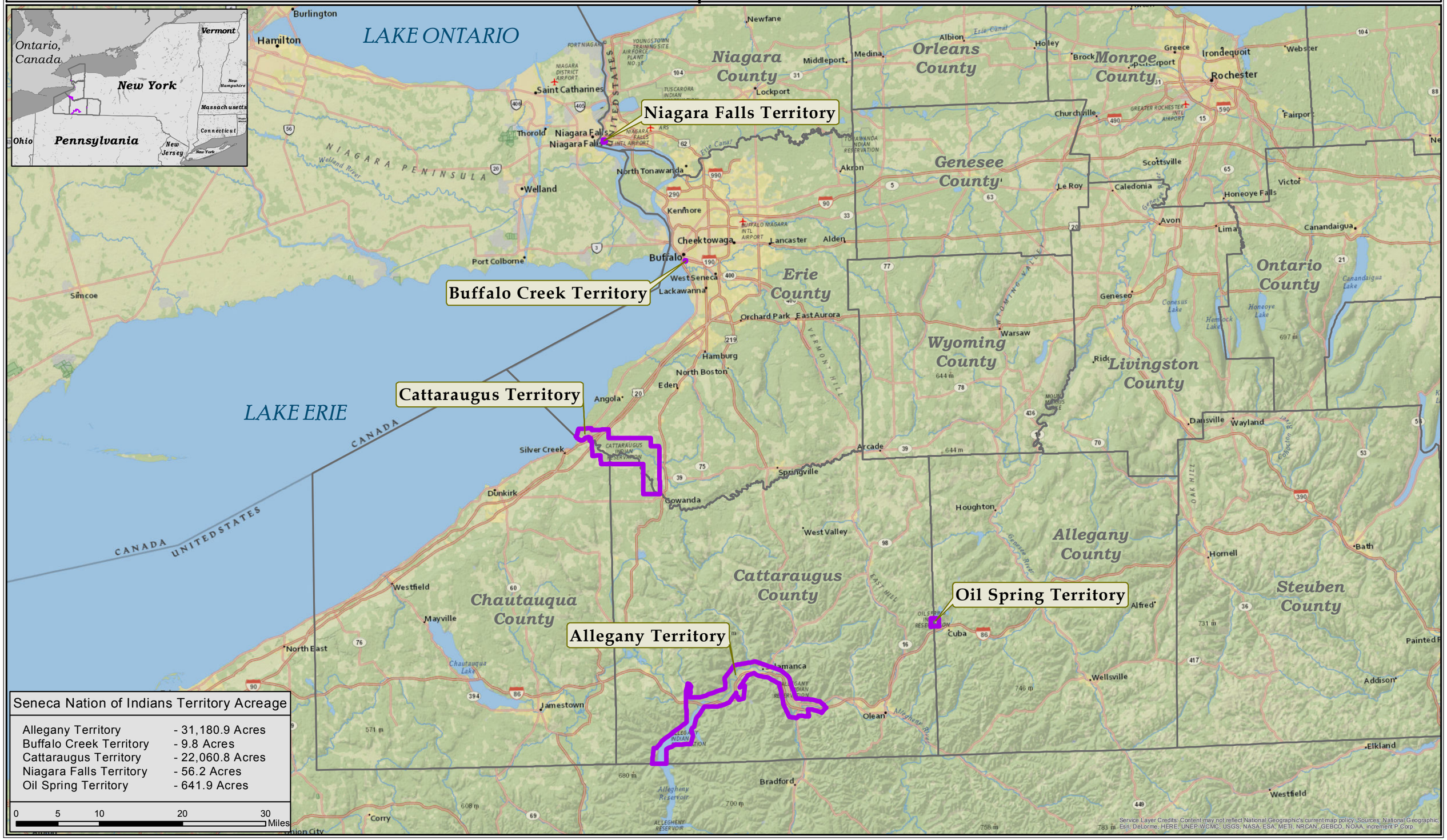
{S E A L}

LENITH WATERMAN, DEPUTY CLERK
SENECA NATION OF INDIANS

Seneca Nation of Indians

Locational Map of the Territories

Print / Export Date: 3/2/2020



2.29.2 NOS Response

Future Coordination-15: Per NOAAs November 15, 2021 written request, the Nation is sending the attached ""Locational Map of the Territories"" Figure for your information, so that you may have a greater understanding of the territorial boundaries of the Seneca Nation. With that being said, the Seneca Nation requests NOAA to contact the Nation prior to surveying and/or mapping projects that are to be performed within the following areas (as identified using the NOAA Electronic Navigational Charts (ENC) [https://nauticalcharts.noaa.gov/charts/noaa-enc.html]):

US4NY32M (North to Buffalo)

US4NY33M (Sturgeon Point to Twenty Mile Creek) US4NY38M (Buffalo to Erie, Dunkirk, Barcelona Harbor) US5NY34M (Niagara Falls to Buffalo)

US5NY34M (Grand Island) US5NY35M (Buffalo Harbor)

> **NOS Response:** Thank you for providing NOS with the geographic boundaries within which the Seneca Nation would like to be contacted about proposed projects.
>
> NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources. NOS will also contact the Seneca Nation in the event that NOS activities result in the recovery of a potentially historic resource or artifact.
>
> NOS intends to notify individual tribes pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation at any time for a proposed action that may have tribal implications.

Future Coordination-16: Outside entities shall follow the Seneca Nation Council Resolution, “To Establish a Policy Governing Access to Nation Territories and Facilities by Officials of Foreign Government” where it has always been custom and tradition of the Seneca Nation that all non-Seneca, desiring to maintain a presence within Nation Territory to first receive permission from the Nation, prior to the visitation and inquiry at least twenty-four (24) hours advance notice of such intent. Additionally, if NOS/NOAA seeks to enter any of the Seneca Nation Territories to conduct surveying and/or mapping activities, then a request should be made in writing, by electronic means, or through the mail to the President of the Seneca Nation at the following addresses:

12837 Route 438 Cattaraugus Territory Seneca Nation Irving, NY 14081

90 Ohi:yo' Way Allegany Territory Seneca Nation Salamanca, NY 14779…

The Nation also requests notification of future projects that are referenced in the above ENCs, prior to the initiation of the project through the National Historic Preservation Act, Section 106. Additionally, the Nation shall be immediately notified of the discovery of archaeological resources during the installation of tide gauges, buoys, GPS reference stations or any other activities.

NOS Response: NOS will ensure that if a project is proposed within the boundaries provided by the Seneca Nation, the appropriate contact will be notified and NOS will follow the approval procedures in the Seneca Nation Council Resolution, "To Establish a Policy Governing Access to Nation Territories and Facilities by Officials of Foreign Government."

NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources. NOS will also contact the Seneca Nation in the event that NOS activities result in the recovery of a potentially historic resource or artifact.

NOS intends to notify individual tribes pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation at any time for a proposed action that may have tribal implications.

Future Coordination-17: The Nation requests that any data collected of the territorial lands must also be shared freely with the Seneca Nation, whether it is mapping, archeological, environmental, or as otherwise related.

NOS Response: NOS will ensure that if a project is proposed within the boundaries provided by the Seneca Nation, the appropriate contact will be notified and NOS will follow the approval procedures in the Seneca Nation Council Resolution, "To Establish a Policy Governing Access to Nation Territories and Facilities by Officials of Foreign Government."

NOS will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources. NOS will also contact the Seneca Nation in the event that NOS activities result in the recovery of a potentially historic resource or artifact.

NOS intends to notify individual tribes pursuant to EO 13175 before conducting any project that may have tribal implications. Federally recognized tribes may request government-to-government consultation at any time for a proposed action that may have tribal implications.

All data collected by NOS is made publicly available to the extent allowed by federal law. The Seneca Nation can reach out to NOAA Navigation Managers to engage in the planning process for future surveying and mapping projects. Information regarding contacting NOAA Navigation Managers can be found at the following website: https://nauticalcharts.noaa.gov/customer-service/regional-managers/index.html.

Endangered Species Act-3: With regard to concerns of the effects of hydrographic surveying projects, including the use of vessels and echo sounders in the waters of the Great Lakes, the Seneca Nation requests that NOAA follow appropriate protocol for work in areas of sensitive habitat and in locations where Endangered, Threatened, Special Concern or High Priority Species of Greatest Conservation within New York State and Federally are listed. Note that the Seneca Nation also has species listings and areas of special protection with regard to cultural and traditional uses, as well as natural resources that are of great value to the Seneca Nation. The

protection of those irreplaceable resources is and will always be of the utmost priority for the Seneca Nation.

NOS Response: Executive Order 13175 of November 6, 2000 (Consultation and Coordination With Indian Tribal Governments), charges all executive departments and agencies with engaging in regular, meaningful, and robust consultation with tribal officials on Federal policies or activities that have tribal implications.

NOS intends to notify individual tribes and ANCs pursuant to EO 13175 before conducting any project that may have tribal implications in order to provide additional information on the project and discuss any potential additional mitigations. Federally recognized tribes may request government-to-government consultation at any time.

NOS will initiate project-specific consultations with the Seneca under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources.

2.30 Virginia Department of Environmental Quality (Bettina Rayfield)

2.30.1 Comment Submission

Commonwealth of Virginia

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

1111 E. Main Street, Suite 1400, Richmond, Virginia 23219
P.O. Box 1105, Richmond, Virginia 23218
(800) 592-5482 FAX (804) 698-4178
www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural and Historic Resources

David K. Paylor
Director
(804) 698-4000

August 23, 2021

Ms. Giannina DiMaio, DOC/NOAA/NOS
Environmental Compliance Coordinator
SSMC4-Station 13612
1305 East West Highway
Silver Spring, Maryland 20910
Via email: nosaa.ec@noaa.gov

RE: Draft Programmatic Environmental Impact Statement, Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition, National Oceanic and Atmospheric Administration, National Ocean Service (DEQ 21-086F)

Dear Ms. DiMaio:

The Commonwealth of Virginia has completed its review of the above-referenced document. The Department of Environmental Quality is responsible for coordinating Virginia's review of federal environmental documents submitted under the National Environmental Policy Act (NEPA) and responding to appropriate federal officials on behalf of the Commonwealth. DEQ is also responsible for coordinating Virginia's review of federal consistency documents submitted pursuant to the Coastal Zone Management Act (CZMA) and providing the state's response. This letter is in response to the June 2021 Draft Programmatic Environment Impact Statement (DPEIS) (notification of document availability received June 25, 2021) for the above-referenced activities. The following agencies participated in the review of the DPEIS:

Department of Environmental Quality
Department of Wildlife Resources
Department of Conservation and Recreation
Marine Resources Commission
Department of Health

In addition, the Department of Historic Resources and the Virginia Institute of Marine Science were invited to comment on the document.

PROJECT DESCRIPTION

The National Oceanic and Atmospheric Administration (NOAA) National Ocean Service (NOS) has prepared a Draft Programmatic Environmental Impact Statement (PEIS) to analyze the potential environmental impacts associated with NOS's recurring data collection projects (surveying and mapping) to characterize underwater features (e.g., habitat, bathymetry, marine debris) throughout United States (U.S.) waters. Data obtained from these projects are used to produce many products, including charts and maps that are relied upon by mariners, scientists, the shipping and fishing industries, and countless other users in the U.S. and beyond.

The Proposed Action is to continue NOS surveying and mapping projects over the next six years. These projects would include surveys performed from crewed, remotely operated, or autonomous vessels operated by NOS field crews, other NOAA personnel on behalf of NOS, contractors, grantees, or permit/authorization holders. These crews and vehicles may use echo sounders and other active acoustic equipment and employ other equipment, including bottom samplers and conductivity, temperature, and depth instruments to collect the needed data. The "action area" for these projects includes rivers; states' offshore waters; the U.S. territorial sea; the contiguous zone; and the U.S. Exclusive Economic Zone (U.S. EEZ). The action area also includes coastal and riparian lands for activities such as the installation, maintenance, and removal of tide gauges.

The Draft PEIS evaluates three alternatives: 1) the No Action Alternative (Alternative A), under which NOS would continue to gather accurate and timely data on the nature and condition of the marine and coastal environment, reflecting the technology, equipment, scope, and methods currently in use by NOS at the current level of effort (i.e., the status quo); 2) Alternative B, under which NOS would increase the adoption of new technologies to more efficiently perform surveying, mapping, charting and related data gathering; and 3) Alternative C, which also includes the adoption of new techniques and technologies and includes an overall funding increase of 20 percent. The Draft PEIS has been prepared to: 1) inform NOS and the public on the physical, biological, economic, and social impacts of NOS mapping and surveying projects; and 2) assist NOS in deciding how to execute its mapping and surveying program over the next six years.

ENVIRONMENTAL IMPACTS AND MITIGATION

1. Surface Waters, Wetlands, and Subaqueous Lands. According to the DPEIS (page 74), NOS activities could impact aquatic habitat characteristics in the action area through: physical impacts to bottom substrate (e.g., from anchoring, collection of bottom grab samples, tide gauge or GPS reference station installation, and SCUBA operations); increase in sedimentation, turbidity, and/or chemical contaminants (e.g., from crewed vessel operations, remotely operated vehicles (ROV) and autonomous vehicle operations, anchoring, collection of bottom grab samples, installation of tide gauges and GPS reference stations, and SCUBA operations); and impacts to water

column (e.g., from crewed vessel operations, ROVs, and autonomous vehicles, anchoring, use of sound speed data collection equipment and bottom grab samplers, operation of drop/towed cameras and video systems, and SCUBA operations).

1(a) Agency Jurisdiction.

(i) Department of Environmental Quality

The State Water Control Board promulgates Virginia's water regulations covering a variety of permits to include the Virginia Pollutant Discharge Elimination System Permit regulating point source discharges to surface waters, Virginia Pollution Abatement Permit regulating sewage sludge, storage and land application of biosolids, industrial wastes (sludge and wastewater), municipal wastewater, and animal wastes, the Surface and Groundwater Withdrawal Permit, and the Virginia Water Protection (VWP) Permit regulating impacts to streams, wetlands, and other surface waters. The VWP permit is a state permit which governs wetlands, surface water, and surface water withdrawals and impoundments. It also serves as §401 certification of the federal Clean Water Act §404 permits for dredge and fill activities in waters of the U.S. The VWP Permit Program is under the Office of Wetlands and Stream Protection, within the DEQ Division of Water Permitting. In addition to central office staff that review and issue VWP permits for transportation and water withdrawal projects, the six DEQ regional offices perform permit application reviews and issue permits for the covered activities:

- Clean Water Act, §401;
- Section 404(b)(i) Guidelines Mitigation Memorandum of Agreement (2/90);
- State Water Control Law, Virginia Code section 62.1-44.15:20 *et seq*.; and
- State Water Control *Regulations*, 9 VAC 25-210-10.

(ii) Virginia Marine Resources Commission

The Virginia Marine Resources Commission (VMRC) regulates encroachments in, on or over state-owned subaqueous beds as well as tidal wetlands pursuant to Virginia Code §28.2-1200 through 1400. For nontidal waterways, VMRC states that it has been the policy of the Habitat Management Division to exert jurisdiction only over the beds of perennial streams where the upstream drainage area is 5 square miles or greater. The beds of such waterways are considered public below the ordinary high water line.

1(b) Agency Findings.

(i) Virginia Department of Environmental Quality

The VWP Permit program at the DEQ Central Office (CO) has no comments on the Proposed Action.

(ii) Virginia Marine Resources Commission

VMRC finds that if any activities involve encroachments below mean low water in tidal waters, or channelward of ordinary high water along non-tidal, natural rivers and streams with a drainage area greater than 5-square miles, a VMRC permit may be required. Any jurisdictional impacts will be reviewed by the VMRC during the Joint Permit Application (JPA) process.

For additional information on DEQ-CO comments, contact Michelle Henicheck at (804) 698-4007 or michelle.henicheck@deq.virginia.gov and/or VMRC comments, Randy Owen at (757) 247-2251 or randy.owen@mrc.virginia.gov.

2. Marine Fisheries. According to the DPEIS (page 552), although the impacts of commercial fishing are a concern for fisheries worldwide, fisheries in the action area are generally managed conservatively and in keeping with the requirements of the Magnuson-Stevens Fishery Conservation and Management Act. Many fish stocks within the action area that were historically overfished have recovered or are recovering from their overfished status and contributing to the overall trend of increasing abundance of U.S. marine fish stocks. The Proposed Action would contribute to and have the potential to increase cumulative impacts to marine fish species, but their relative contribution would be negligible because impacts would be temporary or short-term, would be confined to the immediate vicinity of project areas, and would be small as compared to impacts from all other cumulative actions.

2(a) Agency Jurisdiction. It is the policy of the Commonwealth to conserve and promote the seafood and marine resources of the Commonwealth, including fish, shellfish and marine organisms, and manage the fisheries to maximize food production and recreational opportunities within the Commonwealth's territorial waters. The policy is administered by VMRC (*Virginia Code §§ 28.2-101, -201, -203, -203.1, -225, -551, -600, -601, -603 -618, and -1103, -1203 and the Constitution of Virginia, Article XI, Section 3*).

2(b) Agency Findings. VMRC finds that a VMRC permit may be required for activities related to the Proposed Action. Any jurisdictional impacts will be reviewed by the VMRC during the JPA process.

For additional information, contact VMRC, Randy Owen at (757) 247-2251 or randy.owen@mrc.virginia.gov.

3. Nonpoint Source Pollution Control. The DPEIS (page 74) states that NOS activities could impact habitat characteristics in the action area as a result of terrestrial impacts from ground disturbance during the installation or removal of tide gauges.

3(a) Agency Jurisdiction. The DEQ Office of Stormwater Management (OSWM) administers the following laws and regulations governing construction activities:

- Virginia Erosion and Sediment Control Law (§ 62.1-44.15:51 *et seq*.) and

Regulations (9 VAC 25-840) (VESCL&R);
- Virginia Stormwater Management Act (VSMA, § 62.1-44.15:24 *et seq*.);
- Virginia Stormwater Management Program (VSMP) Regulation (9 VAC 25-870); and
- 2014 General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Construction Activities (9 VAC 25-880).

In addition, DEQ is responsible for the VSMP General Permit for Stormwater Discharges from Construction Activities related to Municipal Separate Storm Sewer Systems (MS4s) and construction activities for the control of stormwater discharges from MS4s and land disturbing activities under the Virginia Stormwater Management Program (9 VAC 25-890-40).

3(b) Requirements.

(i) Erosion and Sediment Control and Stormwater Management Plans

NOS and its authorized agents conducting regulated land-disturbing activities on private and public lands in the state must comply with *VESCL&R* and *VSWML&R,* including coverage under the general permit for stormwater discharge from construction activities, and other applicable federal nonpoint source pollution mandates (e.g. Clean Water Act-Section 313, federal consistency under the Coastal Zone Management Act). Clearing and grading activities, installation of staging areas, parking lots, roads, buildings, utilities, borrow areas, soil stockpiles, and related land-disturbing activities that result in the total land disturbance of equal to or greater than 10,00 square feet (2,500 square feet in a Chesapeake Bay Preservation Area) would be regulated by *VESCL&R.* Accordingly, NOS must prepare and implement an Erosion and Sediment Control (ESC) Plan for applicable land-disturbing activities to ensure compliance with state law and regulations.

Land-disturbing activities that result in the total land disturbance of equal to or greater than one acre (2,500 square feet in Chesapeake Bay Preservation Area) would be regulated by *VSWML&R.* Accordingly, NOS must prepare and implement a Stormwater Management (SWM) Plan for applicable land-disturbing activities to ensure compliance with state law and regulations. The SWM Plan is submitted to the appropriate DEQ regional office which serves the area where the project is located, for review for compliance. NOS is ultimately responsible for achieving project compliance through oversight of on-site contractors, regular field inspection, prompt action against non-compliant sites, and other mechanisms consistent with agency policy. [Reference: VESCL 62.1-44.15 *et seq*.]

(ii) General Permit for Discharges of Stormwater from Construction Activities (VAR10)

The owner or operator of projects involving land-disturbing activities of equal to or greater than one acre is required to apply for registration coverage under the General

Permit for Discharges of Stormwater from Construction Activities and develop a project-specific stormwater pollution prevention plan (SWPPP). Construction activities requiring registration also include land disturbance of less than one acre of total land area that is part of a larger common plan of development or sale if the larger common plan of development will collectively disturb equal to or greater than one acre

- The SWPPP must be prepared prior to submission of the registration statement for coverage under the General Permit.
- The SWPPP must address water quality and quantity in accordance with the VSMP Permit Regulations.

General information and registration forms for the Construction General Permit are available from DEQ. [Reference: Virginia Stormwater Management Act 62.1-44.15 *et seq*.; VSMP Permit Regulations 9 VAC 25-880 *et seq.*].

For additional information, contact DEQ-OSWM, Larry Gavan at (804) 698-4040 or larry.gavan@deq.virginia.gov.

4. Chesapeake Bay Preservation Areas. As noted above, NOS activities could impact habitat characteristics in the action area as a result of terrestrial impacts from ground disturbance during the installation or removal of tide gauges (DPEIS, page 74).

4(a) Agency Jurisdiction. The DEQ Office of Watersheds and Local Government Assistance Programs (OWLGAP) administers the Chesapeake Bay Preservation Act (Virginia Code §62.1-44.15:67 *et seq*.) and *Chesapeake Bay Preservation Area Designation and Management Regulations* (9 VAC 25-830-10 *et seq*.). Each Tidewater locality must adopt a program based on the Bay Act and *Regulations*. The Act and *Regulations* recognize local government responsibility for land use decisions and are designed to establish a framework for compliance without dictating precisely what local programs must look like. Local governments have flexibility to develop water quality preservation programs that reflect unique local characteristics and embody other community goals. Such flexibility also facilitates innovative and creative approaches in achieving program objectives. The regulations address nonpoint source pollution by identifying and protecting certain lands called Chesapeake Bay Preservation Areas. The regulations use a resource-based approach that recognizes differences between various land forms and treats them differently.

4(b) Chesapeake Bay Preservation Areas. In general, the areas protected by the Chesapeake Bay Preservation Act (Bay Act), as locally implemented, require conformance with performance criteria. Chesapeake Bay Preservation Areas (CBPAs) include Resource Protection Areas (RPAs) and Resource Management Areas (RMAs) as designated by the local government. RPAs include:

- tidal wetlands;
- certain non-tidal wetlands;
- tidal shores; and

- a 100-foot vegetated buffer area located adjacent to and landward of these features and along both sides of any water body with perennial flow.

RMAs require less stringent performance criteria than RPAs and are designated using a variety of criteria as approved by DEQ-OWLGAP.

4(c) Requirements.

(i) Water-Dependent Facilities

According to 9 VAC 25-830-140 of the *Regulations*, new or expanded water-dependent facilities may be allowed in CBPAs provided they:

- do not conflict with the local comprehensive plan;
- comply with the performance criteria set forth in 9 VAC2 5-830-130;
- any non-water dependent component is located outside of the RPA; and
- access to the water-dependent facility will be provided with the minimum disturbance necessary.

The *Regulations* (9 VAC 25-830-40) define a “water dependent activity,” as a development of land that cannot exist outside of the RPA and must be located on the shoreline by reason of the intrinsic nature of its operation. This includes facilities such as beaches and other public water-oriented recreation areas. In addition, according to 9 VAC 25-830-140(5), shoreline erosion control projects are permitted within lands analogous to locally designated CBPAs, provided necessary control techniques are employed, and appropriate vegetation is established to protect or stabilize that shoreline in accordance with the best available technical advice and applicable permit conditions or requirements.

(ii) General Performance Criteria

Projects that include land disturbing activity in CBPAs must adhere to the general performance criteria of the *Regulations* (9 VAC 25-830-130), especially with respect to:

- minimizing land disturbance (including access and staging areas),
- retaining indigenous vegetation, and
- minimizing impervious cover.

All land-disturbing activity exceeding 2,500 square feet must comply with the requirements of the *Virginia Erosion and Sediment Control Handbook, Third Edition, 1992*, and satisfy stormwater management criteria consistent with the water quality protection provisions of the *Virginia Stormwater Management Regulations* (9 VAC 25-870-51 and 9 VAC 25-870-103).

(iii) Water Quality Impact Assessment

A water quality impact assessment (WQIA) is required for any proposed land disturbance, development or redevelopment within the RPA to identify the impacts of proposed development on water quality and lands within RPAs consistent with the goals and objectives of the *Regulations* and the local ordinance. The WQIA also provides specific measures for mitigation of those impacts.

For additional information, contact DEQ-OWLGAP, Daniel Moore at (804) 698-4520 or daniel.moore@deq.virginia.gov.

5. Natural Heritage Resources. The DPEIS does not specifically address natural heritage resources affected by the Proposed Action.

5(a) Agency Jurisdiction.

(i) The Virginia Department of Conservation and Recreation's (DCR) Division of Natural Heritage (DNH).

DNH's mission is conserving Virginia's biodiversity through inventory, protection and stewardship. The Virginia Natural Area Preserves Act (Virginia Code §10.1-209 through 217), authorizes DCR to maintain a statewide database for conservation planning and project review, protect land for the conservation of biodiversity, and protect and ecologically manage the natural heritage resources of Virginia (the habitats of rare, threatened and endangered species, significant natural communities, geologic sites, and other natural features).

(ii) The Virginia Department of Agriculture and Consumer Services (VDACS).

The Endangered Plant and Insect Species Act of 1979 (Virginia Code Chapter 39 §3.1-1020 through 1030) authorizes VDACS to conserve, protect and manage endangered and threatened species of plants and insects. Under a Memorandum of Agreement established between VDACS and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species.

5(b) Agency Findings.

(i) Natural Heritage Resources

DCR-DNH searched its Biotics Data System (Biotics) for occurrences of natural heritage resources in Virginia. Several state and federally-listed species including marine mammals, sea turtles, and marine/coastal birds have been documented in the planning area.

(ii) State Natural Area Preserves

DCR files do not indicate the presence of any State Natural Area Preserves under the agency's jurisdiction in the vicinity of the Proposed Action in Virginia.

(iii) State-Listed Plant and Insect Species

DCR finds that the activities will not affect any documented state-listed plants or insects.

5(c) Recommendations.

(i) Federal and State-Listed Species Coordination

Due to the legal status of state and federally-listed species, DCR recommends NOS coordinate with the National Marine Fisheries Service (NMFS), the Virginia Department of Wildlife Resources (DWR), and the United States Fish and Wildlife Service (USFWS) to ensure compliance with protected species legislation.

(ii) Natural Heritage Resources Updates

Contact DCR-DNH to secure updated information on natural heritage resources if the scope of the Proposed Action changes or six months pass before it is utilized, since new and updated information is continually added to Biotics.

For additional information on DCR comments, contact DCR, Rene Hypes at (804) 371-2708 or rene.hypes@dcr.virginia.gov.

6. Wildlife Resources and Protected Species. The bulk of the information and analysis presented in the DPEIS addresses the effect of the Proposed Action on wildlife resources and protected species, including marine mammals, sea turtles, fish, aquatic macroinvertebrates, essential fish habitat, seabirds, shorebirds, coastal birds and waterfowl. In general, the DPEIS finds that the Proposed Action would contribute to and have the potential to increase cumulative impacts, but their relative contribution would be negligible as compared to aggregate contributions from other cumulative actions because the NOS impacts would be temporary or short-term, would be confined to the immediate vicinity of project areas, and would be small as compared to impacts from all other cumulative actions.

6(a) Agency Jurisdiction. The Virginia Department of Wildlife Resources (DWR) (formerly the Department of Game and Inland Fisheries), as the Commonwealth's wildlife and freshwater fish management agency, exercises enforcement and regulatory jurisdiction over wildlife and freshwater fish, including state- or federally-listed endangered or threatened species, but excluding listed insects (Virginia Code, Title 29.1). DWR is a consulting agency under the U.S. Fish and Wildlife Coordination Act (16 U.S. Code §661 *et seq*.) and provides environmental analysis of projects or permit applications coordinated through DEQ and several other state and federal agencies.

DWR determines likely impacts upon fish and wildlife resources and habitat, and recommends appropriate measures to avoid, reduce or compensate for those impacts. For more information, see the DWR website at *www.dwr.virginia.gov.*

6(b) Recommendations. DWR recommends that NOS consider ways to avoid and/or minimize any state-listed species or designated resources impacted by the Proposed Action, including those species that may be documented from near-shore habitats proposed for certain activities. This is in addition to the federally-listed species assessed in the DPEIS for the Proposed Action.

DWR recommends the following steps be performed to assist in the assessment of potential impacts upon state-listed species, for the development of a Coastal Zone Management Act Federal Consistency Determination for proposed activities in Virginia.

A. Access the Virginia Fish and Wildlife Information Service (VAFWIS) at https://vafwis.dwr.virginia.gov/fwis/. A request to subscribe to VAFWIS may be submitted to vafwis_support@dwr.virginia.gov. VAFWIS subscriptions are free of charge. As a subscriber, NOS will be able to generate an IPA for the project area (project site plus a minimum 2-mile buffer) which generates a list of imperiled wildlife and designated wildlife resources known from the project area. NOS may also access VAFWIS as a visitor, but access to data and mapping at this level is restricted.

   Alternatively, NOS may contact DWR's Geographic Information Systems (GIS) Coordinator, Jay Kapalczynsk, at jay.kapalczynski@dwr.virginia.gov, to request access to the Wildlife Mapping and Environmental Review Map Service (WERMS), which allows the user to download GIS data.

B. Access information about the location of bat hibernacula and roosts from the following locations:

- Northern Long-Eared Bats: https://www.dwr.virginia.gov/wildlife/bats/northern-long-eared-bat-application/.
- Little Brown Bats and Tricolored Bats: https://www.dwr.virginia.gov/wildlife/bats/little-brown-bat-tri-colored-bat-winter-habitat-roosts-application/.

C. Access up to date information about the location and status of bald eagle nests in Virginia by accessing the Center for Conservation Biology's Eagle Nest Locator at https://ccbbirds.org/what-we-do/research/species-of-concern/virginia-eagles/nest-locator/.

D. Review the DWR information, guidance, and protocols available at www.virginiawildlife.gov in the "Additional Resources" section and implement, as appropriate.

E. Include the results of the desktop analysis in the final PEIS, Coastal Zone Consistency Determination and other project documents.

For additional information regarding DWR comments, contact DWR, Amy Martin at (804) 367-2211 or amy.ewing@dwr.virginia.gov.

7. Water Resources. The DPEIS does not indicate that the Proposed Action will adversely impact drinking water sources.

7(a) Agency Jurisdiction. The Virginia Department of Health (VDH) Office of Drinking Water (ODW) reviews projects for the potential to impact public drinking water sources (groundwater wells, springs and surface water intakes). VDH administers both federal and state laws governing waterworks operation.

7(b) Agency Findings. VDH-ODW has no comments on the Proposed Action.

For additional information, contact VDH-ODW, Arlene Fields Warren at (804) 864-7781 or arlene.warren@vdh.virginia.gov.

8. Federal Consistency under the CZMA. According to the DPEIS (page 61), in order to facilitate Coastal Zone Management Act (CZMA) review for surveying and mapping projects, NOS will coordinate requirements for federal consistency with coastal states and territories pursuant to Section 307 of the CZMA. NOS will provide the DPEIS to coastal states or territories with approved coastal zone management programs.

8(a) Requirements. Pursuant to the Coastal Zone Management Act (CZMA) of 1972, as amended, NOS is required to determine the consistency of its activities affecting Virginia's coastal resources or coastal uses with the Virginia Coastal Zone Management (CZM) Program (see section 307(c)(1) of the *Act* and 15 CFR Part 930, Subpart C, section 930.34). This involves an analysis of the activities in light of the Enforceable Policies of the Virginia CZM Program, and the submission of a consistency determination reflecting that analysis and committing NOS to comply with the enforceable policies. In addition, the NOS is encouraged to consider the Advisory Policies of the Virginia CZM Program in accordance with 15 CFR §930.39(c). Section 930.39 gives content requirements for the consistency determination, or you may also find guidance in DEQ's *Federal Consistency Information Package* on the agency's website.

For additional information, contact the DEQ Office of Environmental Impact Review (OEIR), Bettina Rayfield at (804) 698-4202 or bettina.rayfield@deq.virginia.gov or John Fisher at (804) 698-4339 or john.fisher@deq.virginia.gov.

Thank you for the opportunity to review the Draft Programmatic Environmental Impact Statement for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition. Detailed comments of reviewing agencies are attached for your

review. Please contact me at (804) 698-4204 or John Fisher at (804) 698-4339 for clarification of these comments.

Sincerely,

Bettina Rayfield, Program Manager
Environmental Impact Review and Long-Range Priorities

Enclosures

Ec: Amy Martin, DWR
Robbie Rhur, DCR
Arleen Warren, VDH
Tiffany Birge, VMRC
Roger Kirchen, DHR
Emily Hein, VIMS

Commonwealth of Virginia

Fisher, John <john.fisher@deq.virginia.gov>

ESSLog# 41395_21-086F_NOAA Surveying and Mapping_DWR_AEM_20210721

1 message

Martin, Amy <amy.ewing@dwr.virginia.gov> Wed, Jul 21, 2021 at 4:51 PM
To: John Fisher <john.fisher@deq.virginia.gov>

John,
We have reviewed the subject project that proposes to continue, with upgrades in technology, survey and mapping activities in "rivers; states' offshore waters; the U.S. territorial sea; the contiguous zone; and the U.S. Exclusive Economic Zone (U.S. EEZ). The action area also includes coastal and riparian lands for activities such as the installation, maintenance, and removal of tide gauges." Activities may include use of "echo sounders and other active acoustic equipment and employ other equipment, including bottom samplers and conductivity, temperature, and depth instruments to collect the needed data."

In addition to the federally-listed species assessed in the Programmatic EIS for the project, we also recommend NOAA consider ways to avoid and/or minimize any state listed species or designated resources impacted by this project, including those species that may be documented from near-shore habitats proposed for certain activities. We recommend the following steps be performed to assist in the assessment of potential impacts upon state-listed species, necessary during development of a Coastal Zone Consistency Determination for the project sites in VA:

A. Access VAFWIS at this link: https://vafwis.DWR.virginia.gov/fwis/
If you are not already a VAFWIS subscriber, you should request to become one by emailing a request to VAFWIS_support@DWR.virginia.gov. VAFWIS Subscriptions are free of charge. As a subscriber, one is able to generate an IPA for the project area (project site plus a minimum 2-mile buffer) which generates a list of imperiled wildlife and designated wildlife resources known from the project area. You may also access VAFWIS as a visitor, but access to data and mapping at this user level is restricted.

Alternatively, you may contact our Geographic Information Systems (GIS) Coordinator, Jay Kapalczynski, at Jay.Kapalczynski@DWR.virginia.gov to request access to the Wildlife Mapping and Environmental Review Map Service (WERMS) which allows you to download GIS data into your own system.

B. Access information about the location of bat hibernacula and roosts from the following locations:

Northern Long-Eared Bats: https://www.dwr.virginia.gov/wildlife/bats/northern-long-eared-bat-application/

Little Brown Bats and Tricolored Bats: https://www.dwr.virginia.gov/wildlife/bats/little-brown-bat-tri-colored-bat-winter-habitat-roosts-application/

C. Access up to date information about the location and status of bald eagle nests in Virginia by accessing the Center for Conservation Biology's Eagle Nest Locator at https://ccbbirds.org/what-we-do/research/species-of-concern/virginia-eagles/nest-locator/

D. Review the DWR information, guidance, and protocols available on our website at the bottom of this page in the "Additional Resources" section and implement, as appropriate.

E. Include the results of your desktop analysis in the EIS, Coastal Zone Consistency Determination and other project documents.

Thank you,
Amy

please note name change below; email address not yet changed

Amy E. Martin *(she/her/hers)*
Environmental Services Biologist
Manager, Wildlife Information
P 804.367.2211
Department of Wildlife Resources
CONSERVE. CONNECT. PROTECT.
A 7870 Villa Park Drive, P.O. Box 90778, Henrico, VA 23228
www.VirginiaWildlife.gov

Commonwealth of Virginia

Fisher, John <john.fisher@deq.virginia.gov>

Fwd: NEW PROJECT NOAA Surveying and Mapping Projects, DEQ #21-086F

1 message

Fulcher, Valerie <valerie.fulcher@deq.virginia.gov> Mon, Jul 26, 2021 at 8:53 AM
To: John Fisher <john.fisher@deq.virginia.gov>

VDH Comments for 21-086F.

---------- Forwarded message ---------
From: **Warren, Arlene** <arlene.warren@vdh.virginia.gov>
Date: Mon, Jul 26, 2021 at 8:51 AM
Subject: Re: NEW PROJECT NOAA Surveying and Mapping Projects, DEQ #21-086F
To: Fulcher, Valerie <valerie.fulcher@deq.virginia.gov>

The Department of Health, Office of Drinking Water has no comments on this subject at this time.

Best Regards,

Arlene Fields Warren

GIS Program Support Technician

Office of Drinking Water

Virginia Department of Health

109 Governor Street

Richmond, VA 23219

(804) 864-7781

COMMONWEALTH of VIRGINIA

Marine Resources Commission
380 Fenwick Road
Bldg 96
Fort Monroe, VA 23651-1064

Matthew J. Strickler
Secretary of Natural Resources

Steven G. Bowman
Commissioner

July 21, 2021

Department of Environmental Quality
Office of Environmental Impact Review
Attn: John Fisher
1111 East Main Street
Richmond, Virginia 23219

Re: NOAA Surveying and Mapping Projects, DEQ #21-086F

Dear Mr. Fisher,

This will respond to the request for comments regarding the Draft Environmental Impact Statement for the NOAA Surveying and Mapping Projects, (DEQ #21-086F), prepared by NOAA National Ocean Service (NOS). Specifically, the NOS has proposed to conduct surveys and mapping for coastal and marine data collection using upgraded equipment, improved hydroacoustic devices, and new tide stations over a six-year time period. A portion of the project area encompasses those rivers and coastal coastal waters throughout the Commonwealth of Virginia.

We reviewed the provided project documents and found the proposed project is within the jurisdictional areas of the Virginia Marine Resources Commission (VMRC) and may require a permit from this agency.

Please be advised that the VMRC, pursuant to Chapters 12, 13 and 14 of Title 28.2 of the Code of Virginia, administers permits required for submerged lands, tidal wetlands, and beaches and dunes. Additionally, the VMRC has jurisdiction over encroachments in, on, or over the beds of rivers, streams, or creeks, which are the property of the Commonwealth. Accordingly, if any portion of any project involves encroachments below mean low water in tidal waters, or channelward of ordinary high water along non-tidal, natural rivers and streams with a drainage area greater than 5-square miles, a permit may be required from our agency. Any jurisdictional impacts will be reviewed by the VMRC during the Joint Permit Application (JPA) process.

Please contact me at 757-247-2251 or by email at randy.owen@mrc.virginia.gov if you have questions. Thank you for the opportunity to comment.

Sincerely,

Randy Owen
Chief, Habitat Management Division

RDO/tlb
HM

Matthew J. Strickler
Secretary of Natural Resources

Clyde E. Cristman
Director

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

Rochelle Altholz
Deputy Director of Administration and Finance

Russell W. Baxter
Deputy Director of Dam Safety & Floodplain Management and Soil & Water Conservation

Nathan Burrell
Deputy Director of Government and Community Relations

Thomas L. Smith
Deputy Director of Operations

MEMORANDUM

DATE: July 26, 2021

TO: John Fisher, DEQ

FROM: Roberta Rhur, Environmental Impact Review Coordinator

SUBJECT: DEQ 21-086F, Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition

Division of Natural Heritage

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

Several state and federally-listed species including marine mammals, sea turtles, and marine/coastal birds have been documented in the planning area. Due to the legal status of these species, DCR recommends coordination with the National Marine Fisheries Service (NMFS), the Virginia Department of Wildlife Resources (VDWR), and the United States Fish and Wildlife Service (USFWS) to ensure compliance with protected species legislation.

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

New and updated information is continually added to Biotics. Please re-submit project information and map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

The Virginia Department of Wildlife Resources (VDWR) maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from https://vafwis.dgif.virginia.gov/fwis/ or contact Ernie Aschenbach at 804-367-2733 or Ernie.Aschenbach@dwr.virginia.gov.

Commonwealth of Virginia

Fisher, John <john.fisher@deq.virginia.gov>

Fwd: NEW PROJECT NOAA Surveying and Mapping Projects, DEQ #21-086F

1 message

Henicheck, Michelle <michelle.henicheck@deq.virginia.gov> Wed, Jul 28, 2021 at 5:43 PM
To: John Fisher <john.fisher@deq.virginia.gov>

I don't have any comments for this project.

Michelle Henicheck, PWS
Senior Wetland Ecologist
Virginia Department of Environmental Quality

Phone: 804.698.4007
Email: michelle.henicheck@deq.virginia.gov

New Location:
1111 East Main Street, Suite 1400
Richmond, Virginia 23219

2.30.2 NOS Response

CZMA-12: VMRC finds that if any activities involve encroachments below mean low water in tidal waters, or channelward of ordinary high water along non-tidal, natural rivers and streams with a drainage area greater than 5-square miles, a VMRC permit may be required. Any jurisdictional impacts will be reviewed by the VMRC during the Joint Permit Application (JPA) process.

> **NOS Response:** NOS activities do not include encroachments below mean low water in tidal waters, or channelward of ordinary high water along non-tidal, natural rivers and streams with a drainage area greater than 5-square miles.
>
> Under the CZMA, federal agency activities with coastal effects are required to be consistent to the maximum extent practicable with federally approved enforceable policies of a State's Coastal Management Program. NOAA regulations at 15 CFR 930.39(e) clarify that unless required by a Federal law, neither the CZMA nor OCM's approval of state enforceable policies authorize the application of state permit requirements to federal agencies. The federal agency activities must be consistent to the maximum extent practicable with the standards that underlie a state's permit, but do not have to apply for or obtain a state permit (2020 OCM Federal Consistency Overview and 65 FR 77123, 77140 (2000)).
>
> NOS provided CD letters to all coastal states and territories with approved CMPs, including Virginia. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under the CZMA.

CZMA-13: VMRC finds that a VMRC permit may be required for activities related to the Proposed Action. Any jurisdictional impacts will be reviewed by the VMRC during the JPA process.

> **NOS Response:** Under the CZMA, federal agency activities with coastal effects are required to be consistent to the maximum extent practicable with federally approved enforceable policies of a State's Coastal Management Program. NOAA regulations at 15 CFR 930.39(e) clarify that unless required by a Federal law, neither the CZMA nor OCM's approval of state enforceable policies authorize the application of state permit requirements to federal agencies. The federal agency activities must be consistent to the maximum extent practicable with the standards that underlie a state's permit, but do not have to apply for or obtain a state permit (2020 OCM Federal Consistency Overview and 65 FR 77123, 77140 (2000)).
>
> NOS provided CD letters to all coastal states and territories with approved CMPs, including Virginia. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under the CZMA.

CZMA-14: NOS and its authorized agents conducting regulated land-disturbing activities on private and public lands in the state must comply with VESCL&R and VSWML&R, including coverage under the general permit for stormwater discharge from construction activities, and other applicable federal nonpoint source pollution mandates (e.g. Clean Water Act- Section 313, federal consistency under the Coastal Zone Management Act). Clearing and grading activities, installation of staging areas, parking lots, roads, buildings, utilities, borrow areas, soil stockpiles,

and related land-disturbing activities that result in the total land disturbance of equal to or greater than 10,00 square feet (2,500 square feet in a Chesapeake Bay Preservation Area) would be regulated by VESCL&R. Accordingly, NOS must prepare and implement an Erosion and Sediment Control (ESC) Plan for applicable land-disturbing activities to ensure compliance with state law and regulations.

> **NOS Response:** Some NOS projects under the Proposed Action would include the installation, maintenance, and removal of tide gauges and GPS reference stations, most of which are affixed to existing docks and piers or secured to rocks in more remote locations. Only very small areas would be disturbed, and any affected habitat components would be expected to recover post-installation. Due to the small scale of any terrestrial installation activities, no terrestrial point or non-point releases would occur.
>
> NOS provided CD letters to all coastal states and territories with approved CMPs, including Virginia. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under the CZMA.

CZMA-15: Land-disturbing activities that result in the total land disturbance of equal to or greater than one acre (2,500 square feet in Chesapeake Bay Preservation Area) would be regulated by VSWML&R. Accordingly, NOS must prepare and implement a Stormwater Management (SWM) Plan for applicable land-disturbing activities to ensure compliance with state law and regulations. The SWM Plan is submitted to the appropriate DEQ regional office which serves the area where the project is located, for review for compliance. NOS is ultimately responsible for achieving project compliance through oversight of on-site contractors, regular field inspection, prompt action against non- compliant sites, and other mechanisms consistent with agency policy. [Reference: VESCL 62.1-44.15 et seq.]

> **NOS Response:** NOS activities do not include land-disturbing activities that result in total land disturbance equal to or greater than one acre (2,500 square feet in Chesapeake Bay Preservation Area).
>
> NOS provided CD letters to all coastal states and territories with approved CMPs, including Virginia. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under the CZMA.

CZMA-16: The owner or operator of projects involving land-disturbing activities of equal to or greater than one acre is required to apply for registration coverage under the General Permit for Discharges of Stormwater from Construction Activities and develop a project- specific stormwater pollution prevention plan (SWPPP). Construction activities requiring registration also include land disturbance of less than one acre of total land area that is part of a larger common plan of development or sale if the larger common plan of development will collectively disturb equal to or greater than one acre

- The SWPPP must be prepared prior to submission of the registration statement for coverage under the General Permit.
- The SWPPP must address water quality and quantity in accordance with the VSMP Permit Regulations.

NOS Response: Thank you for identifying federally enforceable policies that may be applicable to the proposed project. NOS provided CD letters to each coastal state and territory with an approved CMP for compliance under the CZMA, including Virginia. NOS will comply with all requirements under the Clean Water Act (CWA).

CZMA-17: According to 9 VAC 25-830-140 of the Regulations, new or expanded water-dependent facilities may be allowed in CBPAs provided they:

- do not conflict with the local comprehensive plan;
- comply with the performance criteria set forth in 9 VAC2 5-830-130;
- any non-water dependent component is located outside of the RPA; and
- access to the water-dependent facility will be provided with the minimum disturbance necessary.

NOS Response: Thank you for identifying federally enforceable policies that may be applicable to the proposed project. NOS provided CD letters to all coastal states and territories with approved CMPs, including Virginia. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under the CZMA.

CZMA-18: according to 9 VAC 25-830-140(5), shoreline erosion control projects are permitted within lands analogous to locally designated CBPAs, provided necessary control techniques are employed, and appropriate vegetation is established to protect or stabilize that shoreline in accordance with the best available technical advice and applicable permit conditions or requirements.

NOS Response: Thank you for identifying federally enforceable policies that may be applicable to the proposed project. NOS provided CD letters to all coastal states and territories with approved CMPs, including Virginia. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under the CZMA.

CZMA-19: Projects that include land disturbing activity in CBPAs must adhere to the general performance criteria of the Regulations (9 VAC 25-830-130), especially with respect to:

- minimizing land disturbance (including access and staging areas),
- retaining indigenous vegetation, and
- minimizing impervious cover.

NOS Response: Thank you for identifying federally enforceable policies that may be applicable to the proposed project. NOS provided CD letters to all coastal states and territories with approved CMPs, including Virginia. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under the CZMA.

CZMA-20: All land-disturbing activity exceeding 2,500 square feet must comply with the requirements of the Virginia Erosion and Sediment Control Handbook, Third Edition, 1992, and

satisfy stormwater management criteria consistent with the water quality protection provisions of the Virginia Stormwater Management Regulations (9 VAC 25- 870-51 and 9 VAC 25-870-103).

> **NOS Response:** Thank you for identifying federally enforceable policies that may be applicable to the proposed project. NOS provided CD letters to all coastal states and territories with approved CMPs, including Virginia. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under the CZMA. NOS will comply with all requirements under the Clean Water Act.

CZMA-21: A water quality impact assessment (WQIA) is required for any proposed land disturbance, development or redevelopment within the RPA to identify the impacts of proposed development on water quality and lands within RPAs consistent with the goals and objectives of the Regulations and the local ordinance. The WQIA also provides specific measures for mitigation of those impacts.

> **NOS Response:** Thank you for identifying federally enforceable policies that may be applicable to the proposed project. NOS provided CD letters to all coastal states and territories with approved CMPs, including Virginia. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under the CZMA.

Scope-10: The DPEIS does not specifically address natural heritage resources affected by the Proposed Action.

> **NOS Response:** The PEIS addresses all relevant aspects of the human environment, including natural heritage resources. NOS projects are predominantly aquatic actions that infrequently come into contact with terrestrial areas; therefore, natural heritage resources are appropriately addressed where relevant in Chapter 3 of the PEIS. NOS has provided a Federal Consistency Determination letter to VA Department of Environmental Quality (DEQ) under CZMA and will initiate project-specific consultations under Section 106 of the NHPA before commencing any activity with the potential to affect cultural or historic resources.

Endangered Species Act-2: Due to the legal status of state and federally-listed species, DCR recommends NOS coordinate with the National Marine Fisheries Service (NMFS), the Virginia Department of Wildlife Resources (DWR), and the United States Fish and Wildlife Service (USFWS) to ensure compliance with protected species legislation.

> **NOS Response:** NOS has completed consultation with NMFS for compliance with the ESA and MSA. NOS has initiated consultation with USFWS under Section 7 of the ESA on the potential effects to endangered birds. As part of the consultation process, NOS developed mitigation measures to avoid and minimize any potential effects to wildlife. NOS has submitted an application for a Letter of Authorization to NMFS and a petition for Incidental Take Regulations to USFWS for marine mammal species under the MMPA. NOS intends to coordinate with states through the CZMA Federal Consistency process. Until NOS has completed programmatic compliance with USFWS, NMFS, and the Commonwealth

through the CZMA process, NOS will continue to comply with these regulations on a project-by-project basis.

Scope-11: Contact DCR-DNH to secure updated information on natural heritage resources if the scope of the Proposed Action changes or six months pass before it is utilized, since new and updated information is continually added to Biotics.

NOS Response: Thank you for the additional information about Biotics.

Mitigation Measures-7: DWR recommends that NOS consider ways to avoid and/or minimize any state-listed species or designated resources impacted by the Proposed Action, including those species that may be documented from near-shore habitats proposed for certain activities. This is in addition to the federally-listed species assessed in the DPEIS for the Proposed Action.

NOS Response: NOS is committed to public transparency and working with local, state, tribal, and federal partners to reduce environmental impacts from NOS projects. NOS is undergoing consultation with the NMFS and USFWS for compliance under the MMPA, ESA, and MSA. It is not practicable for NOS to evaluate potential impacts to all state-listed species or designated resources.

NOS provided CD letters to all coastal states and territories with approved CMPs, including Virginia. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under CZMA. Potential requirements for future coordination will be developed through the CZMA process.

Federal agency activities must be consistent to the maximum extent practicable with the standards that underlie a state's permit requirements. However, federal agencies do not have to apply for or obtain a state permit unless required by another Federal law (2020 OCM Federal Consistency Overview; 65 FR 77123,77140 (2000); and 15 CFR 930.39(e)).

CZMA-22: DWR recommends the following steps be performed to assist in the assessment of potential impacts upon state-listed species, for the development of a Coastal Zone Management Act Federal Consistency Determination for proposed activities in Virginia.

A. Access the Virginia Fish and Wildlife Information Service (VAFWIS) at https://vafwis.dwr.virginia.gov/fwis/. A request to subscribe to VAFWIS may be submitted to vafwis_support@dwr.virginia.gov. VAFWIS subscriptions are free of charge. As a subscriber, NOS will be able to generate an IPA for the project area (project site plus a minimum 2-mile buffer) which generates a list of imperiled wildlife and designated wildlife resources known from the project area. NOS may also access VAFWIS as a visitor, but access to data and mapping at this level is restricted.

Alternatively, NOS may contact DWR's Geographic Information Systems (GIS) Coordinator, Jay Kapalczynsk, at jay.kapalczynski@dwr.virginia.gov, to request access to the Wildlife Mapping and Environmental Review Map Service (WERMS), which allows the user to download GIS data.

B. Access information about the location of bat hibernacula and roosts from the following locations:

- Northern Long-Eared Bats: https://www.dwr.virginia.gov/wildlife/bats/northern- long-eared-bat-application/.
- Little Brown Bats and Tricolored Bats: https://www.dwr.virginia.gov/wildlife/bats/little-brown-bat-tri-colored-bat-winter- habitat-roosts-application/.

C. Access up to date information about the location and status of bald eagle nests in Virginia by accessing the Center for Conservation Biology's Eagle Nest Locator at https://ccbbirds.org/what-we-do/research/species-of-concern/virginia- eagles/nest-locator/.

D. Review the DWR information, guidance, and protocols available at www.virginiawildlife.gov in the "Additional Resources" section and implement, as appropriate.

E. Include the results of the desktop analysis in the final PEIS, Coastal Zone Consistency Determination and other project documents.

> **NOS Response:** NOS provided CD letters to all coastal states and territories with approved CMPs. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under the CZMA. NOS reviewed this information in the course of preparing the CD for the Commonwealth of Virginia.

CZMA-23: NOS is encouraged to consider the Advisory Policies of the Virginia CZM Program in accordance with 15 CFR §930.39(c). Section 930.39 gives content requirements for the consistency determination, or you may also find guidance in DEQ's Federal Consistency Information Package on the agency's website.

> **NOS Response:** NOS provided CD letters to all coastal states and territories with approved CMPs. The CDs evaluate the coastal effects of proposed activities according to the relevant enforceable policies to make a consistency determination under the CZMA. NOS reviewed the Advisory Policies in accordance with 15 CFR 930.39(c) in the course of preparing the CD for the Commonwealth of Virginia.

APPENDIX D: MITIGATION MEASURES DURING NOS MAPPING AND SURVEYING ACTIVITIES

Mitigation Measures During NOS Mapping and Surveying Activities

General Note: These requirements do not apply when (1) compliance would create an imminent threat to a person or vessel, or (2) to the extent that a vessel cannot comply because it is restricted in its ability to maneuver.

Triggering Event	Crew Response
General	
Vessel and equipment maintenance	All NOS projects would implement mandatory invasive species prevention procedures including, but not limited to, vessel and equipment washdown (including diving equipment), cleaning, and de-ballasting (exchange of ballast water in open ocean waters for those vessels used by NOS that have ballast tanks).
At all times while in transit or on-project	Do not attempt to feed, touch, ride, or otherwise intentionally interact with any marine protected species.
At all times while in transit or on-project	Vessel crew must maintain at least one Protected Species Observer (PSO) at all times. This individual may perform other duties simultaneously. PSOs should use all means necessary to enhance visibility (e.g., spotlights, night vision, Forward Looking Infrared), and will be trained according to NOS Standard Operating Procedures.
Project Planning / Coordination	
Project planning and coordination	NOS would internally coordinate the location and timing of a given project, wherever possible, to ensure that areas are not repeatedly surveyed, except as needed to achieve research or monitoring goals. NOS would not perform surveys on or near ongoing Navy exercises.
General Area Restrictions for Vessel and Vehicle Movement	
Entry into North Atlantic right whale critical habitat	Report into the Mandatory Ship Reporting System.
Before proceeding with operations onboard a vessel 20 meters (m) (65 feet [ft]) or longer in any North Atlantic right whale seasonal management areas, when those areas are active. See maps and coordinates at https://www.fisheries.noaa.gov/national/endangered-species-	Maintain a vessel speed of 10 knots or less. Check with various communication media for general information regarding avoiding ship strikes and specific information regarding North Atlantic right whale sighting locations. These include NOAA weather radio, United States (U.S.) Coast Guard Navigational Telex (NAVTEX) broadcasts, the WhaleAlert app (www.whalealert.org), and Notices to Mariners.

Mitigation Measures During NOS Mapping and Surveying Activities

General Note: These requirements do not apply when (1) compliance would create an imminent threat to a person or vessel, or (2) to the extent that a vessel cannot comply because it is restricted in its ability to maneuver.

Triggering Event	Crew Response
conservation/reducing-vessel-strikes-north-atlantic-right-whales#:~:text=PDF%2C%201197%20pages)Vessel%20Speed%20Restrictions,endangered%20North%20Atlantic%20right%20whales	
Transit areas cross North Pacific right whale critical habitat	Avoid transit through North Pacific right whale critical habitat. For unavoidable transits, vessels must maintain a speed of 10 knots or less.
Entry into Rice's whale areas (Core Distribution Area [CDA] and the 100 m to 400 m isobath in the Gulf of Mexico)	a. Minimize all transits b. Do not exceed 10 knots c. Do not enter at night. If vessels are present in the CDA/isobath at night, the vessel must be anchored, moored, or otherwise immobile.
Use of High Resolution Geophysical (HRG) sources in all areas north of the Forelands in Cook Inlet, Alaska. HRG surveys are defined as surveys using an electromechanical source that operates at frequencies less than 180 kilohertz (kHz), other than those defined at § 217.184(c)(1) (i.e., side-scan sonar, multibeam echosounder, or CHIRP sub-bottom profiler) per the 2020 Bureau of Ocean Energy Management (BOEM) Biological Opinion (BiOp) on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico	The Forelands in Cook Inlet are described as 60°43'10.9"N 151°24'35.8"W (east side of the Inlet, Nikiski, AK) and West Foreland (60°42'48.1"N 151°42'38.3"W). For dedicated mapping and surveying work north of this area (i.e., a specific project involving the use of echo sounders), contact the Alaska Region (akr.prd.section7@noaa.gov) for instructions on how to proceed.

Mitigation Measures During NOS Mapping and Surveying Activities

General Note: These requirements do not apply when (1) compliance would create an imminent threat to a person or vessel, or (2) to the extent that a vessel cannot comply because it is restricted in its ability to maneuver.

Triggering Event	Crew Response
Entry into sensitive Steller sea lion areas	Maintain a vessel separation distance of 3 nautical miles (nm) from Steller sea lion critical habitat, rookeries listed in 50 Code of Federal Regulations (CFR) 223.202, and other haulouts/rookeries as observed during operations. In areas of mandated charting, contact akr.prd.section7@noaa.gov on how to proceed.
Entry into sturgeon and sawfish critical habitat as shown at https://www.fisheries.noaa.gov/resource/map/atlantic-sturgeon-critical-habitat-map-and-gis-data https://www.fisheries.noaa.gov/resource/map/smalltooth-sawfish-critical-habitat-map-and-gis-data https://data.noaa.gov/dataset/dataset/green-sturgeon-critical-habitat-gis-data1	All vessels in coastal waters will operate in a manner to minimize propeller wash and sea floor disturbance, and transiting vessels should follow deep-water routes (e.g., marked channels), as practicable, to reduce disturbance to sturgeon and sawfish critical habitat.
Vessel Movement Restrictions	
In-water seals or sea lions are identified within 91 m (100 yards [yd]) of the vessel	Avoid approaching within 91 m (100 yd) of in-water seals and sea lions.
An Endangered Species Act (ESA)-listed whale is identified within 457 m (500 yd) of the forward path of the vessel	All vessels must steer a course that increases the distance from the whale at a speed of 10 knots or less until the 457 m (500 yd) minimum separation distance has been established.
An ESA-listed whale is sighted within 91 m (100 yd) of the forward path of a vessel	The vessel operator must reduce speed and shift the engine to neutral. Engines must not be engaged until the whale has moved outside of the vessel's path and beyond 457 m (500 yd). If stationary, the vessel must not engage engines until the large whale has moved beyond 457 m (500 yd). A single cetacean at the surface may indicate the presence of submerged animals in the vicinity of the vessel; therefore, precautionary measures should always be exercised.
One or more cetaceans (whales, dolphins, or porpoises) are sighted while a vessel is underway	Attempt to remain parallel to the animal's course if feasible. Avoid excessive speed or abrupt changes in direction until the cetacean has left the area.

Mitigation Measures During NOS Mapping and Surveying Activities

General Note: These requirements do not apply when (1) compliance would create an imminent threat to a person or vessel, or (2) to the extent that a vessel cannot comply because it is restricted in its ability to maneuver.

Triggering Event	Crew Response
One or more sea turtles are sighted while the vessel is underway	Attempt to maintain a distance of 45 m (50 yd) or greater whenever possible.
Night time vessel operation	Vessel operators on project vessels operating at night will use the appropriate lighting to comply with navigation rules and best safety practices. All project areas will be continually monitored for protected species by posted crewmembers during vessel operations.
Reporting Requirements	
Sighting of any injured, dead, or entangled right whales	Report sighting immediately to the U.S. Coast Guard via VHF Channel 16.
Sighting of any injured, dead, or entangled ESA-listed species	Immediately report to National Marine Fisheries Service (NMFS) using the contact information at https://www.fisheries.noaa.gov/report. NMFS also has created a Dolphin & Whale 911 telephone app that can be used to direct calls to the nearest stranding response helpline.
Sightings of critically endangered cetaceans including North Atlantic right whale, North Pacific right whale, Southern Resident killer whale, Main Hawaiian Island insular false killer whale, and Rice's whale	Report sighting within two hours of occurrence when practicable and no later than 24 hours after occurrence to https://www.fisheries.noaa.gov/report. Right whale sightings in any location may also be reported to the U.S. Coast Guard via VHF channel 16 and through the WhaleAlert App: https://www.whalealert.org/.
Discharge Restrictions	
Sighting of any protected marine species within 91 m (100 yd) of the vessel	Do not discharge.
Operating or maintaining a vessel	Follow the International Convention for the Prevention of Pollution from Ships (MARPOL) discharge protocols.
	Meet all Environmental Protection Agency (EPA) Vessel General Permits and Coast Guard requirements.
	Use anti-fouling coatings.
	Clean hull regularly to remove aquatic nuisance species.
	Avoid cleaning of hull in critical habitat.
	Avoid cleaners with nonylphenols.

Mitigation Measures During NOS Mapping and Surveying Activities

General Note: These requirements do not apply when (1) compliance would create an imminent threat to a person or vessel, or (2) to the extent that a vessel cannot comply because it is restricted in its ability to maneuver.

Triggering Event	Crew Response
Restrictions on Instrument / Autonomous System Deployment	
Sighting of any protected marine species within 91 m (100 yd) of the work area	Suspend deployment of all instruments, divers, and autonomous systems. Work already in progress may continue if that activity is not expected to adversely affect the animal(s).
Autonomous Underwater Vehicle (AUV) operation	Equipment such as AUVs would be programmed and operated to avoid sea floor disturbance.
Bottom sampling for sediment verification	NOS would not collect bottom samples for sediment verification on coral reefs, shipwrecks, obstructions, or hard bottom areas.
Instrument Deployment	NOS would ensure that all instruments placed in contact with the sea floor are properly secured to minimize bottom disturbance. NOS would use retrievable instruments, when possible, to avoid abandoning deployed equipment on the sea floor.
Anchoring	Do not anchor in coral critical habitat or other known areas of coral.
	Avoid anchoring in abalone habitat as defined at https://media.fisheries.noaa.gov/2022-05/ch_2021mapseries_AbaloneBlack.jpg
	Avoid anchoring in seagrass.
	Vessel operators would not drag anchor chains.
	Vessel operators would select the anchor location based on depth, protection from seas and wind, and bottom type. Preferred bottom types are sticky mud or sand, as those characteristics allow the flukes of the anchor to dig into the bottom and hold the chain in place. When working in an un-surveyed area or in an area that has not been surveyed in many years, the ship would try to anchor in bays where data have already been collected, providing the ship with better information on where to drop the anchor.
Equipment/Autonomous Systems Deployment	Stiffer line materials should be used for towing and kept taut during operations to reduce the potential for entanglement in bottom features such as coral habitats and shipwrecks.
SCUBA / Snorkeling Restrictions	
When using a boat or platform to conduct self-contained underwater breathing apparatus (SCUBA) or snorkeling operations	At least one person should maintain a visual watch for mobile protected species to ensure none are sighted within the working area. If a listed species moves into the area of work, cessation of operation of any moving equipment within 15 m (50 ft) of the animal should occur. Activities may resume once the species has departed the project area of its own volition.

Mitigation Measures During NOS Mapping and Surveying Activities

General Note: These requirements do not apply when (1) compliance would create an imminent threat to a person or vessel, or (2) to the extent that a vessel cannot comply because it is restricted in its ability to maneuver.

Triggering Event	Crew Response
Diving on or near coral	Divers/snorkelers/swimmers should not stand or rest on live corals/coral reefs. Bottom contact should only be in unconsolidated areas or non-living hardbottom.
At all times during SCUBA or snorkel operations	SCUBA divers/snorkelers involved in in-water activities should have proper training and be capable of responsible dive/snorkel practices (e.g., proper buoyancy) such that they minimize injury to organisms, avoid unnecessary habitat impacts, and avoid injury to sensitive archaeological materials. It is the responsibility of NOAA or grantees/contractors to ensure that divers/snorkelers are trained to a level commensurate with the type and conditions of the diving activity being undertaken. Divers shall use appropriate dive equipment and tools, expert boat anchoring (e.g., hand placement by divers/snorkelers on verified non-living bottom habitat before deployment), and have diver awareness. The organization must have the capacity (appropriate insurance, safety policies, etc.) to oversee all proposed diving/snorkeling activities. SCUBA divers will avoid inadvertent disturbance to the sea floor.
Restrictions on Buoy Deployment, Maintenance, and Retrieval	
At all times during buoy deployment, maintenance, or retrieval of a buoy	Ensure that any buoys attached to the sea floor use the best available mooring systems. All mooring lines and ancillary attachment lines must use one or more of the following measures to reduce entanglement risk: shortest practicable line length, rubber sleeves, weak-links, chains, cables or similar equipment types that prevent lines from looping, wrapping, or entrapping protected species. Buoys, lines (chains, cables, or coated rope systems), swivels, shackles, and anchor designs must prevent any potential entanglement of listed species while ensuring the safety and integrity of the structure or device. When possible, field crews should use retrievable equipment to avoid abandoning material on the sea floor.
	During all buoy deployment and retrieval operations, buoys should be lowered and raised slowly to minimize risk to listed species and benthic habitat. Additionally, PSOs or trained project personnel (if PSOs are not required) should monitor for listed species in the area prior to and during deployment and retrieval and work should be stopped if listed species are observed in the area to minimize entanglement risk.
	All buoys must be properly labeled with owner and contact information.

Mitigation Measures During NOS Mapping and Surveying Activities

General Note: These requirements do not apply when (1) compliance would create an imminent threat to a person or vessel, or (2) to the extent that a vessel cannot comply because it is restricted in its ability to maneuver.

Triggering Event	Crew Response
A live or dead marine protected species becomes entangled in buoy lines	Immediately contact the applicable NMFS stranding coordinator; contact information is available at: https://www.fisheries.noaa.gov/report. Provide any on-water assistance requested. NMFS also has created a Dolphin & Whale 911 telephone app that can be used to direct calls to the nearest stranding response helpline.
Vessel Operation	
Operating vessels in polar bear habitat	Ensure that vessels maintain a 1.6 kilometer (km) (1 mile [mi]) separation distance from polar bears observed on ice, land, or water.
	Be alert to potential presence of polar bears, visually monitor the area and adjacent waters. Be especially vigilant for swimming bears. If a swimming bear(s) is encountered, allow it to continue unhindered. Never approach, herd, chase, or attempt to lure swimming bear(s). Reduce speed when visibility is low and avoid sudden changes in travel direction.
	Navigate slowly, steer around polar bears, and do not approach, circle, pursue, or otherwise force bears to change direction when observed in the water.
	Avoid multiple changes in direction and speed and do not restrict bears' movements on land or sea.
	Do not conduct activities within 1.6 km (1 mi) of known or suspected polar bear dens.
Operating vessels in Pacific walrus habitat	Maintain an appropriate minimum distance from walruses hauled out on ice or land: Marine vessels less than 15 m (50 ft) in length – 1 km (0.5 nm); Marine vessels 15 m or more but less than 30 m (100 ft) in length – 1.8 km (1 nm); and Marine vessels 30 m (100 ft) or more in length – 5.5 km (3 nm).
	Reduce noise levels near haulouts. Avoid abrupt maneuvers, sudden changes in engine noise, using loud speakers, loud deck equipment, or other operations that produce noise when in the vicinity of walrus haulouts. Note that sound carries a long way across the water and often reverberates off of cliffs and bluffs adjacent to coastal walrus haulouts, amplifying noise. Do not operate the vessel in such a way as to separate members of a group of walruses from other members of the group.
	Reduce speed and maintain a minimum distance of 0.8 km (0.5 mi) from groups of walruses in the water.

Mitigation Measures During NOS Mapping and Surveying Activities

General Note: These requirements do not apply when (1) compliance would create an imminent threat to a person or vessel, or (2) to the extent that a vessel cannot comply because it is restricted in its ability to maneuver.

Triggering Event	Crew Response
	If walruses approach the vessel or are found to be in close proximity, place boat engines in neutral and allow the animals to pass. If vessel safety considerations prevent this, carefully steer around animals.
	When weather conditions require, such as when visibility drops, adjust speed accordingly to avoid the likelihood of injury to walruses.
Operating vessels in northern sea otter habitat	Do not operate vessels in such a way as to separate sea otters from other members of their group.
	If northern sea otters are observed in groups of fewer than 10 animals, do not approach within 100 m (109 yd). If the group size is greater than 10, do not approach within 500 m (547 yd).
Operating vessels in manatee habitat (U.S. Gulf coast and Atlantic Coast as far north as the Chesapeake Bay)	All personnel associated with the project shall be instructed about the presence of manatees and manatee speed zones, and the need to avoid collisions with and injury to manatees. All crews shall be advised that there are civil and criminal penalties for harming, harassing, or killing manatees.
	All vessels associated with the project shall operate at "Idle Speed/No Wake" at all times while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.
	Observe water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shut down if a manatee(s) comes within 15 m (50 ft) of the operation. Activities will not resume until the manatee(s) has moved beyond the 15-m (50-ft) radius of the vessel, or until 30 minutes elapses if the manatee(s) has not reappeared within 15 m (50 ft) of the vessel. Animals must not be herded away or harassed into leaving.
	Any collision with or injury to a manatee shall be reported immediately. To report dead, debilitated, or distressed manatees, call 1-877-WHALE HELP (1-877-942-5343). NOAA Fisheries also has created a Dolphin & Whale 911 telephone app that can be used to direct calls to the nearest stranding response helpline.
Aircraft / UAS Operation	
Flying aircraft above Alaska waters and shorelines	Maintain an altitude of at least 305 m (1,000 ft) when flying over northern sea otters.
	Maintain an altitude of at least 457 m (1,500 ft) when flying within 805 m (0.5 mi) of polar bears.

Mitigation Measures During NOS Mapping and Surveying Activities

General Note: These requirements do not apply when (1) compliance would create an imminent threat to a person or vessel, or (2) to the extent that a vessel cannot comply because it is restricted in its ability to maneuver.

Triggering Event	Crew Response
Operating crewed aircraft in polar bear areas.	Unless taking off from or landing at an airport/airstrip, pilots should maintain a minimum of 457 m (1,500 ft) flight altitude and 0.8-km (0.5-mi) horizontal distance from polar bears in the water, and on ice or land. Avoid circling or turning aircraft near polar bears.
Operating aircraft near walrus haulout (Aircraft guidelines to reduce likelihood of walrus take)	Do not fly autonomous system devices or single engine fixed wing aircraft over or within 0.8 km (0.5 mi) of walruses hauled out on land or ice.
	If weather or aircraft safety require flight operations within 0.8 km (0.5 mi) of a haulout site, maintain a 610 m (2,000 ft) minimum altitude.
	Do not fly helicopters over or within 1.6 km (1 mi) of walruses hauled out on land or ice.
	If weather or aircraft safety require crewed flight operations within 1.6 km (1 mi) of a haulout site, maintain a 915 m (3,000 ft) minimum altitude.
	Landings, take-offs, and taxiing of autonomous system devices or single engine fixed wing aircraft should not occur within 0.8 km (0.5 mi) of hauled out walruses, or within 1.6 km (1 mi) for helicopters.
	Avoid circling or turning near walruses hauled out on land or ice.
	If aircraft safety requires flight operations below recommended altitudes near a haulout, pass inland or seaward of the haulout site at the greatest lateral distance manageable for safe operation of the aircraft.
Shore Party Activities	
Operating on land in polar bear areas	Avoid polar bears on land, ice, and water. Conduct activities at the maximum distance possible from polar bears.
	Be prepared. Have a human-bear safety plan that includes information on how to avoid and respond to bear encounters. Carry deterrents, and practice/know how to use them.
	Avoid surprise encounters. Travel in groups, make noise, and be vigilant - especially on barrier islands, in river drainages, along bluff habitat or ice leads/polynyas, near whale or other marine mammal carcasses, or in the vicinity of fresh tracks.
	Minimize attractants. Avoid carrying strongly scented attractants such as meat or fish while away from camp, or place them in air-tight containers to minimize odor transmission.

Mitigation Measures During NOS Mapping and Surveying Activities

General Note: These requirements do not apply when (1) compliance would create an imminent threat to a person or vessel, or (2) to the extent that a vessel cannot comply because it is restricted in its ability to maneuver.

Triggering Event	Crew Response
	Avoid disturbing denning bears. Between November and April, special care is needed to avoid disturbance of denning bears. If activities are to take place during that time period, U.S. Fish and Wildlife Service (USFWS) should be contacted to determine if any additional mitigation is required. In general, activities are not permitted within one mile of known den sites.
If a polar bear is encountered	Prepare deterrent(s). Do not run from or approach polar bears. If the bear is unaware of you, allow it to continue what it was doing before you encountered it. Move to safe shelter (e.g., vehicle or building) if available, and wait until it is safe to proceed.
	Group up. If no safe shelter is available, group up with others and stand positioned to allow for safe deployment of deterrents (e.g., firearm, pistol launcher, bear pepper spray) – until the bear leaves.
	Observe bear behavior. Polar bears that stop what they are doing to turn their head or sniff the air in your direction have likely become aware of your presence. These animals may exhibit various behaviors: 1) Curious polar bears typically move slowly, stopping frequently to sniff the air, moving their heads around to catch a scent, or holding their heads high with ears forward. They may also stand up. 2) A threatened or agitated polar bear may huff, snap its jaws together, stare at you (or the object of threat) and lower its head to below shoulder level, pressing its ears back and swaying from side to side. 3) A predatory bear may sneak up on an object it considers prey. It may also approach in a straight line at constant speed without exhibiting curious or threatened behavior.
If a polar bear approaches	Defend your group. Any bear that approaches within range of your deterrents should be deterred. Stand your ground; do not run. Defend your group, increasing the intensity of your deterrence efforts as necessary. Be aware that lethal take of polar bears is permissible if such taking is imminently necessary in defense of human life. Defense of life kills must be reported to the USFWS within 48 hours.
	If a bear makes physical contact, fight back. If deterrence/lethal efforts have failed and a polar bear attacks (i.e., makes physical contact), do not “play dead”. Fight back using any deterrents available, aiming fists or objects at the bear’s nose and face.

Mitigation Measures During NOS Mapping and Surveying Activities

General Note: These requirements do not apply when (1) compliance would create an imminent threat to a person or vessel, or (2) to the extent that a vessel cannot comply because it is restricted in its ability to maneuver.

Triggering Event	Crew Response
Tide Gauge Installation	
Tide gauge installation projects taking place along the shorelines in manatee habitat (U.S. Gulf coast and Atlantic Coast as far north as the Chesapeake Bay)	Siltation or turbidity barriers shall be made of material in which manatees cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers must not impede manatee movement.
	All personnel associated with the project shall be instructed about the presence of manatees. All crews shall be advised that there are civil and criminal penalties for harming, harassing, or killing manatees.
	All project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shut down if a manatee(s) comes within 15 m (50 ft) of the operation. Activities will not resume until the manatee(s) has moved beyond the 15-m (50-ft) radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 15 m (50 ft) of the operation. Animals must not be herded away or harassed into leaving.
	Any collision with or injury to a manatee shall be reported immediately. To report dead, debilitated, or distressed manatees, call 1-877-WHALE HELP (1-877-942-5343). NOAA Fisheries also has created a Dolphin & Whale 911 telephone app that can be used to direct calls to the nearest stranding response helpline.
	Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed upon completion of the project. One sign which reads “Caution: Boaters” must be posted. A second sign measuring at least 8 ½” by 11" explaining the requirements for “Idle Speed/No Wake” and the shutdown of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities.

APPENDIX E: TECHNICAL ACOUSTIC ANALYSIS OF OCEANOGRAPHIC SURVEYS FOR THE NATIONAL OCEAN SERVICE

Technical Acoustic Analysis of Oceanographic Surveys for the National Ocean Service

Underwater Acoustic and Exposure Modeling of Oceanographic Survey Sounds

Submitted to:

Solv, LLC

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Introduction

The National Ocean Service (NOS) uses many different sound-producing sources when conducting oceanographic surveys. As a practical approach in evaluating the potential impacts of the sounds on marine species near the survey, a series of acoustic modeling steps ranging from simple to sophisticated were performed to support the NOS Programmatic Environment Impact Statement (PEIS) for Surveying and Mapping Projects in U.S. Waters for Coastal and Marine Data Acquisition. An escalating approach was taken because the potential impacts from many of the sources were expected to be negligible, which could be shown using simple models. After evaluating all the sources using the simple modeling approach, sources with the potential for greater impacts were then evaluated with a more sophisticated acoustic model and by considering the behavior of the marine species.

Criteria must be established to gauge the potential for sound to affect marine species. The National Oceanic and Atmospheric Administration (NOAA) has published technical guidance for received sound levels that may result in injury (Level A, NMFS 2018) and received levels that may results in behavioral disruption (Level B, NOAA 2019) (see Appendix B). Based on the acoustic frequency of the signal, each source was categorized as belonging to one of four frequency categories: 1) less than 30 kHz, 2) between 30 and 70 kHz, 3) between 70 and 200 kHz, and 4) above 200 kHz. Sources operating above 200 kHz were not analyzed in this work as they are unlikely to cause behavioral or physiological impacts if animals are unlikely to perceive them. For each source, the distance at which injury could occur was first estimated using the far-field source level and a simple geometric spreading model. If the distance for potential injury was <10 m, then the source was categorized as having a low (negligible) potential for impact and was not considered in additional modeling. The 10 m criteria, roughly approximated from the survey platform vessel sizes, was chosen as encounters at shorter ranges are precluded by the physical presence of the vessel hull. Furthermore, the source level calculated from far-field measurements over estimates the received levels at short ranges (in the near field) before beams from the array have fully formed. If the predicted range to injury was >10 m, then a more accurate propagation model was used to refine the injury range estimate (3D Cumulative Acoustic Modeling). If the refined range was <10 m then the source was again categorized as low impact and not considered in additional modeling. If the refined range was still >10 m, then the sound field of a conservatively-chosen representative sound source in each frequency band (<30 kHz, 30-70 kHz, and 70-200 kHz) was used in simulations that considered species-specific behaviors controlling the movement of simulated animals (

Animal Movement Modeling). These simulations estimated the number of animals that could exceed injury threshold during the representative surveys. Annual injury and behavioral disruption estimates for species were then calculated using the survey level of effort in each region (Annual Exposure Estimates).

Methods

Source Characteristics

The sound a source produces is characterized in time, spectral content, and space. As sound travels away from a source, it is shaped by interactions with the environment in which it propagates. For this reason, the sound field produced by a source is specific to the source and the location. Understanding the potential for sound exposure to impact animals requires an understanding of the sound field to which they could be exposed.

The sound sources of potential concern during active acoustic surveys are the moving Sound Navigation and Ranging (SONAR) sources. The equipment used during any individual survey depends on the final survey design, vessel availability, site conditions, and data needs. A selection of equipment was used in

this assessment to estimate potential horizontal impact distances to regulatory defined injury and behavioral harassment thresholds (described in Appendix B):

- For equipment not measured in Crocker and Fratantonio (2016) manufacturer specifications, personal communications with manufacturers were used. Manufacturer specifications typically represent the maximum output of a source and do not always represent the most likely operational settings. Use of the manufacture's specifications generally overestimates the potential impact for that equipment and is therefore conservative.
- For equipment that was not measured in Crocker and Fratantonio (2016) and where manufacturer specifications were not available or did not contain the required information, a similar source measured in Crocker and Fratantonio (2016) was used as a proxy.

Table 1 identifies the proposed survey equipment expected to operate at, or below, 200 kHz, and lists the relevant acoustic parameters of each of these sources. Equipment that will be operated at frequencies higher than 200 kHz (e.g., some multibeam echosounders and side scan sonars) are not included in this analysis as they operate at frequencies above the hearing range of marine mammals. A full list of the active acoustic equipment that NOS expects to utilize can be found in Appendix D.

Table 1. Active acoustic equipment source and operational parameters as provided by NOS supplemented with manufacturer data and field measurements (Crocker and Fratantonio 2016), when necessary.

Type*	Manufacturer	Model	Source Level (SPLrms, dB re 1 µPa m)	Pulse length (ms)	Minimum frequency (kHz)	Maximum frequency (kHz)	Predominant beam width (deg)	Repitition rate (Hz)
ADCP	Teledyne	RDI Ocean Surveyor	213	22	75	75	180	0.75
ADCP	TRDI	Workhorse/Sentinel	213	22	75	75	20	0.75
ADCP	Teledyne	Ocean Surveyor	220	22	150	150	180	1.5
ADCP	TRDI	Workhorse/Sentinel	233	11.5	150	150	20	0.75
ALT		1007- 200 m altimeter	204	0.45	120	120	180	20
Comm	Nortek	AWAC	184	1	26	26	180	0.5
Comm	Nortek	AWAC	180	1.8	25	25	180	1
Comm	Edgetech	Offshore 4410C Trackpoint II	193	15	4.5	4.5	180	1
Comm	LinkQuest	TN1505b transponder	185	15	31	31	180	1
Comm	Teledyne	ORE Trackpoint III	190	15	8	8	180	0.5
Comm	Tracklink	5000 USBL	190	0.1	14.2	14.2	120	0.5
Comm	Tracklink	1500 HA System	190	15	31	31	180	1
Comm	Tracklink	5000 MA	190	0.1	14.2	14.2	180	1

Type*	Manufacturer	Model	Source Level (SPLrms, dB re 1 µPa m)	Pulse length (ms)	Minimum frequency (kHz)	Maximum frequency (kHz)	Predominant beam width (deg)	Repitition rate (Hz)
Comm	ORE	Offshore 4377A transponder with depth telemetry	197	1.3	23	23	180	0.01
Comm	Benthos	UAT-376 transponders	180	5	25	25	180	4
MBES	Kongsberg	EM710 Mk1 0.5x1	229	2	70	70	140	20
MBES	Kongsberg	EM710 Mk2 0.5x1	231	2	40	40	140	20
MBES	Kongsberg	EM710	231	2	70	70	140	20
MBES	Seabeam	3012 Phase 1 hybrid 12 kHz multibeam sonar bathymetric mapping system	247	20	12	12	180	4
MBES	Simrad	EM302	214	5	30	30	180	10
MBES	Reson	7125	220	0.3	40	40	180	50
MBES	Simrad	ME70	225	5	70	70	180	10
MBES	Simrad	EM710	231	2	100	100	180	20
MBES	Teledyne Odom	MB1	234	0.01	170	170	120	60
MBES	Kongsberg	EM124	242	0.015	12.5	12.5	150	0.17

Type*	Manufacturer	Model	Source Level (SPLrms, dB re 1 µPa m)	Pulse length (ms)	Minimum frequency (kHz)	Maximum frequency (kHz)	Predominant beam width (deg)	Repitition rate (Hz)
SAS	Kongsberg	HISAS 1032	234	0.01	60	60	180	20
SBES	Teledyne Odom	CV100	229	0.04	100	100	20	20
SBES	Teledyne Odom	CV200	229	2	24	24	20	20
SBES	Teledyne Odom	CV200	229	2	50	50	20	20
SBES	Kongsberg	EA 60	234	1	12	12	16	20
SBES	Simrad	ES60	234	1	12	12	180	20
SBES	Kongsberg	EA 60	234	1	38	38	7	20
SBP	EdgeTech	3200-XS w/ SB-0512i	212	5	0.5	0.5	41	10
SBP	Knudsen	320 B/R	222	0.01	3.5	3.5	28	5
SBP	Edgetech	CHIRP	234	1	4	4	180	5
SES	Simrad	EK60	234	2	38	38	180	20
Source	Teledyne	Benthos	177	4	25	25	180	2
Source	Datasonics	DPL-275	180	5	25	25	180	50

Type*	Manufacturer	Model	Source Level (SPLrms, dB re 1 µPa m)	Pulse length (ms)	Minimum frequency (kHz)	Maximum frequency (kHz)	Predominant beam width (deg)	Repitition rate (Hz)
Source	Applied Acoustics Engineering	1300A Series Micro Beacon	183	15	21.5	21.5	180	0.5
SSS	Klein	3000	234	0.4	120	120	180	10

*ADCP = Acoustic Doppler Current Profiler; ALT = Altimeter; Comm = Acoustic Communication System; MBES = Multibeam Echosounder; SAS = Synthetic Aperture Sonar; SBES = Single Beam Echosounder; SBP = Sub Bottom Profiler; SES = Scientific Echosounder; Source = Beacon/pinger; SSS = Side Scan Sonar

Propagation

Geometric Spreading Model

A geometric spreading loss model based on guidance from National Marine Fisheries Service (NMFS) was used to estimate horizontal distances to the NMFS injury criteria for each of the NOS sources and each of the marine mammal hearing groups (Appendix B). Detailed methods used to implement this simplified model are presented in Appendix C. This analysis revealed many sources which had a less than 10 m range to injury impact, making the likelihood of quantifiable exposures highly unlikely and the potential impacts negligible. NMFS provides a spreadsheet to calculate these distances, but it is not designed for high-resolution geophysical survey sources and does not consider seawater absorption or beam patterns, both of which can substantially influence received sound levels, and as such, the remaining sources (Table 3) not eliminated as negligible were carried forward for more detailed, 3D Acoustic Modeling.

3D Acoustic Modeling with Fixed Source/Receiver Accumulation

Using JASCO's Marine Operations Noise Model (MONM, described in Appendix C), sound fields were predicted by combining models of main- and side-lobe fields. Sources were modeled according to the parameterized beam patterns in Table 1. Sources were divided into three categories based on their beam patterns: omni-directional, conical, and fan. Omnidirectional sources only have a main lobe with equal energy produced in all directions. Conical sources have azimuthally symmetric main lobes, generally pointing downwards from platforms, and lower energy at elevation angles outside of the main cone. Fan-type sources are defined by a large difference between along- and across-track beampatterns. Fan-type sources generally have an across-track beamwidth on the order of 90° and an along-track beamwidth on the order of 1° (Figure 1). Propagation loss was modeled separately for the main- and side-lobe portions of the different beam patterns. The source levels were defined independently for the main- and side-lobes, with the beamwidth correction being applied to the side lobe according to the equations provided in Appendix C.

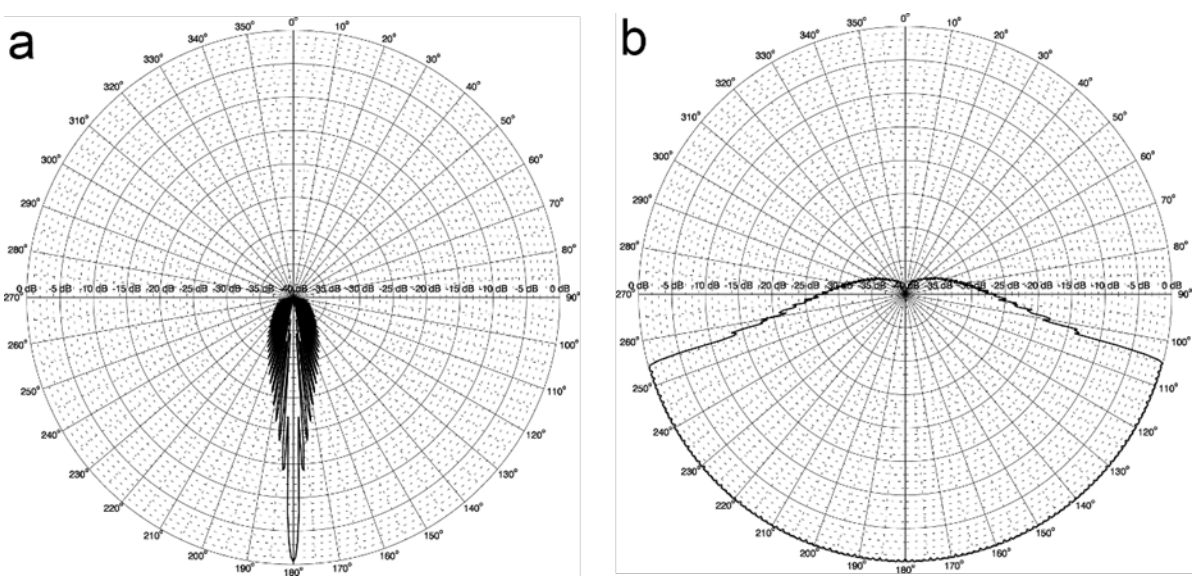

Figure 1. Vertical slice for the Modelled beam pattern for a multibeam system with 191 individual 2ºx2º beams, making a 150º swath perpendicular to the vessel track; (a) along- and (b) across-track direction.

Acoustic propagation was modeled for these sources at 57 locations throughout United States (U.S.) waters (Figure 2). Locations were selected within the operational regions to represent different depth regimes defined in Table 2. For regions where manatees are present, a limit of 10 m was set for the limit between shallow and mid-depth regimes. As manatees are more likely to remain exclusively in very shallow waters, where ranges to impact are short relative to deeper water, assessing impacts only at these depths was necessary for this species, while the impacts for other coastal species could be assessed in the mid-depth regime as well.

As indicated above, a subset of the operational sources within the NOS fleet was modeled (Table 3). These sources were selected as those with the largest ranges to injurious exposures of similar source types (beam pattern, frequency, type). Table 3 describes most acoustic characteristics of the sources used in 3D models.

Table 2. Depth ranges for numerical acoustic propagation models.

Depth Class	Depth Range (m)
Shallow	< 40 < 10*
Mid-depth	40 – 200 10 – 200*
Deep	200 – 1000
Very deep	> 1000

* A 10 m limit for the shallow and mid-depth classes was used in regions where manatees are present.

Table 3. Acoustic parameters for detailed range dependent, 3D propagation modeling.

Manufacturer	Model	SL (dB re 1 µPa)	Frequency (kHz)	Signal duration (ms)	Ping rate (Hz)
Knudsen	320 B/R	222	3.5	10	5
Simrad	ES60	225	12	1	20
Kongsberg	EM124	242	12.5	15	0.17
Teledyne Odom	CV200	229	24	2	20
Simrad	EM302	214	30	5	10
Kongsberg	EM710	231	40	2	20
Teledyne Odom	CV200	229	50	2	20
Kongsberg	EM710	231	70	2	20
Klein	3000	234	100	0.4	10

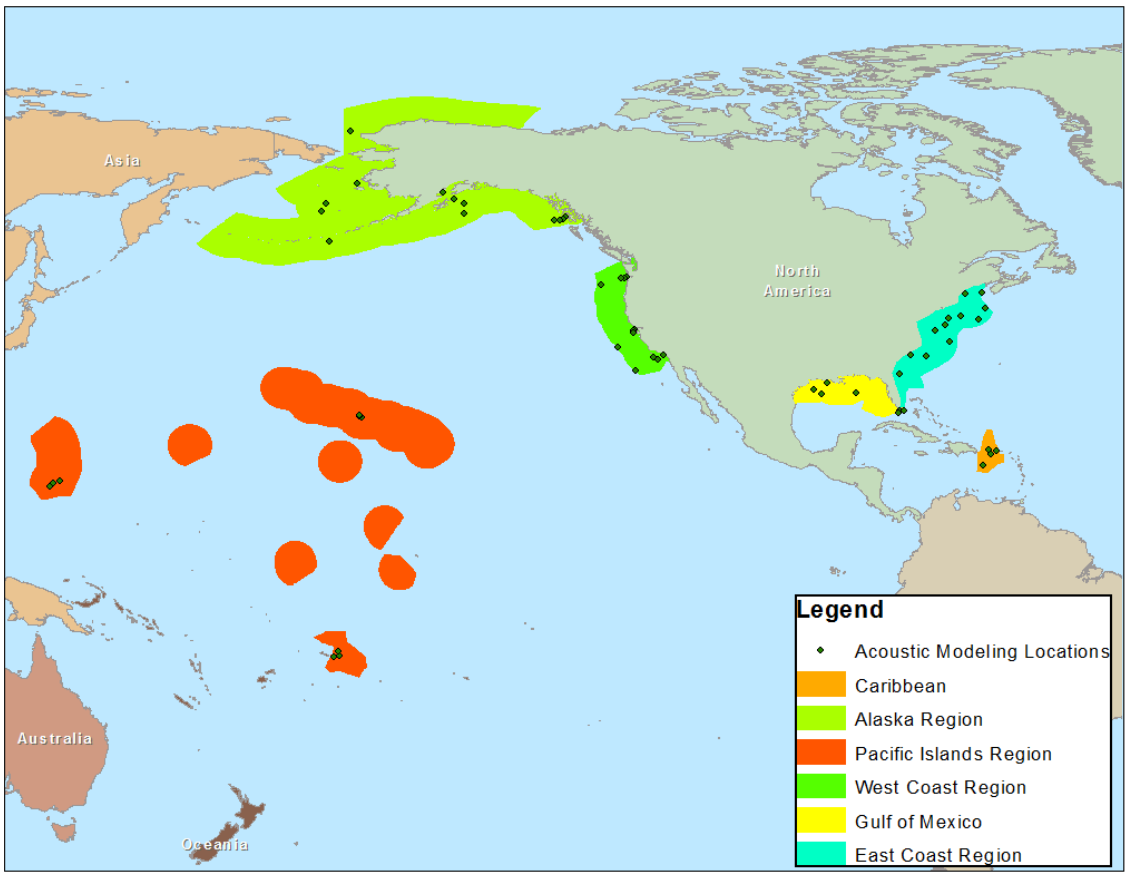

Figure 2. Overview of acoustic modeling locations throughout U.S. waters.

Cumulative Grid

The 3D sound fields generated using MONM with beampatterns represent point-in-time sound fields. The sound sources are most often moving. However, to represent the sound field over the course of a 24-hour period of surveying, a cumulative sound field was calculated by adding the sound field to itself, with an offset of the source position determined by general vessel speeds as provided by operators in Appendix D. These sound fields represent the exposure estimates from a survey assuming that a receiver (e.g., marine mammal) is fixed in place for the duration of the survey and located at the depth with greatest acoustic energy. (The movement and distribution of animal receivers is addressed in the next step in the exposure modeling process, described in the next section). Most of the biotic receivers with which we are concerned will not be in the same location for a 24-hour period, nor would it be at the same – loudest – depth for that duration. Ranges to cumulative threshold criteria isopleths – regions within which a metric is above threshold - were calculated as the normal distance (right angle) from the track.

Animal Movement Modeling

Simulations of active acoustic survey activities and animal movement modeling were run within five different regions (Figure 2). Regions were selected to represent larger geographic areas for proposed activity and provide realistic bathymetric approximations and presence of species groups. Conservative representatives of active acoustic sources in different frequency bands were used as proxy sources for all

active acoustic sources within the frequency bands (<30 kHz, 30-70 kHz, 70-200 kHz). Simulations duration was four days, with three days of active acoustic surveys within the simulation.

Simulation results were analyzed for both injury and behavioral exposures (Appendix B) and average exposures per 24 hours of survey activity for each simulation. Results were then scaled by the expected linear nautical miles in each region, depth regime, and frequency band for each of the alternatives and species modeled. A detailed description of the modeling can be found in Appendix C.

Exposure Range Estimation

Animal movement and exposure modeling can be used to estimate radial distances to cumulative sound exposure level (SEL) impact thresholds as an alternative to single pulse acoustic propagation ranges. The range to the closest point of approach (CPA) for each of the species-specific animats (simulated animals) is recorded. The $ER_{95\%}$ (95% Exposure Range) is the horizontal range that includes 95% of animat CPAs that exceed a given impact threshold (Figure 3). $ER_{95\%}$ is reported for marine mammals for SEL injury threshold.

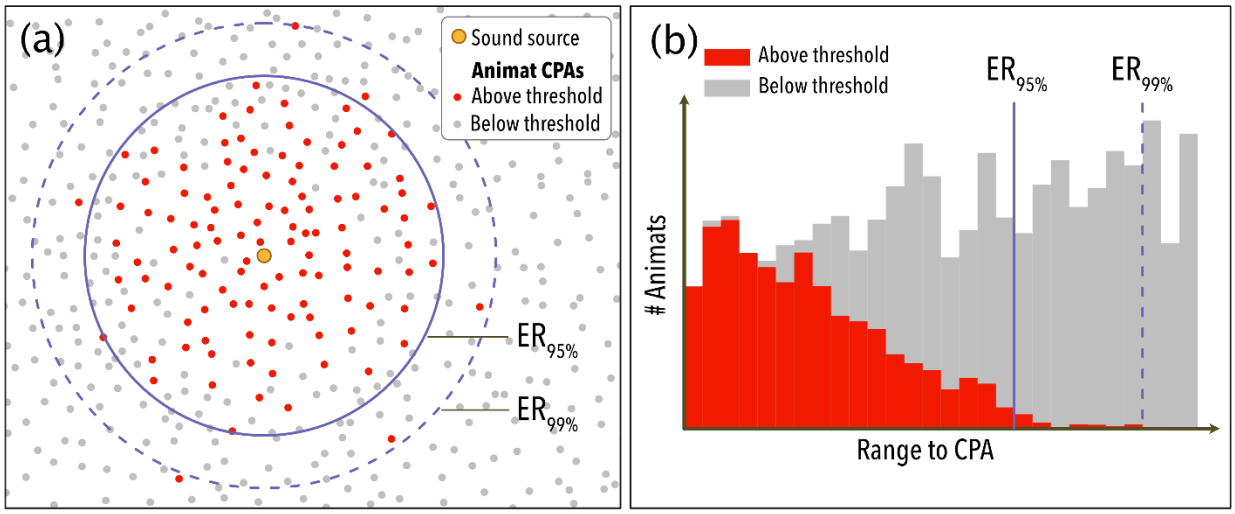

Figure 3. Example distribution of animat closest points of approach (CPAs). Panel (a) shows the horizontal distribution of animats near a sound source. Panel (b) shows the distribution of ranges to animat CPAs. The 95% and 99% Exposure Ranges ($ER_{95\%}$ and $ER_{99\%}$) are indicated in both panels.

Density Estimation

Species density estimates (animals/km^2) were derived from the best available data sources for each species and region. For the east coast of the US and the Gulf of Mexico, densities were obtained using the Duke University Marine Geospatial Ecology Laboratory model results (Roberts et al. 2016a, 2016b, 2017, 2018, 2021a, 2021b). Densities for each species were extracted using the zonal average within each of the NOS operational areas.

For the Alaska and Pacific regions, species abundance and distribution were obtained from the NOAA Stock Assessment Reports (SARs) for cetaceans and pinnipeds (Muto et al. 2022, Carretta et al. 2022), and from the most recent SARs from USFWS for the species under their jurisdiction (USFWS 2014d, 2014c, 2014b, 2014a, 2017, 2018, Regehr et al. 2018, Collazo et al. 2019, Jeffries et al. 2019, Atwood et al. 2020). Species densities within the NOS operational areas were estimated by distributing their abundance over the operational area that fell within the species' habitat preference and associated depth category.

The Navy Marine Species Database was considered for use in the Pacific Ocean and Gulf of Alaska (DoN 2017, 2018, 2019). The coverage of this database, however, is less than the extents of the NOS operational areas, meaning SAR data would still have been needed to fill in large data gaps. While density estimates from SAR abundance may have lower spatial resolution than the Navy Marine Species Database, use of the SAR data is appropriate because they are broadly accurate over the operational area and surveys may occur anywhere within those operational areas.

Table 4 provides a list of densities for each species and each NOS operational area along with the data source for each case.

Table 4. Estimated density of marine mammal species populations grouped by NOS operational region. Density source information from NOAA Stock Assessment Reports (SAR) or Roberts et al. 2018.

Species	Regions	Source	Density (animals/km^2)
Atlantic spotted dolphin	Gulf of Maine	Roberts	5.231E-05
	Georges Bank	Roberts	0.0038
	New England	Roberts	0.0034
	Northeast OCS	Roberts	0.0538
	Mid-Atlantic Bight	Roberts	0.0132
	Gulf of Mexico	Roberts	0.0696
	Southeast Continental Shelf	Roberts	0.0322
	Southeast OCS	Roberts	0.0148
	Atlantic	Roberts	0.0013
Atlantic white-sided dolphin	Gulf of Maine	Roberts	0.1184
	Georges Bank	Roberts	0.0750
	New England	Roberts	0.0374
	Northeast OCS	Roberts	0.0125
	Mid-Atlantic Bight	Roberts	0.0196
	Southeast Continental Shelf	Roberts	0
	Southeast OCS	Roberts	0.0009
	Atlantic	Roberts	0
Baird's beaked whale	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.0022
Bearded seal	Bering	SAR	0.1918
Beluga whale	Beaufort	SAR	0.6623
	Chukchi	SAR	0.0546

Species	Regions	Source	Density (animals/km^2)
	Bering	SAR	0.0117
	Gulf of Alaska (Cook Inlet)	SAR	0.0035
Blainville's beaked whale	Gulf of Maine	Roberts	0
	Georges Bank	Roberts	0.0004
	New England	Roberts	0.0003
	Northeast OCS	Roberts	0.0105
	Mid-Atlantic Bight	Roberts	0.0006
	Gulf of Mexico	Roberts	0.0042
	Southeast Continental Shelf	Roberts	0.0002
	Southeast OCS	Roberts	0.0098
	Atlantic	Roberts	0.0001
	Hawaiian Archipelago	SAR	0.0005
Blue whale	Gulf of Maine, Georges Bank, New England, Northeast OCS, Mid-Atlantic Bight, Southeast Continental Shelf, Southeast OCS, Atlantic	Roberts	9.181E-06
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.0031
	Hawaiian Archipelago	SAR	0.0001
Bowhead whale	Bering, Chukchi, Beaufort	SAR	0.0193
Bryde's whale	Gulf of Maine, Georges Bank, New England	Roberts	0
	Southeast Continental Shelf, Atlantic	Roberts	1.442E-05
	Northeast OCS	Roberts	1.052E-07
	Mid-Atlantic Bight	Roberts	2.797E-07
	Southeast OCS	Roberts	1.294E-05
	Hawaiian Archipelago	SAR	0.0002

Species	Regions	Source	Density (animals/km^2)
California sea lion	Southern California Bight	SAR	21.0738
Clymene dolphin	Gulf of Maine	Roberts	0
	Georges Bank	Roberts	7.747E-08
	New England	Roberts	1.189E-05
	Northeast OCS	Roberts	0.0048
	Mid-Atlantic Bight	Roberts	0.0005
	Gulf of Mexico	Roberts	0.0157
	Southeast Continental Shelf	Roberts	7.523E-05
	Southeast OCS	Roberts	0.0176
	Atlantic	Roberts	5.080E-13
Common bottlenose dolphin	Gulf of Maine	Roberts	0.0011
	Georges Bank	Roberts	0.0222
	New England	Roberts	0.0485
	Northeast OCS	Roberts	0.0467
	Mid-Atlantic Bight	Roberts	0.1855
	Gulf of Mexico	Roberts	0.2015
	Southeast Continental Shelf	Roberts	0.1613
	Southeast OCS	Roberts	0.0218
	Atlantic	Roberts	0.0127
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.0593
	Hawaiian Archipelago	SAR	0.0093
Common minke whale	Gulf of Maine	Roberts	0.0036
	Georges Bank	Roberts	0.0033

Species	Regions	Source	Density (animals/km^2)
	New England, Mid-Atlantic Bight	Roberts	0.0014
	Northeast OCS	Roberts	0.0002
	Southeast Continental Shelf	Roberts	0.0003
	Southeast OCS	Roberts	0.0005
	Atlantic	Roberts	0.0006
	Gulf of Alaska, Aleutians	SAR	0.0059
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.0071
	Bering	SAR	0.0026
Cuvier's beaked whale	Gulf of Maine	Roberts	3.777E-05
	Georges Bank	Roberts	0.0013
	New England	Roberts	0.0007
	Northeast OCS	Roberts	0.0177
	Mid-Atlantic Bight	Roberts	0.0015
	Gulf of Mexico	Roberts	0.0042
	Southeast OCS	Roberts	0.0124
	Atlantic, Southeast Continental Shelf	Roberts	0.0002
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.0061
	Hawaiian Archipelago	SAR	0.0019
Dall's porpoise	SE Alaska, Gulf of Alaska, Aleutians, Bering	SAR	0.0216
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.0027
Dwarf sperm whale	Gulf of Maine	Roberts	0
	Georges Bank	Roberts	6.150E-05

Species	Regions	Source	Density (animals/km^2)
	New England	Roberts	2.691E-05
	Northeast OCS	Roberts	0.0110
	Mid-Atlantic Bight	Roberts	5.325E-05
	Gulf of Mexico	Roberts	0.0031
	Southeast Continental Shelf	Roberts	0.0005
	Southeast OCS	Roberts	0.0123
	Atlantic	Roberts	2.482E-07
False killer whale	Gulf of Maine, Georges Bank, New England, Northeast OCS, Mid-Atlantic Bight, Southeast Continental Shelf, Southeast OCS, Atlantic	Roberts	7.786E-05
	Gulf of Mexico	Roberts	0.0045
	Central/Western Pacific	SAR	0.7380
	Hawaiian Archipelago	SAR	0.0367
	American Samoa	SAR	1.2313
Fin whale	Gulf of Maine	Roberts	0.0060
	Georges Bank	Roberts	0.0071
	New England	Roberts	0.0046
	Northeast OCS	Roberts	0.0008
	Mid-Atlantic Bight	Roberts	0.0044
	Gulf of Mexico	Roberts	1.222E-05
	Southeast Continental Shelf	Roberts	3.583E-05
	Southeast OCS	Roberts	0.0001
	Atlantic	Roberts	3.610E-05
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.0041

Species	Regions	Source	Density (animals/km^2)
	Gulf of Alaska	SAR	0.0021
	Bering	SAR	0.0021
	Hawaiian Archipelago	SAR	0.0001
Fraser's dolphin	Gulf of Maine, Georges Bank, New England	Roberts	0
	Northeast OCS	Roberts	0.0002
	Mid-Atlantic Bight	Roberts	1.654E-05
	Gulf of Mexico	Roberts	0.0023
	Southeast Continental Shelf	Roberts	0.0006
	Southeast OCS	Roberts	0.0010
	Atlantic	Roberts	0.0009
	Hawaiian Archipelago	SAR	1.1226
Gervais' beaked whale	Gulf of Maine	Roberts	0
	Georges Bank	Roberts	0.0004
	New England	Roberts	0.0003
	Northeast OCS	Roberts	0.0105
	Mid-Atlantic Bight	Roberts	0.0006
	Gulf of Mexico	Roberts	0.0042
	Southeast Continental Shelf	Roberts	0.0002
	Southeast OCS	Roberts	0.0098
	Atlantic	Roberts	0.0001
Gray whale	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.0205
	SE Alaska, Gulf of Alaska, Bering, Chukchi, Beaufort	SAR	0.0001
	Aleutians	SAR	4.6947E-05

Species	Regions	Source	Density (animals/km^2)
Gray seal	Gulf of Maine	Roberts	0.0534
	Georges Bank	Roberts	0.0082
	New England	Roberts	0.0404
	Northeast OCS	Roberts	4.634E-06
	Mid-Atlantic Bight	Roberts	0.0085
	Southeast Continental Shelf	Roberts	6.042E-08
	Southeast OCS	Roberts	6.243E-07
	Atlantic	Roberts	0
Guadalupe fur seal	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.0104
Harbor porpoise	Gulf of Maine	Roberts	0.1058
	Georges Bank	Roberts	0.0402
	New England	Roberts	0.0276
	Northeast OCS	Roberts	0.0100
	Mid-Atlantic Bight	Roberts	0.0103
	Southeast Continental Shelf	Roberts	0.0001
	Southeast OCS	Roberts	0.0002
	Atlantic	Roberts	1.827E-06
	Southwest Continental Shelf	SAR	0.0211
	Gulf of Alaska	SAR	0.0138
	Northwest Continental Shelf	SAR	0.0096
	SE Alaska	SAR	0.0038
	Aleutians, Bering	SAR	0.0015
Harbor seal	Gulf of Maine	Roberts	0.0534

Species	Regions	Source	Density (animals/km^2)
	Georges Bank	Roberts	0.0082
	New England	Roberts	0.0404
	Northeast OCS	Roberts	4.634E-06
	Mid-Atlantic Bight	Roberts	0.0085
	Southeast Continental Shelf	Roberts	6.042E-08
	Southeast OCS	Roberts	6.243E-07
	Atlantic	Roberts	0
	SE Alaska	SAR	0.7421
	Gulf of Alaska	SAR	0.6731
	Southern California Bight, Southwest Continental Shelf	SAR	0.2158
	Aleutians	SAR	0.0217
	Bering	SAR	0.0286
Harp seal	Gulf of Maine	Roberts	0.0534
	Georges Bank	Roberts	0.0082
	New England	Roberts	0.0404
	Northeast OCS	Roberts	4.634E-06
	Mid-Atlantic Bight	Roberts	0.0085
	Southeast Continental Shelf	Roberts	6.042E-08
	Southeast OCS	Roberts	6.243E-07
	Atlantic	Roberts	0
Hawaiian monk seal	Hawaiian Archipelago	SAR	0.1264
Hooded seal	Gulf of Maine	Roberts	0.0534
	Georges Bank	Roberts	0.0082
	New England	Roberts	0.0404

Species	Regions	Source	Density (animals/km^2)
	Northeast OCS	Roberts	4.634E-06
	Mid-Atlantic Bight	Roberts	0.0085
	Southeast Continental Shelf	Roberts	6.042E-08
	Southeast OCS	Roberts	6.243E-07
	Atlantic	Roberts	0
Humpback whale	Gulf of Maine	Roberts	0.0038
	Georges Bank	Roberts	0.0034
	New England, Mid-Atlantic Bight	Roberts	0.0017
	Northeast OCS	Roberts	7.286E-05
	Southeast Continental Shelf	Roberts	2.048E-05
	Southeast OCS	Roberts	1.020E-05
	Atlantic	Roberts	6.757E-06
	SE Alaska, Gulf of Alaska, Bering, Aleutians, Hawaiian Archipelago (Central North Pacific)	SAR	0.0019
	SE Alaska, Gulf of Alaska, Bering, Aleutians, Hawaiian Archipelago (Western North Pacific)	SAR	0.0002
	American Samoa (Western North Pacific)	SAR	0.0004
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf (CA/OR/WA)	SAR	0.0019
Long-beaked common dolphin	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.6482
Longman's (Indo-Pacific) beaked whale	Hawaiian Archipelago	SAR	0.0011
Manatee	Gulf of Mexico, Atlantic	SAR	0.0552
	Caribbean	SAR	0.0958

Species	Regions	Source	Density (animals/km^2)
Melon-headed whale	Gulf of Maine, Georges Bank, New England	Roberts	0
	Northeast OCS	Roberts	0.0006
	Mid-Atlantic Bight	Roberts	2.973E-05
	Southeast Continental Shelf	Roberts	0.0014
	Gulf of Mexico	Roberts	0.0097
	Southeast OCS, Atlantic	Roberts	0.0023
	Hawaiian Archipelago	SAR	0.0171
Mesoplodont beaked whales (all)	Gulf of Maine	Roberts	0
	Georges Bank	Roberts	0.0004
	New England	Roberts	0.0003
	Northeast OCS	Roberts	0.0105
	Mid-Atlantic Bight	Roberts	0.0006
	Gulf of Mexico	Roberts	0.0042
	Southeast Continental Shelf	Roberts	0.0002
	Southeast OCS	Roberts	0.0098
	Atlantic	Roberts	0.0001
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.0050
North Atlantic right whale	Gulf of Maine	Roberts	0.0010
	Georges Bank	Roberts	0.0004
	New England	Roberts	0.0013
	Northeast OCS	Roberts	3.343E-07
	Mid-Atlantic Bight	Roberts	0.0007
	Southeast Continental Shelf	Roberts	3.275E-05

Species	Regions	Source	Density (animals/km^2)
	Southeast OCS	Roberts	8.160E-08
	Atlantic	Roberts	6.450E-06
North Pacific right whale	Aleutians, Bering	SAR	4.6716E-05
Northern bottlenose whale	Gulf of Maine, Southeast Continental Shelf, Atlantic	Roberts	0
	Georges Bank	Roberts	1.776E-05
	New England	Roberts	1.750E-05
	Northeast OCS	Roberts	0.0004
	Mid-Atlantic Bight	Roberts	2.149E-05
	Southeast OCS	Roberts	4.123E-05
Northern elephant seal	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf, SE Alaska, Gulf of Alaska, Aleutians	SAR	0.2369
Northern fur seal	SE Alaska, Gulf of Alaska, Aleutians, Bering	SAR	1.8907
	Southern California Bight, Southwest Continental Shelf	SAR	1.6530
Northern right whale dolphin	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.4998
Killer whale, offshore	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.0005
Pacific white-sided dolphin	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.2721
	SE Alaska, Gulf of Alaska, Aleutians	SAR	0.1007
Pantropical spotted dolphin	Gulf of Maine	Roberts	3.190E-09
	Georges Bank	Roberts	6.439E-06
	New England	Roberts	6.948E-06
	Northeast OCS	Roberts	0.0005
	Mid-Atlantic Bight	Roberts	4.113E-05

Species	Regions	Source	Density (animals/km^2)
	Gulf Of Mexico	Roberts	0.1147
	Southeast Continental Shelf	Roberts	0.0025
	Southeast OCS	Roberts	0.0045
	Atlantic	Roberts	0.0022
	Hawaiian Archipelago	SAR	1.0908
Pilot whale, long finned	Gulf of Maine	Roberts	0.0046
	Georges Bank	Roberts	0.0239
	New England	Roberts	0.0234
	Northeast OCS	Roberts	0.0302
	Mid-Atlantic Bight	Roberts	0.0252
	Gulf Of Mexico	Roberts	0.0027
	Southeast Continental Shelf	Roberts	0.0067
	Southeast OCS	Roberts	0.0135
	Atlantic	Roberts	0.0191
Pilot whale, short finned	Gulf of Maine	Roberts	0.0046
	Georges Bank	Roberts	0.0239
	New England	Roberts	0.0234
	Northeast OCS	Roberts	0.0302
	Mid-Atlantic Bight	Roberts	0.0252
	Gulf Of Mexico	Roberts	0.0027
	Southeast Continental Shelf	Roberts	0.0067
	Southeast OCS	Roberts	0.0135
	Atlantic	Roberts	0.0191

Species	Regions	Source	Density (animals/km^2)
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.0013
	Hawaiian Archipelago	SAR	0.0052
Polar bear	Bering, Chukchi	SAR	0.0075
	Beaufort	SAR	0.0134
Pygmy killer whale	Gulf of Mexico	Roberts	0.0030
	Hawaiian Archipelago	SAR	0.1819
Pygmy sperm whale	Gulf of Maine	Roberts	0
	Georges Bank	Roberts	6.150E-05
	New England	Roberts	2.691E-05
	Northeast OCS	Roberts	0.0110
	Mid-Atlantic Bight	Roberts	5.325E-05
	Gulf Of Mexico	Roberts	0.0031
	Southeast Continental Shelf	Roberts	0.0005
	Southeast OCS	Roberts	0.0123
	Atlantic	Roberts	2.482E-07
	Hawaiian Archipelago	SAR	0.7410
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.0320
Killer whale, resident	SE Alaska	SAR	0.0023
	Gulf of Alaska	SAR	0.0036
	Bering	SAR	0.0021
	Aleutians	SAR	0.0008
	Northwest Continental Shelf, Southern California Bight, Southwest Continental Shelf	SAR	0.0001

Species	Regions	Source	Density (animals/km^2)
	Hawaiian Archipelago	SAR	0.0001
Ribbon seal	Gulf of Alaska, Aleutians, Bering, Chukchi, Beaufort	SAR	0.0797
Rice’s whale	Gulf of Mexico	Roberts	6.453E-05
Ringed seal	Bering, Chukchi	SAR	0.0859
Risso's dolphin	Gulf of Maine	Roberts	0.0007
	Georges Bank	Roberts	0.0134
	New England	Roberts	0.0216
	Northeast OCS	Roberts	0.0226
	Mid-Atlantic Bight	Roberts	0.0094
	Gulf of Mexico	Roberts	0.0044
	Southeast Continental Shelf	Roberts	0.0042
	Southeast OCS	Roberts	0.0049
	Atlantic	Roberts	0.0001
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.0095
	Hawaiian Archipelago	SAR	0.0030
Rough-toothed dolphin	Gulf of Maine	Roberts	5.703E-05
	Georges Bank	Roberts	0.0001
	New England	Roberts	0.0002
	Northeast OCS	Roberts	0.0010
	Mid-Atlantic Bight	Roberts	0.0003
	Gulf of Mexico	Roberts	0.0069
	Southeast Continental Shelf	Roberts	0.0020
	Southeast OCS	Roberts	0.0024

Species	Regions	Source	Density (animals/km^2)
	Atlantic	Roberts	0.0021
	Hawaiian Archipelago	SAR	1.3448
Sea otter	Northwest Continental Shelf (WA/OR)	SAR	0.0412
	Southwest Continental Shelf (CA)	SAR	0.0877
	SE Alaska	SAR	0.0746
	Aleutians (SW Alaska)	SAR	0.0425
	Gulf of Alaska (SC Alaska)	SAR	0.0326
Sei whale	Gulf of Maine	Roberts	0.0011
	Georges Bank	Roberts	0.0008
	New England, Mid-Atlantic Bight	Roberts	0.0003
	Northeast OCS	Roberts	0.0004
	Southeast Continental Shelf	Roberts	3.772E-05
	Southeast OCS	Roberts	0.0001
	Atlantic	Roberts	6.363E-05
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.0008
	Hawaiian Archipelago	SAR	0.0002
Short-beaked common dolphin	Gulf of Maine	Roberts	0.0185
	Georges Bank	Roberts	0.2215
	New England	Roberts	0.2575
	Northeast OCS	Roberts	0.0699
	Mid-Atlantic Bight	Roberts	0.1880
	Southeast Continental Shelf	Roberts	0.0008
	Southeast OCS	Roberts	0.0080

Species	Regions	Source	Density (animals/km^2)
	Atlantic	Roberts	0.0005
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.8821
Sowerby's beaked whale	Gulf of Maine	Roberts	0
	Georges Bank	Roberts	0.0004
	New England	Roberts	0.0003
	Northeast OCS	Roberts	0.0105
	Mid-Atlantic Bight	Roberts	0.0006
	Gulf of Mexico	Roberts	0.0042
	Southeast Continental Shelf	Roberts	0.0002
	Southeast OCS	Roberts	0.0098
	Atlantic	Roberts	0.0001
Sperm whale	Gulf of Maine	Roberts	8.513E-05
	Georges Bank	Roberts	0.0012
	New England	Roberts	0.0011
	Northeast OCS	Roberts	0.0090
	Mid-Atlantic Bight	Roberts	0.0007
	Gulf of Mexico	Roberts	0.0030
	Southeast Continental Shelf	Roberts	0.0005
	Southeast OCS	Roberts	0.0055
	Atlantic	Roberts	3.881E-05
	SE Alaska, Gulf of Alaska, Aleutians, Bering, Chukchi, Beaufort	SAR	0.0002
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.0033
	Hawaiian Archipelago	SAR	0.0024

Species	Regions	Source	Density (animals/km^2)
Spinner dolphin	Gulf of Maine	Roberts	0
	Georges Bank	Roberts	5.083E-05
	New England	Roberts	5.967E-05
	Northeast OCS, Southeast OCS, Atlantic	Roberts	0.0004
	Mid-Atlantic Bight	Roberts	4.280E-05
	Gulf of Mexico	Roberts	0.0199
	Southeast Continental Shelf	Roberts	0.0002
	Hawaiian Archipelago	SAR	0.0182
Spotted seal	Aleutians, Bering, Chukchi, Beaufort	SAR	1.0466
Steller sea lion	Northwest Continental Shelf	SAR	0.3796
	SE Alaska, Gulf of Alaska, Aleutians, Bering	SAR	0.0251
Striped dolphin	Gulf of Maine	Roberts	3.828E-05
	Georges Bank	Roberts	0.0093
	New England	Roberts	0.0124
	Northeast OCS	Roberts	0.3297
	Mid-Atlantic Bight	Roberts	0.0091
	Gulf of Mexico	Roberts	0.0070
	Southeast Continental Shelf	Roberts	7.452E-05
	Southeast OCS	Roberts	0.0209
	Atlantic	Roberts	8.165E-06
	Hawaiian Archipelago	SAR	0.9642
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	SAR	0.4281
	Gulf of Maine	Roberts	0

Species	Regions	Source	Density (animals/km^2)
Killer whale, transient	Georges Bank, New England, Northeast OCS, Mid-Atlantic Bight, Southeast Continental Shelf, Southeast OCS, Atlantic	Roberts	8.954E-06
	Gulf of Mexico	Roberts	0.0003
	Northwest Continental Shelf, SE Alaska	SAR	0.0010
	Aleutians	SAR	0.0004
	Gulf of Alaska	SAR	0.0002
	Hawaiian Archipelago	SAR	0.0001
True's beaked whale	Gulf of Maine	Roberts	0
	Georges Bank	Roberts	0.0004
	New England	Roberts	0.0003
	Northeast OCS	Roberts	0.0105
	Mid-Atlantic Bight	Roberts	0.0006
	Gulf of Mexico	Roberts	0.0042
	Southeast Continental Shelf	Roberts	0.0002
	Southeast OCS	Roberts	0.0098
	Atlantic	Roberts	0.0001
Walrus	Aleutians, Bering, Chukchi	SAR	0.0612
White-beaked dolphin	Gulf of Maine, New England	Roberts	8.411E-05
	Georges Bank	Roberts	8.365E-05
	Northeast OCS	Roberts	3.068E-06
	Mid-Atlantic Bight	Roberts	8.247E-05
	Southeast Continental Shelf, Atlantic	Roberts	0
	Southeast OCS	Roberts	5.813E-07

Proposed Alternative Exposure Calculations

The different levels of survey effort for the three alternatives evaluated in the PEIS (described in Sections 2.4, 2.5, and 2.6 of the PEIS) affect the numbers of estimated exposures for each alternative. While NOS did not provide region specific differences in the nautical miles that would be surveyed between the different alternatives, they did provide the total number of nautical miles surveyed under each of the alternatives for each NOS program office by region and depth. It was assumed that the change in survey effort between alternatives would be distributed uniformly across the geographic regions. Only three offices estimated that levels of effort for active acoustic equipment use would be different between the alternatives: Office of Coast Survey (OCS), National Centers for Coastal Ocean Science (NCCOS), and Office of Response and Restoration (ORR). ORR only uses active acoustic equipment operating at frequencies above 200 kHz, so the variation in their survey effort was not included in this analysis. The estimated nautical miles surveyed for OCS and NCCOS in each region for Alternatives B and C were scaled by the percent change in survey effort miles relative to Alternative A for each equipment type used (Table 5).

Table 5. Proposed linear nautical miles of survey effort by alternative for the NOS program offices that reported different levels of effort for active acoustic equipment use between the alternatives. Percentages of miles relative to Alternative A are provided in parentheses.

Category	Alternative A	Alternative B	Alternative C
< 30 kHz	391,623	489,462	587,300
30 – 200 kHz	734,920	885,692	1,036,464

The changes in OCS and NCCOS single beam and multibeam echosounder effort were used to scale the effects of all NOS program office hydroacoustic surveying due to their use of active acoustic sources with operational frequencies between 30 and 200 kHz. The increased nautical miles for the sub-bottom profiler effort in the different alternatives was applied to the acoustic equipment operating below 30 kHz. As can be seen in Table 5, OCS single beam and multibeam effort accounts for the greatest overall effort compared to other equipment or offices. The changes in effort between the alternatives, and therefore exposures, is most heavily influenced by the OCS single beam and multibeam estimates.

Results

Geometric Spreading Loss Model

Ranges to threshold for injurious exposure for each of the marine mammal hearing groups were calculated for each of the sources using the simplified acoustic propagation model of geometric spreading loss (described in Appendix C) (Table 6). Many of the ranges to threshold are negligible (<1 m), and it was determined that further modeling was unnecessary. Sources were considered de minimis if the largest range to impact was less than 10 m. The impact of any source with such short ranges to acoustic criteria thresholds would be related to its presence as either a stationary object or the platform from which it operates, both of which are outside the scope of this analysis. A subset of sources, with operational characteristics representing the full range of frequencies, with ranges >10 m were further analyzed using more sophisticated modeling approaches; see next sections.

Table 6. Range to NMFS 2018 technical guidance injury thresholds based on a geometric spreading loss model.

Type**	Manufacturer	Model	LFC*	MFC*	HFC*	PPW*	OPW*	SI*	de minimis Impact
ADCP	Teledyne	RDI Ocean Surveyor	<1 m	<1 m	92	<1 m	<1 m	<1 m	NO
ADCP	TRDI	Ocean Surveyor	<1 m	1	136	<1 m	<1 m	<1 m	NO
ADCP	Teledyne	Workhorse/Sentinel	<1 m	<1 m	5	<1 m	<1 m	<1 m	YES
ALT		1007- 200m altimeter	<1 m	<1 m	8	<1 m	<1 m	<1 m	YES
Comm	Nortek	AWAC	<1 m	<1 m	<1 m	<1 m	<1 m	<1 m	YES
Comm	Edgetech	Offshore 4410C Trackpoint II	<1 m	<1 m	<1 m	<1 m	<1 m	<1 m	YES
Comm	LinkQuest	TN1505b transponder	<1 m	<1 m	<1 m	<1 m	<1 m	<1 m	YES
Comm	Teledyne	Ore Trackpoint III	<1 m	<1 m	<1 m	<1 m	<1 m	<1 m	YES
Comm	Tracklink	5000 USBL	<1 m	<1 m	<1 m	<1 m	<1 m	<1 m	YES
Comm	Tracklink	TrackLink 1500 HA System	<1 m	<1 m	1	<1 m	<1 m	<1 m	YES
Comm	Tracklink	5000 MA	<1 m	<1 m	<1 m	<1 m	<1 m	<1 m	YES
Comm	ORE	ORE Offshore 4377A	<1 m	<1 m	<1 m	<1 m	<1 m	<1 m	YES
Comm	Benthos	UAT-376 transponders	<1 m	<1 m	<1 m	<1 m	<1 m	<1 m	YES
MBES	Kongsberg	EM124	43	70	3039	45	<1 m	17	NO
MBES	Kongsberg	EM710 Mk1 0.5x1	<1 m	38	549	1	<1 m	<1 m	NO
MBES	Kongsberg	EM710 Mk2 0.5x1	4	85	1131	10	<1 m	3	NO
MBES	Kongsberg	EM710	<1 m	53	610	2	<1 m	<1 m	NO
MBES	Simrad	EM302	<1 m	3	383	<1 m	<1 m	<1 m	NO
MBES	Reson	7125	<1 m	4	341	<1 m	<1 m	<1 m	NO

Type**	Manufacturer	Model	LFC*	MFC*	HFC*	PPW*	OPW*	SI*	de minimis Impact
MBES	Simrad	ME70	<1 m	22	460	<1 m	<1 m	<1 m	NO
MBES	Simrad	EM710	<1 m	33	440	<1 m	<1 m	<1 m	NO
MBES	Teledyne Odom	MB1	<1 m	<1 m	82	<1 m	<1 m	<1 m	NO
SAS	Kongsberg	HISAS 1032	<1 m	1	141	<1 m	<1 m	<1 m	NO
SBES	Teledyne Odom	CV100	<1 m	<1 m	6	<1 m	<1 m	<1 m	NO
SBES	Teledyne Odom	CV200	<1 m	2	169	<1 m	<1 m	<1 m	NO
SBES	Kongsberg	EA 60	1	2	174	1	<1 m	<1 m	NO
SBES	Simrad	ES60	55	83	3301	57	<1 m	21	NO
SBES	Kongsberg	EA 60	<1 m	<1 m	52	<1 m	<1 m	<1 m	NO
SBP	EdgeTech	3200-XS w/ SB-0512i	<1 m	<1 m	<1 m	<1 m	<1 m	<1 m	YES
SBP	Edgetech	Chirp	<1 m	<1 m	5	<1 m	<1 m	6	YES
SBP	Knudsen	320 B/R	<1 m	<1 m	6	<1 m	<1 m	<1 m	NO
SES	Simrad	EK60	9	143	1411	21	<1 m	7	NO
Source	Teledyne	Benthos	<1 m	<1 m	<1 m	<1 m	<1 m	<1 m	YES
Source	Datasonics	DPL-275	<1 m	<1 m	2	<1 m	<1 m	<1 m	YES
Source	Applied Acoustics Engineering	1300A Series Micro Beacon	<1 m	<1 m	<1 m	<1 m	<1 m	<1 m	YES
SSS	Klein	3000	<1 m	9	292	<1 m	<1 m	<1 m	NO

*LFC = Low Frequency Cetaceans; MFC = Mid Frequency Cetaceans; HFC = High Frequency Cetaceans; PPW = Phocid Pinnipeds in Water; OPW = National Centers for Coastal Ocean Science Otariid Pinnipeds in Water; SI = Sirenians

**ADCP = Acoustic Doppler Current Profiler; ALT = Altimeter; Comm = Acoustic Communication System; MBES = Multibeam Echosounder; SAS = Synthetic Aperture Sonar; SBES = Single Beam Echosounder; SBP = Sub Bottom Profiler; SES = Scientific Echosounder; Source = Beacon/pinger; SSS = Side Scan Sonar

3D Cumulative Acoustic Modeling

After eliminating the de minimis sources from further evaluation, eight sources, representing the different frequency bands of the sources for which the geometric spreading loss calculations resulted in the greatest ranges under the source and operational conditions provided by NOS offices (Table 3), were modeled using JASCO's Bellhop raytracing implementation (Appendix C). These models were run at 57 locations within the geographic region NOS proposes active acoustic survey operations. In each of the regions, up to four source locations were selected representing a depth regime of shallow, mid-depth, deep, and very deep (Table 2). At each of the 57 locations, acoustic propagation models were run for the corresponding to the different source frequencies of the representative sources (Table 3). Seasonal sound velocity profiles were selected to represent a variety of conditions with one to four profiles based on variability of the sound velocity profile (Teague et al. 1990, Carnes 2009) at a location. Examples of the range dependent one-second, sound exposure levels for four sources along their major axes are provided in Figures 4 through 7 for the different hearing group weightings. The variation in the received level as a function of range and depth is represented by color. The directionality of the source, frequency content of the signal, depth of the water, and weighting function applied all play a role in the propagation loss predicted. These plots represent point in time models and do not indicate ranges to criteria thresholds. These model results were used as inputs to the animal movement modeling.

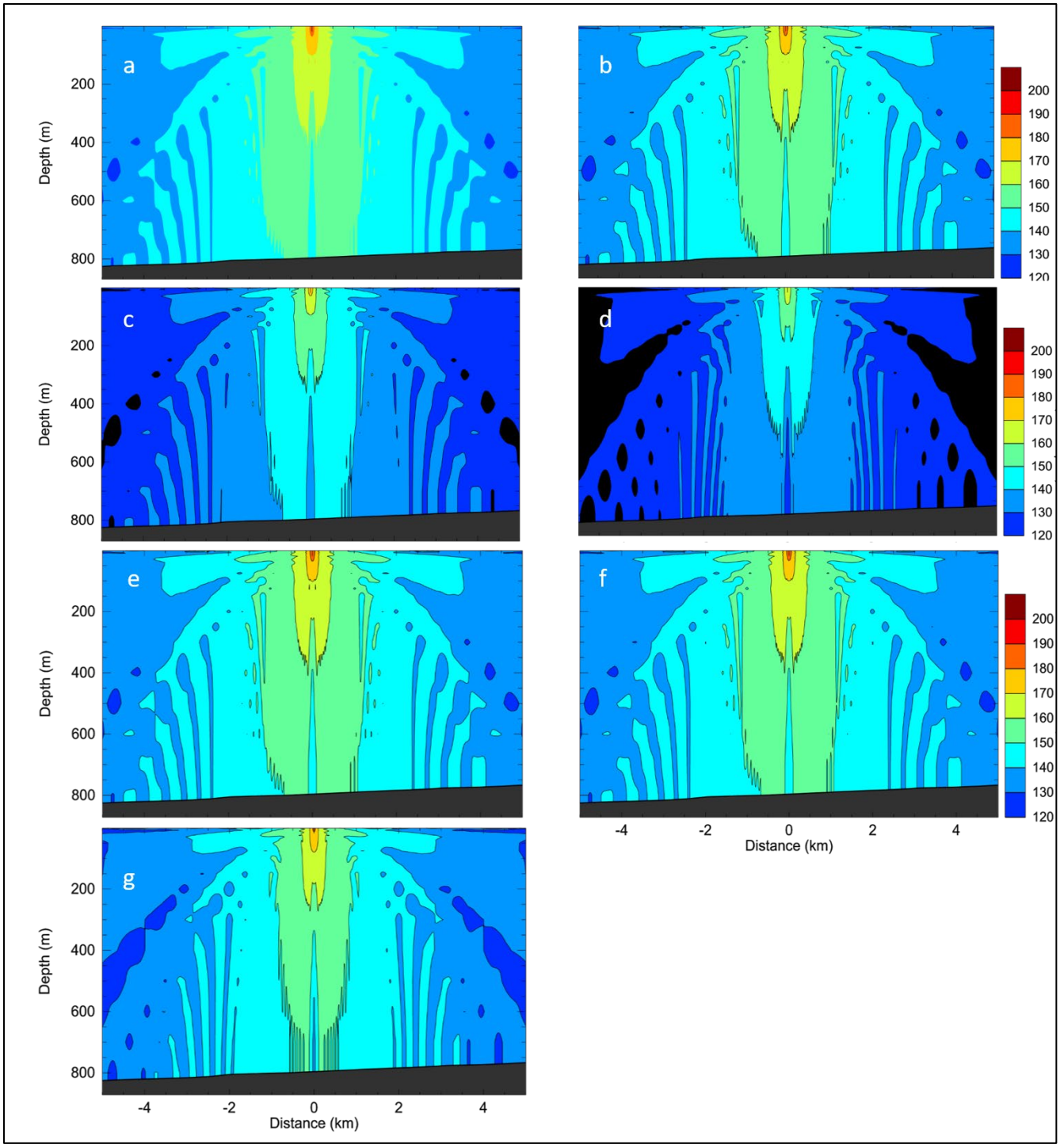

Figure 4. Knudsen 320 B/R 3.5 kHz sound exposure level at the Atlantic (24.821°N, -79.9265°E) across-track modeling site in deep water. a) Unweighted b) LF weighted c) MF weighted d) HF weighted e) OPW weighted f) PPW weighted g) SI weighted.

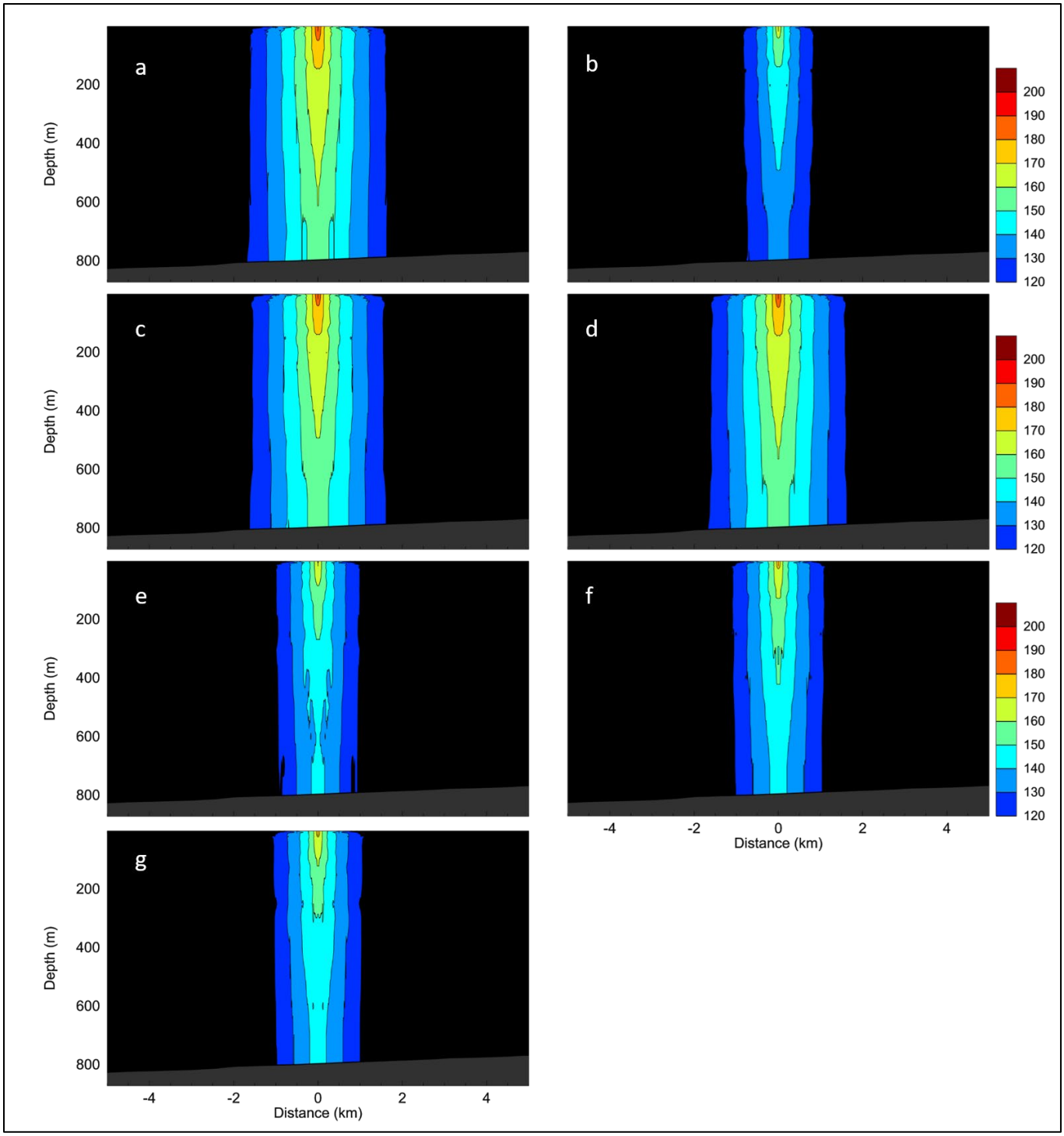

Figure 5. Kongsberg EM710 at 70 kHz sound exposure level at the Atlantic (24.821°N, -79.9265°E) across-track modeling site in deep water. a) Unweighted b) LF weighted c) MF weighted d) HF weighted e) OPW weighted f) PPW weighted g) SI weighted.

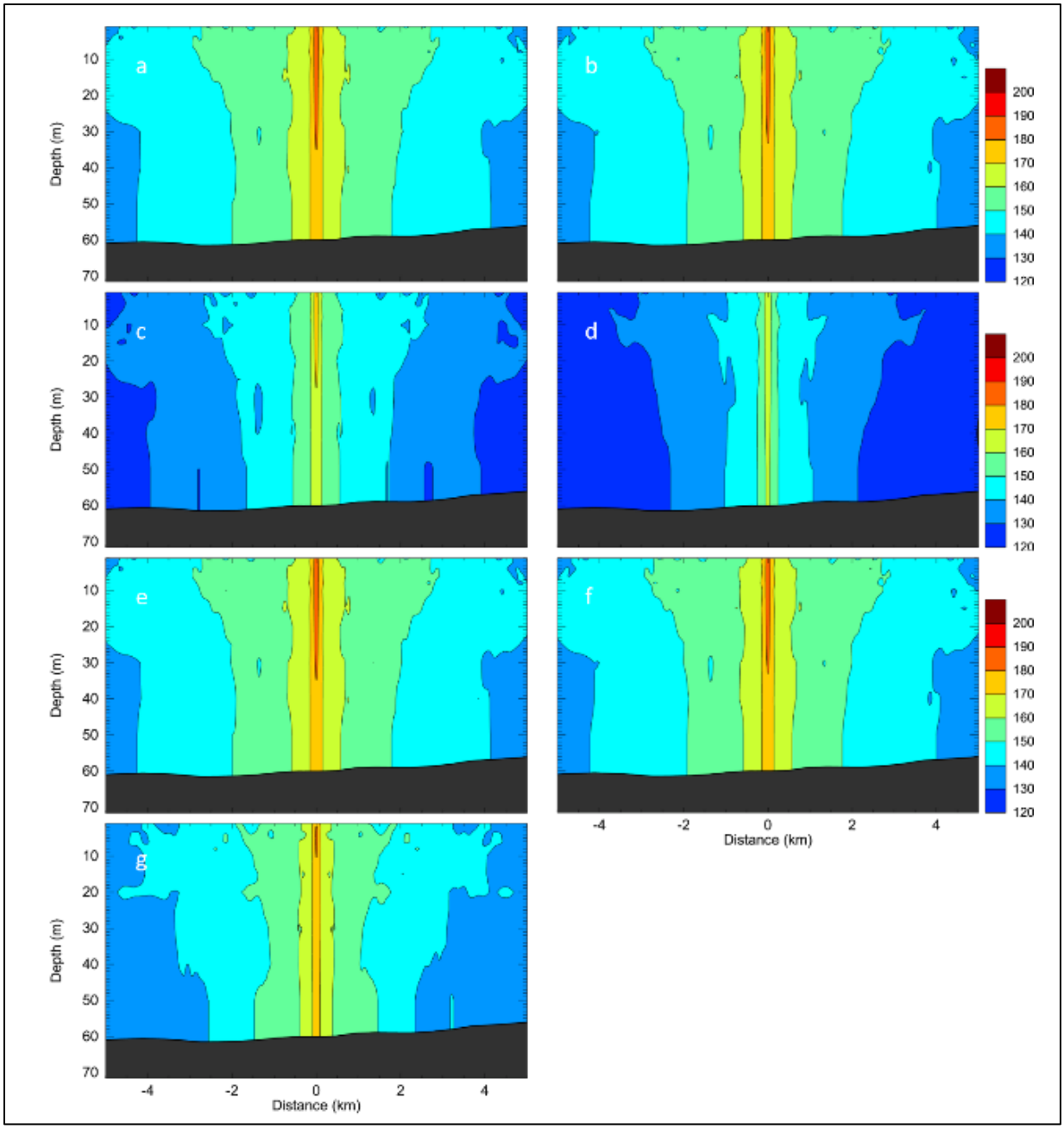

Figure 6. Knudsen 320 B/R 3.5 kHz sound exposure level at the Atlantic (24.5390°N, -80.7623°E) across-track modeling site in mid-depth water. a) Unweighted b) LF weighted c) MF weighted d) HF weighted e) OPW weighted f) PPW weighted g) SI weighted.

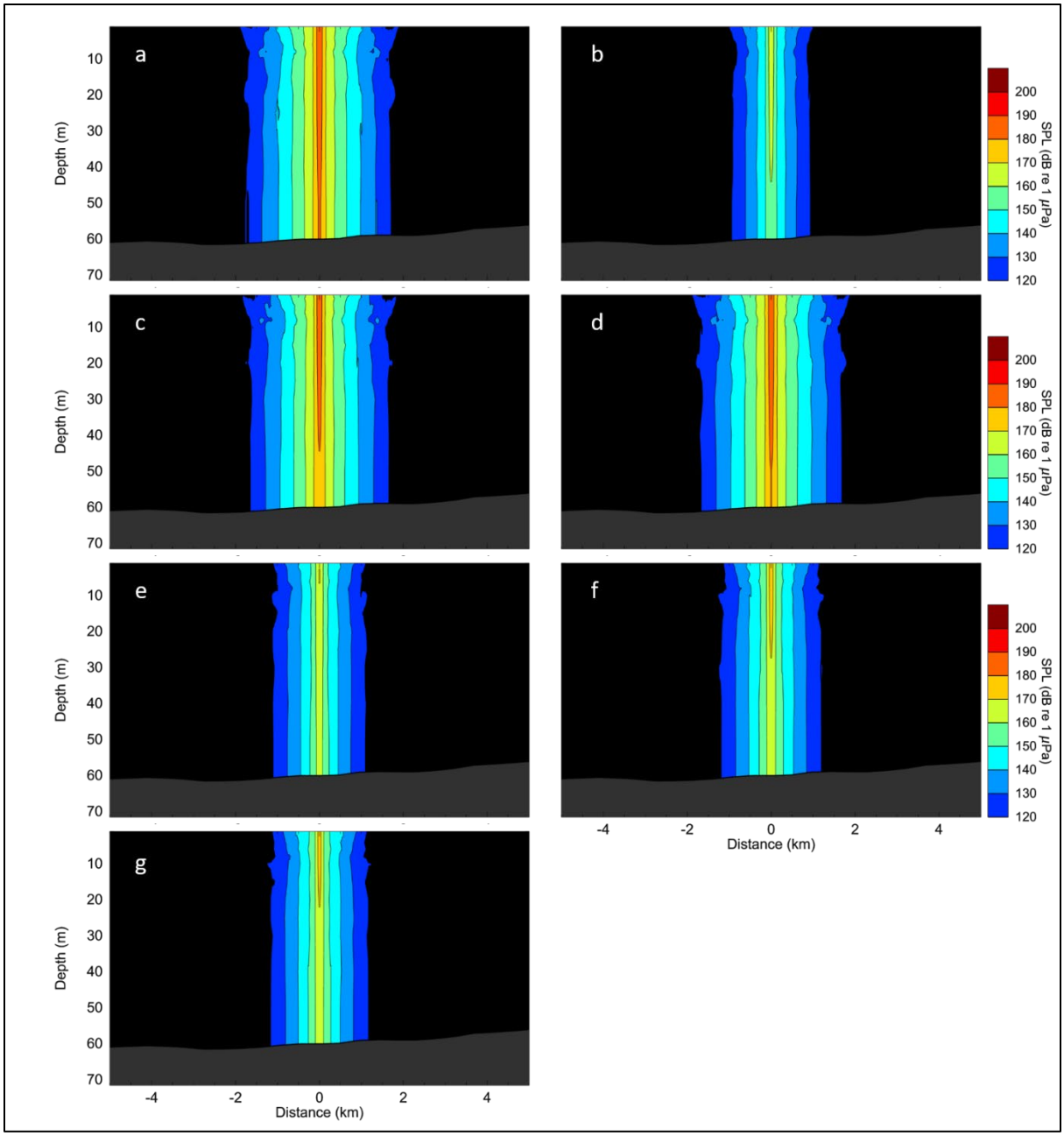

Figure 7. Kongsberg EM710 at 70 kHz sound exposure level at the Atlantic (24.5390°N, -80.7623°E) across-track modeling site in mid-depth water. a) Unweighted b) LF weighted c) MF weighted d) HF weighted e) OPW weighted f) PPW weighted g) SI weighted.

Cumulative exposure ranges were calculated by adding the propagation results from a point source along a track. The sound fields were weighted according to the hearing group weighting functions and evaluated against non-impulsive threshold criteria (NMFS 2018). Ranges to cumulative exposure thresholds for non-impulsive criteria for low-frequency cetaceans, mid-frequency cetaceans, phocid pinnipeds, and other carnivores were less than 10 m for all sources even under the most conservative use cases.

Animal Movement Modeling

Simulations representing 72 hours of continuous NOS survey activities were conducted using sound fields generated from the 3-D acoustic propagation modeling. Simulations were conducted in five regions, Alaska, the East Coast, the Gulf of Mexico, the West Coast, and Hawaii for representative acoustic sources.

For most species, no injurious exposures were estimated at any range. In Tables 7 through 11, results for most species that can possibly be exposed above Injury criteria suggest that zero percent of the individuals within a simulation are exposed above the Injury threshold once scaled by the real-world population densities. For many of the species with exposures above the Injury threshold, criteria were exceeded but only if the animats were within 12 m of the source. Of the exposures above the Injury threshold at greater ranges, all were for high-frequency cetaceans (harbor and Dall's porpoises, and pygmy and dwarf sperm whales). The exposure ranges for these species was up to 154 m.

Exposures exceeding the behavioral disruption threshold were estimated for many more species. Ranges to these thresholds were limited to <300 m for most species. Some deep diving species, sperm whales and beaked whales, had exposure ranges up to 675 m including depth. This occurred when animats were within the main beam directly below the source but at limited horizontal range.

Table 7. Distance (Range) to Injury and Behavioral Exposure results for animal movement simulations in Alaskan waters. Percent of the simulated individuals and ranges to exposure for each species and source type for injury and behavioral criteria are presented.

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Blue whale	Knudsen 320 B/R	0.00%	0	0.18%	135
Blue whale	Kongsberg EM710	0.00%	0	0.11%	195
Blue whale	Simard ES60	0.00%	0	0.34%	199
Fin whale	Knudsen 320 B/R	0.00%	0	0.48%	131
Fin whale	Kongsberg EM710	0.00%	0	0.19%	70
Fin whale	Simard ES60	0.00%	0	0.64%	170
Humpback whale	Knudsen 320 B/R	0.00%	0	3.65%	194
Humpback whale	Kongsberg EM710	0.00%	0	1.76%	124
Humpback whale	Simard ES60	0.00%	0	4.91%	267
Common minke whale	Knudsen 320 B/R	0.00%	0	0.23%	155
Common minke whale	Kongsberg EM710	0.00%	0	0.25%	229
Common minke whale	Simard ES60	0.00%	0	0.32%	191
North Pacific right whale	Knudsen 320 B/R	0.00%	0	0.46%	126
North Pacific right whale	Kongsberg EM710	0.00%	0	0.54%	212
North Pacific right whale	Simard ES60	0.00%	0	0.74%	178

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Sei whale	Knudsen 320 B/R	0.00%	0	0.39%	125
Sei whale	Kongsberg EM710	0.00%	0	0.45%	233
Sei whale	Simard ES60	0.00%	0	0.49%	172
Baird's beaked whale	Knudsen 320 B/R	0.00%	0	0.53%	135
Baird's beaked whale	Kongsberg EM710	0.00%	0	0.31%	195
Baird's beaked whale	Simard ES60	0.00%	0	0.96%	199
Beaked whales (guild)	Knudsen 320 B/R	0.00%	0	0.53%	135
Beaked whales (guild)	Kongsberg EM710	0.00%	0	0.31%	195
Beaked whales (guild)	Simard ES60	0.00%	0	0.96%	199
Beluga whale	Knudsen 320 B/R	0.00%	0	0.67%	135
Beluga whale	Kongsberg EM710	0.00%	0	0.71%	211
Beluga whale	Simard ES60	0.00%	0	0.97%	186
Blainville's beaked whale	Knudsen 320 B/R	0.00%	0	0.98%	140
Blainville's beaked whale	Kongsberg EM710	0.00%	0	0.55%	199
Blainville's beaked whale	Simard ES60	0.00%	0	1.44%	181
Common bottlenose dolphin	Knudsen 320 B/R	0.00%	0	0.49%	147
Common bottlenose dolphin	Kongsberg EM710	0.00%	0	0.54%	223
Common bottlenose dolphin	Simard ES60	0.00%	0	0.62%	197
Killer whale	Knudsen 320 B/R	0.00%	0	0.67%	149
Killer whale	Kongsberg EM710	0.00%	0	0.52%	216
Killer whale	Simard ES60	0.00%	0	0.73%	171
Mesoplodont whales	Knudsen 320 B/R	0.00%	0	0.29%	143
Mesoplodont whales	Kongsberg EM710	0.00%	0	0.18%	142
Mesoplodont whales	Simard ES60	0.00%	0	0.44%	181
Pacific white-sided dolphin	Knudsen 320 B/R	0.00%	0	0.49%	147

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Pacific white-sided dolphin	Kongsberg EM710	0.00%	0	0.54%	223
Pacific white-sided dolphin	Simard ES60	0.00%	0	0.62%	197
Sperm whale	Knudsen 320 B/R	0.00%	0	0.22%	153
Sperm whale	Kongsberg EM710	0.00%	0	0.12%	966
Sperm whale	Simard ES60	0.00%	0	0.35%	198
Stejneger's beaked whale	Knudsen 320 B/R	0.00%	0	0.53%	135
Stejneger's beaked whale	Kongsberg EM710	0.00%	0	0.31%	195
Stejneger's beaked whale	Simard ES60	0.00%	0	0.96%	199
Dall's porpoise	Knudsen 320 B/R	0.08%	19	1.12%	126
Dall's porpoise	Kongsberg EM710	0.02%	18	0.66%	168
Dall's porpoise	Simard ES60	0.02%	12	1.53%	177
Harbor porpoise	Knudsen 320 B/R	0.07%	27	0.11%	148
Harbor porpoise	Kongsberg EM710	0.05%	26	0.36%	86
Harbor porpoise	Simard ES60	0.01%	18	0.12%	146
Harbor seal	Knudsen 320 B/R	0.00%	0	2.67%	188
Harbor seal	Kongsberg EM710	0.00%	0	0.98%	60
Harbor seal	Simard ES60	0.00%	0	2.95%	255
Northern fur seal	Knudsen 320 B/R	0.00%	0	2.99%	203
Northern fur seal	Kongsberg EM710	0.00%	0	1.09%	66
Northern fur seal	Simard ES60	0.00%	0	3.52%	240
Ribbon seal	Knudsen 320 B/R	0.00%	0	2.91%	209
Ribbon seal	Kongsberg EM710	0.00%	0	0.97%	61
Ribbon seal	Simard ES60	0.00%	0	3.22%	240
Sea otter	Knudsen 320 B/R	0.00%	0	10.29%	180
Sea otter	Kongsberg EM710	0.00%	0	4.10%	54
Sea otter	Simard ES60	0.00%	0	12.01%	249
Spotted seal	Knudsen 320 B/R	0.00%	0	2.91%	209

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Spotted seal	Kongsberg EM710	0.00%	0	0.97%	61
Spotted seal	Simard ES60	0.00%	0	3.22%	240
Walrus	Knudsen 320 B/R	0.00%	0	1.47%	179
Walrus	Kongsberg EM710	0.00%	0	0.48%	69
Walrus	Simard ES60	0.00%	0	1.87%	268

Table 8. Distance (Range) to Injury and Behavioral Exposure results for animal movement simulations off the East Coast of the U.S.Percent of the simulated individuals and ranges to exposure for each species and source type for injury and behavioral criteria are presented.

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Blue whale	Knudsen 320 B/R	0.00%	0	2.04%	136
Blue whale	Kongsberg EM710	0.00%	0	1.78%	201
Blue whale	Simard ES60	0.00%	0	2.90%	188
Bryde's whale	Knudsen 320 B/R	0.00%	0	1.28%	199
Bryde's whale	Kongsberg EM710	0.00%	0	1.30%	201
Bryde's whale	Simard ES60	0.00%	0	1.42%	249
Fin whale	Knudsen 320 B/R	0.00%	0	3.62%	217
Fin whale	Kongsberg EM710	0.00%	0	1.18%	83
Fin whale	Simard ES60	0.00%	0	4.88%	283
Humpback whale	Knudsen 320 B/R	0.00%	0	3.60%	214
Humpback whale	Kongsberg EM710	0.00%	0	2.90%	271
Humpback whale	Simard ES60	0.00%	0	4.94%	278
Common minke whale	Knudsen 320 B/R	0.00%	0	4.45%	196

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Common minke whale	Kongsberg EM710	0.00%	0	3.41%	202
Common minke whale	Simard ES60	0.00%	0	6.10%	274
North Atlantic right whale	Knudsen 320 B/R	0.00%	0	4.65%	219
North Atlantic right whale	Kongsberg EM710	0.00%	0	3.50%	261
North Atlantic right whale	Simard ES60	0.00%	0	5.79%	280
Sei whale	Knudsen 320 B/R	0.00%	0	4.70%	225
Sei whale	Kongsberg EM710	0.00%	0	3.54%	263
Sei whale	Simard ES60	0.00%	0	6.43%	272
Atlantic spotted dolphin	Knudsen 320 B/R	0.00%	0	3.62%	211
Atlantic spotted dolphin	Kongsberg EM710	0.00%	0	2.90%	253
Atlantic spotted dolphin	Simard ES60	0.00%	0	5.14%	274
Atlantic white-sided dolphin	Knudsen 320 B/R	0.00%	0	3.42%	206
Atlantic white-sided dolphin	Kongsberg EM710	0.00%	0	3.10%	254
Atlantic white-sided dolphin	Simard ES60	0.00%	0	4.65%	267
Blainville's beaked whale	Knudsen 320 B/R	0.00%	0	2.10%	154
Blainville's beaked whale	Kongsberg EM710	0.00%	0	2.18%	232
Blainville's beaked whale	Simard ES60	0.00%	0	3.17%	193
Clymene dolphin	Knudsen 320 B/R	0.00%	0	1.29%	143
Clymene dolphin	Kongsberg EM710	0.00%	0	1.35%	246
Clymene dolphin	Simard ES60	0.00%	0	1.80%	186

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Common bottlenose dolphin	Knudsen 320 B/R	0.00%	0	4.68%	221
Common bottlenose dolphin	Kongsberg EM710	0.00%	0	3.21%	229
Common bottlenose dolphin	Simard ES60	0.00%	0	6.21%	279
False killer whale	Knudsen 320 B/R	0.00%	0	1.68%	152
False killer whale	Kongsberg EM710	0.00%	0	1.33%	240
False killer whale	Simard ES60	0.00%	0	2.27%	194
Fraser's dolphin	Knudsen 320 B/R	0.00%	0	2.15%	141
Fraser's dolphin	Kongsberg EM710	0.00%	0	1.57%	208
Fraser's dolphin	Simard ES60	0.00%	0	2.66%	186
Killer whale	Knudsen 320 B/R	0.00%	0	1.32%	145
Killer whale	Kongsberg EM710	0.00%	0	1.39%	272
Killer whale	Simard ES60	0.00%	0	1.90%	200
Melon-headed whale	Knudsen 320 B/R	0.00%	0	1.43%	146
Melon-headed whale	Kongsberg EM710	0.00%	0	1.45%	225
Melon-headed whale	Simard ES60	0.00%	0	2.00%	194
Mesoplodont whales	Knudsen 320 B/R	0.00%	0	1.89%	125
Mesoplodont whales	Kongsberg EM710	0.00%	0	1.71%	220
Mesoplodont whales	Simard ES60	0.00%	0	2.43%	192
Northern bottlenose whale	Knudsen 320 B/R	0.00%	0	2.36%	136
Northern bottlenose whale	Kongsberg EM710	0.00%	0	2.06%	201
Northern bottlenose whale	Simard ES60	0.00%	0	3.36%	188

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Pantropical spotted dolphin	Knudsen 320 B/R	0.00%	0	1.62%	134
Pantropical spotted dolphin	Kongsberg EM710	0.00%	0	1.42%	214
Pantropical spotted dolphin	Simard ES60	0.00%	0	2.10%	185
Pilot whales	Knudsen 320 B/R	0.00%	0	1.55%	143
Pilot whales	Kongsberg EM710	0.00%	0	1.63%	246
Pilot whales	Simard ES60	0.00%	0	2.17%	186
Risso's dolphin	Knudsen 320 B/R	0.00%	0	3.21%	187
Risso's dolphin	Kongsberg EM710	0.00%	0	3.01%	252
Risso's dolphin	Simard ES60	0.00%	0	4.92%	272
Rough-toothed dolphin	Knudsen 320 B/R	0.00%	0	4.56%	221
Rough-toothed dolphin	Kongsberg EM710	0.00%	0	3.13%	229
Rough-toothed dolphin	Simard ES60	0.00%	0	6.06%	279
Short-beaked common dolphin	Knudsen 320 B/R	0.00%	0	1.51%	163
Short-beaked common dolphin	Kongsberg EM710	0.00%	0	1.41%	196
Short-beaked common dolphin	Simard ES60	0.00%	0	1.74%	213
Short-finned pilot whale	Knudsen 320 B/R	0.00%	0	2.52%	229
Short-finned pilot whale	Kongsberg EM710	0.00%	0	2.48%	273
Short-finned pilot whale	Simard ES60	0.00%	0	2.81%	254
Sperm whale	Knudsen 320 B/R	0.00%	0	2.52%	135
Sperm whale	Kongsberg EM710	0.00%	0	2.10%	205
Sperm whale	Simard ES60	0.00%	0	3.15%	185

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Spinner dolphin	Knudsen 320 B/R	0.00%	0	2.09%	138
Spinner dolphin	Kongsberg EM710	0.00%	0	1.99%	220
Spinner dolphin	Simard ES60	0.00%	0	3.24%	190
Striped dolphin	Knudsen 320 B/R	0.00%	0	3.60%	209
Striped dolphin	Kongsberg EM710	0.00%	0	2.39%	227
Striped dolphin	Simard ES60	0.00%	0	5.01%	270
Dwarf sperm whale	Knudsen 320 B/R	0.11%	2	2.44%	131
Dwarf sperm whale	Kongsberg EM710	0.07%	17	1.91%	204
Dwarf sperm whale	Simard ES60	0.07%	32	3.33%	169
Harbor porpoise	Knudsen 320 B/R	0.49%	39	0.59%	223
Harbor porpoise	Kongsberg EM710	0.18%	28	1.47%	77
Harbor porpoise	Simard ES60	0.00%	0	0.61%	281
Pygmy sperm whale	Knudsen 320 B/R	0.11%	2	0.73%	151
Pygmy sperm whale	Kongsberg EM710	0.07%	17	0.84%	250
Pygmy sperm whale	Simard ES60	0.07%	32	1.14%	199
Gray seal	Knudsen 320 B/R	0.00%	0	1.54%	211
Gray seal	Kongsberg EM710	0.00%	0	1.52%	282
Gray seal	Simard ES60	0.00%	0	1.68%	280
Harbor seal	Knudsen 320 B/R	0.00%	0	3.10%	210
Harbor seal	Kongsberg EM710	0.00%	0	2.81%	288
Harbor seal	Simard ES60	0.00%	0	3.44%	270
Harp seal	Knudsen 320 B/R	0.00%	0	3.03%	210
Harp seal	Kongsberg EM710	0.00%	0	2.75%	288

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Harp seal	Simard ES60	0.00%	0	3.37%	270
Hooded seal	Knudsen 320 B/R	0.00%	0	4.48%	225
Hooded seal	Kongsberg EM710	0.00%	0	4.48%	276
Hooded seal	Simard ES60	0.00%	0	4.88%	266
Manatee	Knudsen 320 B/R	0.00%	0	2.87%	225
Manatee	Kongsberg EM710	0.00%	0	2.41%	276
Manatee	Simard ES60	0.00%	0	3.06%	266

Table 9. Distance (Range) to Injury and Behavioral Exposure results for animal movement simulations in the Gulf of Mexico. Percent of the simulated individuals and ranges to exposure for each species and source type for injury and behavioral criteria are presented.

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Rice's whale	Knudsen 320 B/R	0.00%	0	2.05%	137
Rice's whale	Kongsberg EM710	0.00%	0	2.12%	219
Rice's whale	Simard ES60	0.00%	0	3.31%	215
Atlantic spotted dolphin	Knudsen 320 B/R	0.00%	0	1.46%	112
Atlantic spotted dolphin	Kongsberg EM710	0.00%	0	1.50%	201
Atlantic spotted dolphin	Simard ES60	0.00%	0	1.70%	197
Blainville's beaked whale	Knudsen 320 B/R	0.00%	0	1.93%	140
Blainville's beaked whale	Kongsberg EM710	0.00%	0	1.70%	207

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Blainville's beaked whale	Kongsberg EM710	0.00%	0	1.33%	180
Blainville's beaked whale	Simard ES60	0.00%	0	2.71%	172
Blainville's beaked whale	Simard ES60	0.00%	0	2.77%	178
Clymene dolphin	Knudsen 320 B/R	0.00%	0	2.05%	198
Clymene dolphin	Kongsberg EM710	0.00%	0	1.95%	131
Clymene dolphin	Simard ES60	0.00%	0	1.75%	227
Common bottlenose dolphin	Knudsen 320 B/R	0.00%	0	2.46%	142
Common bottlenose dolphin	Kongsberg EM710	0.00%	0	2.57%	215
Common bottlenose dolphin	Simard ES60	0.00%	0	3.76%	205
Cuvier’s beaked whale	Knudsen 320 B/R	0.00%	0	1.51%	128
Cuvier’s beaked whale	Kongsberg EM710	0.00%	0	0.47%	126
Cuvier’s beaked whale	Simard ES60	0.00%	0	2.28%	180
False killer whale	Knudsen 320 B/R	0.00%	0	2.47%	180
False killer whale	Kongsberg EM710	0.00%	0	1.95%	117
False killer whale	Simard ES60	0.00%	0	1.59%	204
Fraser's dolphin	Knudsen 320 B/R	0.00%	0	0.35%	131
Fraser's dolphin	Kongsberg EM710	0.00%	0	0.46%	215
Fraser's dolphin	Simard ES60	0.00%	0	0.68%	205
Killer whale	Knudsen 320 B/R	0.00%	0	1.70%	207
Killer whale	Kongsberg EM710	0.00%	0	2.23%	199
Killer whale	Simard ES60	0.00%	0	1.44%	154
Melon-headed whale	Knudsen 320 B/R	0.00%	0	1.62%	260
Melon-headed whale	Kongsberg EM710	0.00%	0	2.71%	172
Melon-headed whale	Simard ES60	0.00%	0	1.95%	131

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Pantropical spotted dolphin	Knudsen 320 B/R	0.00%	0	1.64%	229
Pantropical spotted dolphin	Kongsberg EM710	0.00%	0	1.92%	185
Pantropical spotted dolphin	Simard ES60	0.00%	0	1.38%	118
Pilot whales	Knudsen 320 B/R	0.00%	0	1.75%	227
Pilot whales	Kongsberg EM710	0.00%	0	1.92%	185
Pilot whales	Simard ES60	0.00%	0	1.16%	117
Pygmy killer whale	Knudsen 320 B/R	0.00%	0	2.08%	208
Pygmy killer whale	Kongsberg EM710	0.00%	0	2.05%	198
Pygmy killer whale	Simard ES60	0.00%	0	1.25%	138
Risso's dolphin	Knudsen 320 B/R	0.00%	0	1.35%	114
Risso's dolphin	Kongsberg EM710	0.00%	0	1.53%	229
Risso's dolphin	Simard ES60	0.00%	0	1.88%	210
Rough-toothed dolphin	Knudsen 320 B/R	0.00%	0	2.42%	226
Rough-toothed dolphin	Kongsberg EM710	0.00%	0	2.03%	232
Rough-toothed dolphin	Simard ES60	0.00%	0	2.58%	252
Short-finned pilot whale	Knudsen 320 B/R	0.00%	0	1.72%	167
Short-finned pilot whale	Kongsberg EM710	0.00%	0	1.20%	144
Short-finned pilot whale	Simard ES60	0.00%	0	0.54%	178
Sperm whale	Knudsen 320 B/R	0.00%	0	0.74%	132
Sperm whale	Kongsberg EM710	0.00%	0	1.08%	230
Sperm whale	Simard ES60	0.00%	0	1.47%	212
Spinner dolphin	Knudsen 320 B/R	0.00%	0	2.42%	140
Spinner dolphin	Kongsberg EM710	0.00%	0	2.08%	218

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Spinner dolphin	Simard ES60	0.00%	0	4.04%	212
Striped dolphin	Knudsen 320 B/R	0.00%	0	2.12%	132
Striped dolphin	Kongsberg EM710	0.00%	0	2.21%	224
Striped dolphin	Simard ES60	0.00%	0	3.23%	209
Dwarf sperm whale	Knudsen 320 B/R	0.05%	5	2.77%	173
Dwarf sperm whale	Kongsberg EM710	0.00%	0	1.25%	138
Dwarf sperm whale	Simard ES60	0.03%	35	1.42%	192
Pygmy sperm whale	Knudsen 320 B/R	0.03%	7	2.80%	223
Pygmy sperm whale	Kongsberg EM710	0.00%	0	2.84%	181
Pygmy sperm whale	Simard ES60	0.03%	35	1.83%	129
Manatee	Knudsen 320 B/R	0.00%	0	1.58%	131
Manatee	Kongsberg EM710	0.00%	0	0.94%	161
Manatee	Simard ES60	0.00%	0	2.37%	187

Table 10. Exposure results for animal movement simulations off Hawaii. Percent of the simulated individuals and ranges to exposure for each species and source type for injury and behavioral criteria are presented.

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Blue whale	Knudsen 320 B/R	0.00%	0	0.17%	137
Blue whale	Kongsberg EM710	0.00%	0	0.18%	231
Blue whale	Simard ES60	0.00%	0	0.28%	205
Bryde's whale	Knudsen 320 B/R	0.00%	0	0.45%	116
Bryde's whale	Kongsberg EM710	0.00%	0	0.79%	231
Bryde's whale	Simard ES60	0.00%	0	1.10%	197
Fin whale	Knudsen 320 B/R	0.00%	0	1.51%	141

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Fin whale	Kongsberg EM710	0.00%	0	1.56%	204
Fin whale	Simard ES60	0.00%	0	2.11%	202
Humpback whale	Knudsen 320 B/R	0.00%	0	7.66%	138
Humpback whale	Kongsberg EM710	0.00%	0	5.01%	211
Humpback whale	Simard ES60	0.00%	0	8.63%	179
Common minke whale	Knudsen 320 B/R	0.00%	0	2.75%	124
Common minke whale	Kongsberg EM710	0.00%	0	3.35%	224
Common minke whale	Simard ES60	0.00%	0	4.87%	204
Sei whale	Knudsen 320 B/R	0.00%	0	0.44%	126
Sei whale	Kongsberg EM710	0.00%	0	0.53%	221
Sei whale	Simard ES60	0.00%	0	0.63%	200
Blainville's beaked whale	Knudsen 320 B/R	0.00%	0	0.56%	205
Blainville's beaked whale	Kongsberg EM710	0.00%	0	0.37%	215
Blainville's beaked whale	Simard ES60	0.00%	0	0.29%	131
Common bottlenose dolphin	Knudsen 320 B/R	0.00%	0	1.11%	137
Common bottlenose dolphin	Kongsberg EM710	0.00%	0	1.09%	197
Common bottlenose dolphin	Simard ES60	0.00%	0	1.97%	210
False killer whale	Knudsen 320 B/R	0.00%	0	0.16%	142
False killer whale	Kongsberg EM710	0.00%	0	0.15%	214
False killer whale	Simard ES60	0.00%	0	0.29%	197

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Fraser's dolphin	Knudsen 320 B/R	0.00%	0	0.20%	134
Fraser's dolphin	Kongsberg EM710	0.00%	0	0.13%	208
Fraser's dolphin	Simard ES60	0.00%	0	0.21%	161
Killer whale	Knudsen 320 B/R	0.00%	0	0.24%	134
Killer whale	Kongsberg EM710	0.00%	0	0.24%	208
Killer whale	Simard ES60	0.00%	0	0.41%	197
Longman's (Indo-Pacific) beaked whale	Knudsen 320 B/R	0.00%	0	0.23%	144
Longman's (Indo-Pacific) beaked whale	Kongsberg EM710	0.00%	0	0.21%	242
Longman's (Indo-Pacific) beaked whale	Simard ES60	0.00%	0	0.31%	185
Melon-headed whale	Knudsen 320 B/R	0.00%	0	0.55%	120
Melon-headed whale	Kongsberg EM710	0.00%	0	0.70%	214
Melon-headed whale	Simard ES60	0.00%	0	0.94%	203
Pantropical spotted dolphin	Knudsen 320 B/R	0.00%	0	0.13%	126
Pantropical spotted dolphin	Kongsberg EM710	0.00%	0	0.19%	227
Pantropical spotted dolphin	Simard ES60	0.00%	0	0.29%	209
Pilot whales (guild)	Knudsen 320 B/R	0.00%	0	1.38%	120
Pilot whales (guild)	Kongsberg EM710	0.00%	0	1.49%	209
Pilot whales (guild)	Simard ES60	0.00%	0	2.30%	201
Pygmy killer whale	Knudsen 320 B/R	0.00%	0	1.18%	130

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Pygmy killer whale	Kongsberg EM710	0.00%	0	0.98%	206
Pygmy killer whale	Simard ES60	0.00%	0	1.57%	201
Risso's dolphin	Knudsen 320 B/R	0.00%	0	3.26%	141
Risso's dolphin	Kongsberg EM710	0.00%	0	2.85%	228
Risso's dolphin	Simard ES60	0.00%	0	3.88%	185
Rough-toothed dolphin	Knudsen 320 B/R	0.00%	0	1.72%	140
Rough-toothed dolphin	Kongsberg EM710	0.00%	0	1.47%	213
Rough-toothed dolphin	Simard ES60	0.00%	0	2.53%	199
Short-beaked common dolphin	Knudsen 320 B/R	0.00%	0	1.75%	129
Short-beaked common dolphin	Kongsberg EM710	0.00%	0	1.70%	213
Short-beaked common dolphin	Simard ES60	0.00%	0	2.34%	191
Short-finned pilot whale	Knudsen 320 B/R	0.00%	0	1.16%	128
Short-finned pilot whale	Kongsberg EM710	0.00%	0	1.02%	210
Short-finned pilot whale	Simard ES60	0.00%	0	1.81%	199
Sperm whale	Knudsen 320 B/R	0.00%	0	0.88%	114
Sperm whale	Kongsberg EM710	0.00%	0	1.03%	196
Sperm whale	Simard ES60	0.00%	0	1.34%	182
Spinner dolphin	Knudsen 320 B/R	0.00%	0	0.05%	145
Spinner dolphin	Kongsberg EM710	0.00%	0	0.05%	228
Spinner dolphin	Simard ES60	0.00%	0	0.07%	198

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Striped dolphin	Knudsen 320 B/R	0.00%	0	0.41%	146
Striped dolphin	Kongsberg EM710	0.00%	0	0.42%	225
Striped dolphin	Simard ES60	0.00%	0	0.58%	194
Dwarf sperm whale	Knudsen 320 B/R	0.00%	0	0.69%	141
Dwarf sperm whale	Kongsberg EM710	0.00%	0	0.62%	228
Dwarf sperm whale	Simard ES60	0.00%	0	0.85%	185
Pygmy sperm whale	Knudsen 320 B/R	0.00%	0	0.79%	118
Pygmy sperm whale	Kongsberg EM710	0.00%	0	1.08%	201
Pygmy sperm whale	Simard ES60	0.00%	0	1.60%	202
Hawaiian monk seal	Knudsen 320 B/R	0.00%	0	2.59%	138
Hawaiian monk seal	Kongsberg EM710	0.00%	0	2.21%	211
Hawaiian monk seal	Simard ES60	0.00%	0	3.63%	202

Table 11. Exposure results for animal movement simulations off the West Coast of the US. Percent of the simulated individuals and ranges to exposure for each species and source type for injury and behavioral criteria are presented.

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Blue whale	Knudsen 320 B/R	0.00%	0	0.28%	478
Blue whale	Kongsberg EM710	0.00%	0	0.04%	413
Blue whale	Simard ES60	0.00%	0	0.39%	477

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Bryde's whale	Knudsen 320 B/R	0.00%	0	1.06%	121
Bryde's whale	Kongsberg EM710	0.00%	0	1.02%	199
Bryde's whale	Simard ES60	0.00%	0	1.74%	197
Fin whale	Knudsen 320 B/R	0.00%	0	1.38%	133
Fin whale	Kongsberg EM710	0.00%	0	1.18%	203
Fin whale	Simard ES60	0.00%	0	1.75%	193
Humpback whale	Knudsen 320 B/R	0.00%	0	14.39%	206
Humpback whale	Kongsberg EM710	0.00%	0	6.32%	147
Humpback whale	Simard ES60	0.00%	0	20.03%	301
Common minke whale	Knudsen 320 B/R	0.00%	0	2.02%	137
Common minke whale	Kongsberg EM710	0.00%	0	1.36%	195
Common minke whale	Simard ES60	0.00%	0	2.42%	172
North Pacific right whale	Knudsen 320 B/R	0.00%	0	2.76%	146
North Pacific right whale	Kongsberg EM710	0.00%	0	2.63%	214
North Pacific right whale	Simard ES60	0.00%	0	3.66%	191
Sei whale	Knudsen 320 B/R	0.00%	0	1.38%	133
Sei whale	Kongsberg EM710	0.00%	0	1.18%	203
Sei whale	Simard ES60	0.00%	0	1.75%	193
Beaked whale	Knudsen 320 B/R	0.00%	0	0.43%	589
Beaked whale	Kongsberg EM710	0.00%	0	0.07%	611
Beaked whale	Simard ES60	0.00%	0	0.55%	530

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Blainville's beaked whale	Knudsen 320 B/R	0.00%	0	1.77%	493
Blainville's beaked whale	Kongsberg EM710	0.00%	0	0.10%	392
Blainville's beaked whale	Simard ES60	0.00%	0	0.87%	496
Common bottlenose dolphin	Knudsen 320 B/R	0.00%	0	1.14%	126
Common bottlenose dolphin	Kongsberg EM710	0.00%	0	0.99%	194
Common bottlenose dolphin	Simard ES60	0.00%	0	1.46%	193
Killer whale	Knudsen 320 B/R	0.00%	0	1.28%	143
Killer whale	Kongsberg EM710	0.00%	0	1.01%	197
Killer whale	Simard ES60	0.00%	0	1.84%	191
Long-beaked common dolphin	Knudsen 320 B/R	0.00%	0	1.39%	125
Long-beaked common dolphin	Kongsberg EM710	0.00%	0	1.18%	197
Long-beaked common dolphin	Simard ES60	0.00%	0	2.13%	197
Mesoplodont whales	Knudsen 320 B/R	0.00%	0	0.43%	589
Mesoplodont whales	Kongsberg EM710	0.00%	0	0.07%	611
Mesoplodont whales	Simard ES60	0.00%	0	0.55%	530
Northern right whale dolphin	Knudsen 320 B/R	0.00%	0	0.43%	589
Northern right whale dolphin	Kongsberg EM710	0.00%	0	0.07%	611
Northern right whale dolphin	Simard ES60	0.00%	0	0.55%	530

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Pacific white-sided dolphin	Knudsen 320 B/R	0.00%	0	1.53%	132
Pacific white-sided dolphin	Kongsberg EM710	0.00%	0	1.51%	202
Pacific white-sided dolphin	Simard ES60	0.00%	0	2.46%	202
Pilot whale	Knudsen 320 B/R	0.00%	0	1.39%	125
Pilot whale	Kongsberg EM710	0.00%	0	1.18%	197
Pilot whale	Simard ES60	0.00%	0	2.13%	197
Risso's dolphin	Knudsen 320 B/R	0.00%	0	1.38%	143
Risso's dolphin	Kongsberg EM710	0.00%	0	1.13%	191
Risso's dolphin	Simard ES60	0.00%	0	1.85%	185
Short-beaked common dolphin	Knudsen 320 B/R	0.00%	0	1.91%	140
Short-beaked common dolphin	Kongsberg EM710	0.00%	0	1.27%	191
Short-beaked common dolphin	Simard ES60	0.00%	0	2.82%	192
Short-finned pilot whale	Knudsen 320 B/R	0.00%	0	0.75%	115
Short-finned pilot whale	Kongsberg EM710	0.00%	0	0.80%	208
Short-finned pilot whale	Simard ES60	0.00%	0	1.11%	201
Sperm whale	Knudsen 320 B/R	0.00%	0	0.42%	506
Sperm whale	Kongsberg EM710	0.00%	0	0.15%	675
Sperm whale	Simard ES60	0.00%	0	0.67%	477
Stejneger's beaked whale	Knudsen 320 B/R	0.00%	0	0.75%	478

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Stejneger's beaked whale	Kongsberg EM710	0.00%	0	0.11%	413
Stejneger's beaked whale	Simard ES60	0.00%	0	1.02%	477
Striped dolphin	Knudsen 320 B/R	0.00%	0	0.93%	526
Striped dolphin	Kongsberg EM710	0.00%	0	0.14%	253
Striped dolphin	Simard ES60	0.00%	0	1.22%	522
Dall's porpoise	Knudsen 320 B/R	0.07%	20	1.07%	136
Dall's porpoise	Kongsberg EM710	0.06%	24	0.62%	128
Dall's porpoise	Simard ES60	0.01%	15	1.58%	191
Dwarf sperm whale	Knudsen 320 B/R	0.00%	0	0.19%	460
Dwarf sperm whale	Kongsberg EM710	0.00%	0	0.04%	248
Dwarf sperm whale	Simard ES60	0.00%	0	0.29%	470
Harbor porpoise	Knudsen 320 B/R	0.20%	26	2.69%	140
Harbor porpoise	Kongsberg EM710	0.13%	28	1.12%	78
Harbor porpoise	Simard ES60	0.00%	0	3.80%	189
Pygmy sperm whale	Knudsen 320 B/R	0.00%	0	0.00%	0
Pygmy sperm whale	Kongsberg EM710	0.00%	0	0.00%	0
Pygmy sperm whale	Simard ES60	0.00%	0	0.00%	0
California sea lion	Knudsen 320 B/R	0.00%	0	3.21%	203
California sea lion	Kongsberg EM710	0.00%	0	1.22%	69
California sea lion	Simard ES60	0.00%	0	3.91%	275
Guadalupe fur seal	Knudsen 320 B/R	0.00%	0	3.12%	211
Guadalupe fur seal	Kongsberg EM710	0.00%	0	1.10%	69
Guadalupe fur seal	Simard ES60	0.00%	0	3.68%	280

Simulated Species	Source	Injury Percent	Injury Exposure ($ER_{95\%}$) Range (m)	Behavior Percent	Behavior Exposure ($ER_{95\%}$) Range (m)
Harbor seal	Knudsen 320 B/R	0.00%	0	3.21%	203
Harbor seal	Kongsberg EM710	0.00%	0	1.22%	69
Harbor seal	Simard ES60	0.00%	0	3.91%	275
Northern fur seal	Knudsen 320 B/R	0.00%	0	3.12%	211
Northern fur seal	Kongsberg EM710	0.00%	0	1.10%	69
Northern fur seal	Simard ES60	0.00%	0	3.68%	280
Sea otter	Knudsen 320 B/R	0.00%	0	12.92%	212
Sea otter	Kongsberg EM710	0.00%	0	4.86%	66
Sea otter	Simard ES60	0.00%	0	14.84%	266

Annual Exposure Estimates

Annual injury exposure estimates were calculated by determining the proportion of animats that were exposed above threshold for a given survey type (less than 30 kHz or between 30 and 200 kHz) in each of the regions (Tables 7 through 11), scaling by the density of that species within the activity regions (Table 4), and multiplying by the number of days required to complete the proposed efforts. Estimated exposures summed over all regions are presented in Tables 12, 13, and 14, respectively for proposed Alternatives A, B, and C. Except for high-frequency cetaceans, no faunal group would be exposed to sound levels exceeding injury criteria for non-impulsive sounds. For high-frequency cetaceans, Dall's and harbor porpoise and pygmy and dwarf sperm whales, simulation results suggest that few animals would be exposed above non-impulsive injury criteria threshold. After incorporating survey effort and species' regional densities, injurious exposures would be expected within a maximum of 50 m. However, for these high-resolution sources, this range is well within the near-field. The actual received levels of sound within the near-field are well below the modeled far-field approximations (e.g., (Urick 1983)) meaning the number of injurious exposures is overestimated. It is also noted that high-frequency species such as harbor porpoise are known to avoid loud sounds (aversion). Aversion was not considered in the exposure estimates which also over estimates the number of injurious exposures.

Annual behavioral exposure estimates were similarly calculated. The proportion of simulated animats exposed above threshold for a survey was calculated (Tables 7 through 11). That number was then scaled by the estimated density (Table 4) and level of effort for that region. Tables 15, 16, and 17 contain annual and total exposures by proposed alternative A, B, and C, respectively. Table 18 provides estimated daily exposures above behavioral criteria thresholds and the average time, in seconds, that animats above criteria threshold were exposed above that criteria, grouped by species and region (stock).

Injury Exposures

Table 12. Injury exposures for each year of active acoustic surveys for activities associated with proposed Alternative A summed over all simulated regions.

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Blue whale	0	0	0	0	0	0
Bowhead whale	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0
Common minke whale	0	0	0	0	0	0
Fin whale	0	0	0	0	0	0
Gray whale	0	0	0	0	0	0
Humpback whale	0	0	0	0	0	0
North Atlantic right whale	0	0	0	0	0	0
North Pacific right whale	0	0	0	0	0	0
Rice’s whale	0	0	0	0	0	0
Sei whale	0	0	0	0	0	0
Atlantic spotted dolphin	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0
Baird's beaked whale	0	0	0	0	0	0
Beluga whale	0	0	0	0	0	0
Gervais’ beaked whale	0	0	0	0	0	0
Blainville’s beaked whale	0	0	0	0	0	0
Mesoplodont beaked whales (all)	0	0	0	0	0	0
Clymene dolphin	0	0	0	0	0	0
Common bottlenose dolphin	0	0	0	0	0	0

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Cuvier's beaked whale	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0
Resident killer whale	0	0	0	0	0	0
Transient killer whale	0	0	0	0	0	0
Offshore killer whale	0	0	0	0	0	0
Long-beaked common dolphin	0	0	0	0	0	0
Longman's (Indo-Pacific) beaked whale	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0
Northern right whale dolphin	0	0	0	0	0	0
Pacific white-sided dolphin	0	0	0	0	0	0
Pantropical spotted dolphin	0	0	0	0	0	0
Pilot whale, long finned	0	0	0	0	0	0
Pilot whale, short finned	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0
Risso's dolphin	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0
Short-beaked common dolphin	0	0	0	0	0	0
Sperm whale	0	0	0	0	0	0

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Sowerby's beaked whale	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0
Striped dolphin	0	0	0	0	0	0
White-beaked dolphin	0	0	0	0	0	0
True's beaked whale	0	0	0	0	0	0
Dwarf sperm whale	0.67	0.79	0.67	0.67	0.67	3.47
Pygmy sperm whale	0.29	0.48	0.27	0.47	0.47	1.98
Dall's porpoise	1.12	1.09	1.09	1.09	1.09	5.48
Harbor porpoise	5.09	5.19	5.11	4.42	4.42	24.23
Bearded seal	0	0	0	0	0	0
Gray seal	0	0	0	0	0	0
Guadalupe fur seal	0	0	0	0	0	0
Hawaiian monk seal	0	0	0	0	0	0
Harbor seal	0	0	0	0	0	0
Harp seal	0	0	0	0	0	0
Hooded seal	0	0	0	0	0	0
Northern fur seal	0	0	0	0	0	0
Ribbon seal	0	0	0	0	0	0
Ringed seal	0	0	0	0	0	0
Spotted seal	0	0	0	0	0	0
Manatee	0	0	0	0	0	0
Sea otter	0	0	0	0	0	0
Walrus	0	0	0	0	0	0
Northern elephant seal	0	0	0	0	0	0
Polar bear	0	0	0	0	0	0

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
California sea lion	0	0	0	0	0	0
Steller sea lion	0	0	0	0	0	0
Northern bottlenose whale	0	0	0	0	0	0

Table 13. Injury exposures for each year of active acoustic surveys for activities associated with proposed Alternative B summed over all simulated regions.

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Blue whale	0	0	0	0	0	0
Bowhead whale	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0
Common minke whale	0	0	0	0	0	0
Fin whale	0	0	0	0	0	0
Gray whale	0	0	0	0	0	0
Humpback whale	0	0	0	0	0	0
North Atlantic right whale	0	0	0	0	0	0
North Pacific right whale	0	0	0	0	0	0
Rice’s whale	0	0	0	0	0	0
Sei whale	0	0	0	0	0	0
Atlantic spotted dolphin	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0
Baird's beaked whale	0	0	0	0	0	0
Beluga whale	0	0	0	0	0	0
Gervais’ beaked whale	0	0	0	0	0	0

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Blainville's beaked whale	0	0	0	0	0	0
Mesoplodont beaked whales (all)	0	0	0	0	0	0
Clymene dolphin	0	0	0	0	0	0
Common bottlenose dolphin	0	0	0	0	0	0
Cuvier's beaked whale	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0
Resident killer whale	0	0	0	0	0	0
Transient killer whale	0	0	0	0	0	0
Offshore killer whale	0	0	0	0	0	0
Long-beaked common dolphin	0	0	0	0	0	0
Longman's (Indo-Pacific) beaked whale	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0
Northern right whale dolphin	0	0	0	0	0	0
Pacific white-sided dolphin	0	0	0	0	0	0
Pantropical spotted dolphin	0	0	0	0	0	0
Pilot whale, long finned	0	0	0	0	0	0
Pilot whale, short finned	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Risso's dolphin	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0
Short-beaked common dolphin	0	0	0	0	0	0
Sperm whale	0	0	0	0	0	0
Sowerby's beaked whale	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0
Striped dolphin	0	0	0	0	0	0
White-beaked dolphin	0	0	0	0	0	0
True's beaked whale	0	0	0	0	0	0
Dwarf sperm whale	0.84	0.99	0.84	0.84	0.84	4.35
Pygmy sperm whale	0.37	0.60	0.35	0.60	0.60	2.52
Dall's porpoise	1.39	1.36	1.36	1.31	1.36	6.78
Harbor porpoise	5.86	5.89	5.89	1.97	5.05	24.66
Bearded seal	0	0	0	0	0	0
Gray seal	0	0	0	0	0	0
Guadalupe fur seal	0	0	0	0	0	0
Hawaiian monk seal	0	0	0	0	0	0
Harbor seal	0	0	0	0	0	0
Harp seal	0	0	0	0	0	0
Hooded seal	0	0	0	0	0	0
Northern fur seal	0	0	0	0	0	0
Ribbon seal	0	0	0	0	0	0
Ringed seal	0	0	0	0	0	0
Spotted seal	0	0	0	0	0	0
Manatee	0	0	0	0	0	0

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Sea otter	0	0	0	0	0	0
Walrus	0	0	0	0	0	0
Northern elephant seal	0	0	0	0	0	0
Polar bear	0	0	0	0	0	0
California sea lion	0	0	0	0	0	0
Steller sea lion	0	0	0	0	0	0
Northern bottlenose whale	0	0	0	0	0	0

Table 14. Injury exposures for each year of active acoustic surveys for activities associated with proposed Alternative C summed over all simulated regions.

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Blue whale	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0
Common minke whale	0	0	0	0	0	0
Fin whale	0	0	0	0	0	0
Gray whale	0	0	0	0	0	0
Humpback whale	0	0	0	0	0	0
North Atlantic right whale	0	0	0	0	0	0
North Pacific right whale	0	0	0	0	0	0
Rice’s whale	0	0	0	0	0	0
Sei whale	0	0	0	0	0	0
Atlantic spotted dolphin	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0
Baird's beaked whale	0	0	0	0	0	0

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Beluga whale	0	0	0	0	0	0
Bowhead whale	0	0	0	0	0	0
Gervais' beaked whale	0	0	0	0	0	0
Blainville's beaked whale	0	0	0	0	0	0
Mesoplodont beaked whales (all)	0	0	0	0	0	0
Clymene dolphin	0	0	0	0	0	0
Common bottlenose dolphin	0	0	0	0	0	0
Cuvier's beaked whale	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0
Resident killer whale	0	0	0	0	0	0
Transient killer whale	0	0	0	0	0	0
Offshore killer whale	0	0	0	0	0	0
Long-beaked common dolphin	0	0	0	0	0	0
Longman's (Indo-Pacific) beaked whale	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0
Northern right whale dolphin	0	0	0	0	0	0
Pacific white-sided dolphin	0	0	0	0	0	0
Pantropical spotted dolphin	0	0	0	0	0	0

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Pilot whale, long finned	0	0	0	0	0	0
Pilot whale, short finned	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0
Risso's dolphin	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0
Short-beaked common dolphin	0	0	0	0	0	0
Sperm whale	0	0	0	0	0	0
Sowerby's beaked whale	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0
Striped dolphin	0	0	0	0	0	0
White-beaked dolphin	0	0	0	0	0	0
True's beaked whale	0	0	0	0	0	0
Dwarf sperm whale	1.03	1.20	1.03	1.02	1.02	5.30
Pygmy sperm whale	0.43	0.71	0.42	0.70	0.70	2.96
Dall's porpoise	1.63	1.63	1.63	1.59	1.63	8.11
Harbor porpoise	3.46	6.58	6.64	2.54	5.63	24.85
Bearded seal	0	0	0	0	0	0
Gray seal	0	0	0	0	0	0
Guadalupe fur seal	0	0	0	0	0	0
Hawaiian monk seal	0	0	0	0	0	0
Harbor seal	0	0	0	0	0	0
Harp seal	0	0	0	0	0	0
Hooded seal	0	0	0	0	0	0

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Northern fur seal	0	0	0	0	0	0
Ribbon seal	0	0	0	0	0	0
Ringed seal	0	0	0	0	0	0
Spotted seal	0	0	0	0	0	0
Manatee	0	0	0	0	0	0
Sea otter	0	0	0	0	0	0
Walrus	0	0	0	0	0	0
Northern elephant seal	0	0	0	0	0	0
Polar bear	0	0	0	0	0	0
California sea lion	0	0	0	0	0	0
Steller sea lion	0	0	0	0	0	0
Northern bottlenose whale	0	0	0	0	0	0

Behavioral Disruption Exposures

Table 15. Behavioral disruption exposures for each year of active acoustic surveys for activities associated with proposed Alternative A summed over all simulated regions.

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Atlantic spotted dolphin	358.84	459.24	267.86	409.39	407.86	1903.19
Atlantic white-sided dolphin	466.66	497.54	449.99	454.17	454.17	2322.53
Baird's beaked whale	5.99	5.98	5.98	5.98	5.98	29.91
Bearded seal	319.01	438.48	472.75	110.40	110.40	1451.04
Beluga whale	13.27	18.24	215.36	4.59	4.59	256.05
Beluga whale, Cook Inlet	2.18	3.38	2.60	1.84	1.84	11.84
Blainville's beaked whale	9.12	11.10	9.12	7.31	7.31	43.96
Blue whale	12.65	12.60	12.62	12.59	12.59	63.05

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Bowhead whale	3.50	0.23	55.08	0.04	0.04	58.89
Bryde's whale	1.15	0.66	1.17	0.66	0.66	4.30
California sea lion	7054.02	5862.63	5550.02	5550.02	5550.02	29566.71
Clymene dolphin	28.25	29.55	14.19	23.19	23.19	118.37
Common bottlenose dolphin	430.98	422.25	313.33	337.97	336.05	1840.58
Common minke whale	68.42	75.97	70.33	64.67	64.65	344.04
Cuvier's beaked whale	17.97	18.07	17.94	13.33	13.33	80.64
Dall's porpoise	23.67	22.86	22.87	22.85	22.85	115.10
Dwarf sperm whale	12.00	14.20	12.00	9.13	9.13	56.46
False killer whale	101.61	62.00	97.55	60.16	60.16	381.48
Fin whale	69.27	78.84	68.76	64.68	64.68	346.23
Fraser's dolphin	820.57	381.51	820.57	381.47	381.47	2785.59
Gervais' beaked whale	8.78	10.94	8.78	7.15	7.15	42.80
Gray whale	448.83	441.41	441.36	440.54	440.54	2212.68
Gray seal	126.69	129.73	119.39	91.77	91.77	559.35
Guadalupe fur seal	46.07	45.34	45.29	45.27	45.27	227.24
Harbor porpoise	194.79	211.93	191.53	184.66	184.66	967.57
Harbor seal	1969.71	2140.57	1928.96	1649.68	1649.68	9338.60
Harp seal	156.55	160.27	147.52	113.36	113.36	691.06
Hawaiian monk seal	140.06	89.35	140.06	89.35	89.35	548.17
Hooded seal	69.73	77.71	65.22	54.27	54.27	321.20
Humpback whale	18.79	21.90	18.05	19.05	19.05	96.84
Humpback whale, CA	42.05	41.19	40.91	41.12	41.12	206.39
Humpback whale, CNP	9.69	9.16	10.91	5.54	5.54	40.84

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Humpback whale, WNP	1.06	1.00	1.20	0.60	0.60	4.46
Long-beaked common dolphin	3257.27	3171.10	3141.06	3163.46	3163.46	15896.35
Longman's (Indo-Pacific) beaked whale	0.69	0.32	0.69	0.32	0.32	2.34
Manatee	43.56	43.99	51.12	43.99	43.99	226.65
Melon-headed whale	12.38	9.10	12.38	8.10	8.10	50.06
Mesoplodont beaked whales (all)	22.17	24.30	22.14	20.51	20.51	109.63
North Atlantic right whale	3.08	3.84	2.83	2.34	2.34	14.43
North Pacific right whale	0.01	0.00	0.02	0.00	0.00	0.03
Northern elephant seal	1163.38	1224.13	1139.82	1067.70	1067.70	5662.73
Northern fur seal	4600.58	6340.74	5809.33	2112.84	2112.84	20976.33
Northern bottlenose whale	0.11	0.11	0.11	0.08	0.08	0.49
Northern right whale dolphin	542.24	506.74	494.26	503.61	503.61	2550.46
Offshore killer whale	4.21	4.14	4.14	4.13	4.13	20.75
Pacific white-sided dolphin	1284.13	1287.23	1243.22	1218.28	1218.28	6251.14
Pantropical spotted dolphin	987.62	544.46	987.62	542.65	542.65	3605.00
Pilot whale, long finned	61.81	73.50	60.85	55.92	55.77	307.85
Pilot whale, short finned	50.45	54.81	49.16	43.53	43.43	241.38
Polar bear	8.31	12.86	26.52	3.24	3.24	54.17
Pygmy killer whale	256.86	148.92	254.99	148.12	148.12	957.01

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Pygmy sperm whale	2684.82	1535.23	2682.75	1534.47	1534.46	9971.73
Resident killer whale	7.47	8.23	8.02	6.54	6.54	36.80
Ribbon seal	196.11	286.31	694.49	97.80	97.80	1372.51
Rice's whale	0.15	0.16	0.08	0.13	0.13	0.65
Ringed seal	142.93	196.46	664.74	49.46	49.46	1103.05
Risso's dolphin	178.72	188.55	165.09	144.33	144.13	820.82
Rough-toothed dolphin	2693.06	1554.46	2686.03	1551.86	1551.78	10037.19
Sea otter, CA	119.19	118.11	122.18	118.11	118.11	595.70
Sea otter, SC	57.69	94.94	70.72	47.03	47.03	317.41
Sea otter, SE	113.30	79.86	79.86	79.86	79.86	432.74
Sea otter, WA	40.57	38.39	35.04	39.09	39.09	192.18
Sei whale	8.45	8.31	8.29	8.03	8.03	41.11
Short-beaked common dolphin	5397.64	5442.63	5240.39	5147.95	5147.91	26376.52
Sowerby's beaked whale	8.50	8.70	8.50	4.96	4.96	35.62
Sperm whale	11.94	13.77	11.92	12.52	12.52	62.67
Spinner dolphin	16.37	22.80	16.37	22.48	22.48	100.50
Spotted seal	1538.41	2380.14	4907.14	600.16	600.16	10026.01
Steller sea lion	508.30	526.29	509.62	463.92	463.92	2472.05
Striped dolphin	2802.40	1717.52	2802.16	1717.30	1717.30	10756.68
Transient killer whale	4.91	4.74	4.45	4.55	4.55	23.20
True's beaked whale	8.50	8.70	8.50	4.96	4.96	35.62
Walrus	76.86	105.65	357.48	26.60	26.60	593.19
White-beaked dolphin	0.55	0.67	0.51	0.48	0.48	2.69

Table 16. Behavioral disruption exposures for each year of active acoustic surveys for activities associated with proposed Alternative B summed over all simulated regions.

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Atlantic spotted dolphin	423.48	559.29	323.37	481.92	500.53	2288.59
Atlantic white-sided dolphin	522.43	552.19	504.09	106.28	504.33	2189.32
Baird's beaked whale	7.39	7.37	7.37	6.60	7.37	36.10
Bearded seal	350.91	482.33	520.02	121.44	121.44	1596.14
Beluga whale	14.60	20.06	236.90	5.05	5.05	281.66
Beluga whale, Cook Inlet	2.60	3.92	3.06	2.22	2.22	14.02
Blainville's beaked whale	11.42	13.85	11.42	9.13	9.13	54.95
Blue whale	15.58	15.52	15.55	13.85	15.51	76.01
Bowhead whale	3.85	0.25	60.59	0.05	0.05	64.79
Bryde's whale	1.43	0.83	1.44	0.82	0.83	5.35
California sea lion	8591.92	7281.39	6937.52	6937.52	6937.52	36685.87
Clymene dolphin	32.47	35.61	17.01	28.41	28.62	142.12
Common bottlenose dolphin	496.62	496.53	367.17	334.85	401.70	2096.87
Common minke whale	80.23	88.62	82.35	50.30	76.17	377.67
Cuvier's beaked whale	22.47	22.58	22.43	16.64	16.64	100.76
Dall's porpoise	29.30	28.41	28.42	27.25	28.40	141.78
Dwarf sperm whale	14.98	17.73	14.98	11.39	11.39	70.47
False killer whale	126.19	77.07	121.73	74.82	75.06	474.87
Fin whale	80.73	91.24	80.18	46.25	75.63	374.03
Fraser's dolphin	1025.72	476.88	1025.72	476.83	476.83	3481.98
Gervais' beaked whale	10.99	13.65	10.99	8.93	8.93	53.49
Gray whale	545.18	537.01	536.96	436.25	536.06	2591.46

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Gray seal	144.47	143.78	136.44	14.95	102.01	541.65
Guadalupe fur seal	56.02	55.22	55.17	45.31	55.14	266.86
Harbor porpoise	218.17	235.91	214.58	43.47	205.92	918.05
Harbor seal	2360.64	2546.08	2315.80	1763.75	2006.10	10992.37
Harp seal	178.50	177.61	168.57	18.47	126.02	669.17
Hawaiian monk seal	175.09	111.69	175.09	111.69	111.69	685.25
Hooded seal	78.70	85.91	73.73	6.33	60.10	304.77
Humpback whale	21.14	24.56	20.31	7.11	21.41	94.53
Humpback whale, CA	51.02	50.07	49.77	40.91	50.00	241.77
Humpback whale, CNP	11.61	10.72	12.95	6.74	6.74	48.76
Humpback whale, WNP	1.27	1.18	1.42	0.74	0.74	5.35
Long-beaked common dolphin	3907.61	3812.81	3779.77	2833.40	3804.41	18138.00
Longman's (Indo-Pacific) beaked whale	0.87	0.39	0.87	0.39	0.39	2.91
Manatee	53.24	52.65	61.55	35.47	52.65	255.56
Melon-headed whale	15.49	11.39	15.49	10.14	10.14	62.65
Mesoplodont beaked whales (all)	27.48	30.11	27.45	23.66	25.39	134.09
North Atlantic right whale	3.49	4.28	3.21	0.75	2.64	14.37
North Pacific right whale	0.01	0.00	0.02	0.00	0.00	0.03
Northern elephant seal	1401.52	1468.33	1375.59	1093.79	1296.26	6635.49
Northern fur seal	5192.02	7106.21	6521.65	2455.52	2455.52	23730.92
Northern bottlenose whale	0.13	0.14	0.13	0.12	0.12	0.64

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Northern right whale dolphin	632.83	593.78	580.05	356.61	590.33	2753.60
Offshore killer khale	5.11	5.03	5.02	4.08	5.02	24.26
Pacific white-sided dolphin	1540.08	1543.46	1495.05	1130.30	1467.62	7176.51
Pantropical spotted dolphin	1234.51	680.31	1234.51	678.33	678.33	4505.99
Pilot whale, long finned	74.33	87.79	73.29	58.07	67.31	360.79
Pilot whale, short finned	61.02	65.80	59.57	46.16	52.67	285.22
Polar bear	9.14	14.15	29.17	3.57	3.57	59.60
Pygmy killer whale	320.71	185.98	318.66	185.09	185.09	1195.53
Pygmy sperm whale	3355.57	1918.85	3353.29	1917.91	1917.98	12463.60
Resident killer whale	9.06	9.87	9.66	7.79	8.02	44.40
Ribbon seal	221.22	320.44	769.43	113.08	113.08	1537.25
Rice's whale	0.17	0.20	0.10	0.17	0.17	0.81
Ringed seal	157.22	216.10	731.22	54.41	54.41	1213.36
Risso's dolphin	216.36	224.51	201.34	154.26	174.92	971.39
Rough-toothed dolphin	3364.40	1941.97	3356.63	1937.10	1939.03	12539.13
Sea otter, CA	136.47	135.29	139.77	44.74	135.29	591.56
Sea otter, SC	68.40	109.38	82.75	56.68	56.68	373.89
Sea otter, SE	136.22	99.44	99.44	99.44	99.44	533.98
Sea otter, WA	47.20	44.80	41.11	33.71	45.58	212.40
Sei whale	10.08	9.89	9.94	6.52	9.57	46.00
Short-beaked common dolphin	6476.20	6513.09	6303.20	4599.48	6188.88	30080.85
Sowerby's beaked whale	10.64	10.86	10.64	6.19	6.19	44.52
Sperm whale	14.79	17.08	14.77	14.63	15.52	76.79

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Spinner dolphin	20.48	28.45	20.48	28.09	28.09	125.59
Spotted seal	1692.25	2618.16	5397.85	660.18	660.18	11028.62
Steller sea lion	613.20	633.00	614.65	520.15	564.39	2945.39
Striped dolphin	3482.55	2126.46	3482.28	1976.41	2126.21	13193.91
Transient killer whale	5.99	5.82	5.48	5.37	5.62	28.28
True's beaked whale	10.64	10.86	10.64	6.19	6.19	44.52
Walrus	84.55	116.22	393.23	29.26	29.26	652.52
White-beaked dolphin	0.61	0.76	0.58	0.24	0.56	2.75

Table 17. Behavioral disruption exposures for each year of active acoustic surveys for activities associated with proposed Alternative C summed over all simulated regions.

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Atlantic spotted dolphin	466.76	659.32	378.93	574.29	593.21	2672.51
Atlantic white-sided dolphin	138.73	606.86	558.22	132.37	554.53	1990.71
Baird's beaked whale	8.28	8.76	8.76	8.00	8.76	42.56
Bearded seal	382.81	526.18	567.30	132.48	132.48	1741.25
Beluga whale	15.92	21.89	258.44	5.51	5.51	307.27
Beluga whale, Cook Inlet	3.03	4.46	3.53	2.61	2.61	16.24
Blainville's beaked whale	13.70	16.61	13.70	10.95	10.95	65.91
Blue whale	17.44	18.44	18.47	16.81	18.43	89.59
Bowhead whale	4.20	0.27	66.10	0.05	0.05	70.67
Bryde's whale	1.72	0.99	1.73	0.98	0.98	6.40
California sea lion	10129.83	8700.16	8325.03	8325.03	8325.03	43805.08

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Clymene dolphin	36.38	41.69	19.84	33.85	34.06	165.82
Common bottlenose dolphin	494.72	570.79	421.04	399.27	467.35	2353.17
Common minke whale	67.34	101.26	94.35	60.74	87.68	411.37
Cuvier's beaked whale	27.00	27.09	26.90	20.03	19.97	120.99
Dall's porpoise	34.21	33.98	33.99	32.85	33.97	169.00
Dwarf sperm whale	17.96	21.27	17.96	13.68	13.68	84.55
False killer whale	150.45	92.13	145.88	90.33	89.93	568.72
Fin whale	61.81	103.61	91.67	55.81	86.60	399.50
Fraser's dolphin	1230.85	572.27	1230.85	572.22	572.22	4178.41
Gervais' beaked whale	13.19	16.38	13.19	10.72	10.72	64.20
Gray whale	566.05	632.61	632.55	530.79	631.57	2993.57
Gray seal	66.10	157.82	153.47	20.07	112.26	509.72
Guadalupe fur seal	58.71	65.11	65.04	55.11	65.01	308.98
Harbor porpoise	66.66	259.91	237.64	55.25	227.19	846.65
Harbor seal	2562.23	2951.61	2702.61	2109.32	2362.53	12688.30
Harp seal	81.70	194.96	189.63	24.79	138.68	629.76
Hawaiian monk seal	210.10	134.03	210.10	135.67	134.03	823.93
Hooded seal	28.29	94.10	82.25	9.03	65.96	279.63
Humpback whale	7.67	27.21	22.56	8.66	23.79	89.89
Humpback whale, CA	53.12	58.96	58.63	49.70	58.88	279.29
Humpback whale, CNP	13.53	12.28	14.99	7.96	7.93	56.69
Humpback whale, WNP	1.48	1.34	1.64	0.88	0.87	6.21
Long-beaked common dolphin	3801.70	4454.53	4418.49	3453.94	4445.37	20574.03

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Longman's (Indo-Pacific) beaked whale	1.03	0.48	1.03	0.48	0.48	3.50
Manatee	53.26	61.30	71.99	43.97	61.30	291.82
Melon-headed whale	18.58	13.65	18.58	12.16	12.16	75.13
Mesoplodont beaked whales (all)	31.69	35.94	32.75	28.59	30.28	159.25
North Atlantic right whale	1.81	4.73	3.60	0.93	2.93	14.00
North Pacific right whale	0.01	0.00	0.02	0.00	0.00	0.03
Northern elephant seal	1489.15	1712.53	1611.36	1318.29	1524.81	7656.14
Northern fur seal	5783.45	7871.65	7233.95	2798.17	2798.17	26485.39
Northern bottlenose whale	0.16	0.16	0.16	0.13	0.13	0.74
Northern right whale dolphin	528.08	680.83	665.85	435.97	677.06	2987.79
Offshore killer whale	5.30	5.92	5.92	4.96	5.92	28.02
Pacific white-sided dolphin	1531.84	1799.71	1746.91	1372.52	1716.98	8167.96
Pantropical spotted dolphin	1481.41	816.16	1481.41	813.99	813.99	5406.96
Pilot whale, long finned	77.11	102.09	85.71	69.58	78.86	413.35
Pilot whale, short finned	64.90	76.80	69.95	55.42	61.93	329.00
Polar bear	9.98	15.43	31.82	3.89	3.89	65.01
Pygmy killer whale	384.55	223.04	382.32	223.84	222.08	1435.83
Pygmy sperm whale	4026.21	2302.46	4023.85	2320.03	2301.52	14974.07
Resident killer whale	10.43	11.48	11.26	9.22	9.45	51.84

Species	Year2	Year3	Year4	Year5	Year6	Total Exposures
Ribbon seal	246.32	354.56	844.36	128.34	128.34	1701.92
Rice's whale	0.20	0.24	0.12	0.20	0.20	0.96
Ringed seal	171.51	235.75	797.69	59.36	59.36	1323.67
Risso's dolphin	235.13	260.52	237.63	184.81	205.75	1123.84
Rough-toothed dolphin	4034.00	2329.52	4027.28	2342.89	2326.30	15059.99
Sea otter, CA	88.95	152.47	157.35	58.25	152.47	609.49
Sea otter, SC	79.11	123.81	94.76	66.33	66.33	430.34
Sea otter, SE	159.14	119.02	119.02	119.02	119.02	635.22
Sea otter, WA	39.45	51.21	47.19	40.23	52.06	230.14
Sei whale	8.76	11.45	11.57	7.92	11.06	50.76
Short-beaked common dolphin	6291.58	7583.54	7366.01	5605.76	7229.85	34076.74
Sowerby's beaked whale	12.76	13.04	12.76	7.43	7.43	53.42
Sperm whale	17.10	20.40	17.65	17.66	18.53	91.34
Spinner dolphin	24.58	34.12	24.58	33.72	33.72	150.72
Spotted seal	1846.09	2856.17	5888.56	720.19	720.19	12031.20
Steller sea lion	664.50	739.72	719.70	626.14	664.88	3414.94
Striped dolphin	4062.98	2535.36	4162.40	2384.35	2535.10	15680.19
Transient killer whale	6.78	6.91	6.53	6.48	6.70	33.40
True's beaked whale	12.76	13.04	12.76	7.43	7.43	53.42
Walrus	92.24	126.78	428.98	31.92	31.92	711.84
White-beaked dolphin	0.34	0.86	0.65	0.29	0.64	2.78

Daily Exposure Estimates

Table 18. Daily behavioral disruption exposures for active acoustic sources below 30 kHz and from 30 kHz to 200 kHz. Thresholds for these exposures are 160 dB unweighted sound pressure level (SPL). The time above the behavioral criteria threshold, in seconds, indicates the duration for which an animat was exposed above threshold.

Species	Regions	Exposures <30kHz	Time (s) above 160 dB	Exposures <200kHz	Time (s) above 160 dB
Atlantic spotted dolphin	Atlantic	0.03	58	0.04	75
	New England	0.08	58	0.11	75
	Georges Bank	0.09	58	0.12	75
	Mid-Atlantic Bight	0.3	58	0.41	75
	Southeast OCS	0.33	58	0.46	75
	Southeast Continental Shelf	0.72	58	1.01	75
	Gulf of Mexico	1.01	43	1.69	71
	Northeast OCS	1.21	58	1.68	75
Atlantic white-sided dolphin	Southeast OCS	0.02	68	0.03	88
	Northeast OCS	0.27	68	0.39	88
	Mid-Atlantic Bight	0.43	68	0.61	88
	New England	0.82	68	1.16	88
	Georges Bank	1.64	68	2.33	88
	Gulf of Maine	2.59	68	3.69	88
Baird's beaked whale	Northwest Continental Shelf, Southern California Bight, Southwest Continental Shelf	0.03	52	0.04	62
Bearded seal	Bering	3.07	131	3.39	170
Beluga whale	Bering	0.1	85	0.14	120
	Chukchi	0.46	85	0.66	120

Species	Regions	Exposures <30kHz	Time (s) above 160 dB	Exposures <200kHz	Time (s) above 160 dB
	Beaufort	5.52	85	7.95	120
Beluga whale, Cook Inlet	Gulf of Alaska	0.03	85	0.04	120
Blainville's beaked whale	Mid-Atlantic Bight	0	31	0.01	37
	Southeast OCS	0.08	31	0.12	37
	Northeast OCS	0.09	31	0.13	37
Blue whale	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	0.06	6	0.08	37
Bowhead whale	Chukchi, Beaufort, Bering	0.23	42	0.32	51
Bryde's whale	Hawaiian Archipelago	0	48	0.01	91
California sea lion	Southern California Bight	362.94	156	442.55	172
Clymene dolphin	Mid-Atlantic Bight	0.01	42	0.01	50
	Northeast OCS	0.07	42	0.10	50
	Gulf of Mexico	0.19	33	0.26	46
	Southeast OCS	0.24	42	0.35	50
Common bottlenose dolphin	Gulf of Maine	0.01	444	0.01	588
	Atlantic	0.09	444	0.10	588
	Southeast OCS	0.15	444	0.17	588
	Georges Bank	0.16	444	0.17	588
	Hawaiian Archipelago	0.16	102	0.25	212
	Northeast OCS	0.33	444	0.36	588
	New England	0.34	444	0.38	588

Species	Regions	Exposures <30kHz	Time (s) above 160 dB	Exposures <200kHz	Time (s) above 160 dB
	Southwest Continental Shelf, Southern California Bight, Northwest Continental Shelf	0.69	73	0.88	104
	Southeast Continental Shelf	1.13	444	1.25	588
	Mid-Atlantic Bight	1.3	444	1.44	588
	Gulf of Mexico	1.77	212	2.06	451
Common minke whale	Northeast OCS	0.01	67	0.01	79
	Southeast Continental Shelf	0.01	67	0.01	79
	Southeast OCS	0.01	67	0.02	79
	Atlantic	0.02	67	0.02	79
	New England	0.04	67	0.05	79
	Mid-Atlantic Bight	0.04	67	0.05	79
	Bering	0.05	38	0.05	32
	Georges Bank	0.09	67	0.12	79
	Gulf of Maine	0.10	67	0.13	79
	Aleutians, Gulf of Alaska	0.11	38	0.12	32
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	0.18	34	0.22	35
Cuvier's beaked whale	Gulf of Mexico	0	50	0.04	87
	New England	0.01	31	0.01	37
	Hawaiian Archipelago	0.01	24	0.02	41
	Georges Bank	0.01	31	0.02	37
	Mid-Atlantic Bight	0.01	31	0.02	37

Species	Regions	Exposures <30kHz	Time (s) above 160 dB	Exposures <200kHz	Time (s) above 160 dB
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	0.08	54	0.10	57
	Southeast OCS	0.11	31	0.15	37
	Northeast OCS	0.15	31	0.21	37
Dall's porpoise	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	0.04	38	0.06	48
	Aleutians, Gulf of Alaska, Bering, SE Alaska	0.43	47	0.59	47
Dwarf sperm whale	Southeast Continental Shelf	0	33	0.01	38
	Gulf of Mexico	0.02	32	0.04	53
	Northeast OCS	0.10	33	0.14	38
	Southeast OCS	0.11	33	0.16	38
False killer whale	Gulf of Mexico	0.05	31	0.07	51
	Hawaiian Archipelago	0.57	32	0.98	56
	Central/Western Pacific	11.48	42	19.68	47
	American Samoa	19.15	32	32.84	56
Fin whale	Northeast OCS	0.02	96	0.03	119
	Bering, Gulf of Alaska	0.03	45	0.04	46
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	0.09	45	0.12	46
	Mid-Atlantic Bight	0.11	96	0.15	119
	New England	0.12	96	0.15	119

Species	Regions	Exposures <30kHz	Time (s) above 160 dB	Exposures <200kHz	Time (s) above 160 dB
	Gulf of Maine	0.15	96	0.20	119
	Georges Bank	0.18	96	0.24	119
Fraser's dolphin	Southeast Continental Shelf	0.01	30	0.01	42
	Atlantic	0.01	30	0.02	42
	Southeast OCS	0.01	30	0.02	42
	Gulf of Mexico	0.03	30	0.04	42
	Hawaiian Archipelago	11.73	28	21.33	46
Gervais' beaked whale	Mid-Atlantic Bight	0	31	0.01	37
	Southeast OCS	0.08	31	0.12	37
	Northeast OCS	0.09	31	0.13	37
Gray whale	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	1.54	119	2.13	128
Gray seal	Georges Bank	0.11	185	0.12	200
	Mid-Atlantic Bight	0.11	185	0.13	200
	New England	0.55	185	0.61	200
	Gulf of Maine	0.72	185	0.81	200
Guadalupe fur seal	Southern California Bight, Northwest Continental Shelf, Southwest Continental Shelf	0.17	125	0.21	132
Harbor porpoise	Southeast OCS	0		0.01	
	Aleutians, Bering	0.02	52	0.03	66
	SE Alaska	0.08	52	0.11	66
	Gulf of Alaska	0.18	52	0.24	66

Species	Regions	Exposures <30kHz	Time (s) above 160 dB	Exposures <200kHz	Time (s) above 160 dB
	Northeast OCS	0.19	134	0.26	134
	Mid-Atlantic Bight	0.20	106	0.27	134
	Northwest ContinentalContinental Shelf	0.20	46	0.29	54
	Southwest Continental Shelf	0.44	46	0.63	54
	New England	0.54	106	0.72	134
	Georges Bank	0.78	106	1.05	134
	Gulf of Maine	2.06	106	2.77	134
Harbor seal	Georges Bank	0.07	209	0.08	221
	Mid-Atlantic Bight	0.07	209	0.08	221
	Aleutians	0.33	135	0.36	190
	New England	0.34	209	0.37	221
	Bering	0.44	153	0.48	190
	Gulf of Maine	0.45	209	0.49	221
	Southern California Bight, Southwest Continental Shelf	3.72	156	4.53	172
	Gulf of Alaska	10.25	135	11.29	190
	SE Alaska	12.78	135	15.58	190
Harp seal	Georges Bank	0.14	196	0.15	207
	Mid-Atlantic Bight	0.14	196	0.16	207
	New England	0.68	196	0.76	207
	Gulf of Maine	0.90	196	1.00	207
Hawaiian monk seal	Hawaiian Archipelago	3.26	61	4.61	114

Species	Regions	Exposures <30kHz	Time (s) above 160 dB	Exposures <200kHz	Time (s) above 160 dB
Hooded seal	Georges Bank	0.14	196	0.15	207
	Mid-Atlantic Bight	0.14	196	0.16	207
	New England	0.68	196	0.76	207
	Gulf of Maine	0.90	196	1.00	207
Humpback whale	New England	0.04	77	0.06	82
	Mid-Atlantic Bight	0.05	77	0.06	82
	Georges Bank	0.09	77	0.11	82
	Gulf of Maine	0.10	77	0.13	82
Humpback whale, CA	Northwest Continental Shelf, Southwest Continental Shelf, Southern California Bight	0.14	119	0.19	128
Humpback whale, CNP	Gulf of Alaska, Aleutians, Bering, Hawaiian Archipelago, SE Alaska	0.02	39	0.03	68
Humpback whale, WNP	American Samoa	0	39	0.01	68
Long-beaked common dolphin	Southwest Continental Shelf, Northwest Continental Shelf, Southern California Bight	13.68	43	21.03	52
Longman's (Indo-Pacific) beaked whale	Hawaiian Archipelago	0	24	0.01	41
Manatee	Gulf of Mexico, Atlantic	0.85	175	0.90	178
	Caribbean	2.37	267	2.59	265
Melon-headed whale	Northeast OCS	0.01	32	0.01	39
	Southeast Continental Shelf	0.01	32	0.02	39

Species	Regions	Exposures <30kHz	Time (s) above 160 dB	Exposures <200kHz	Time (s) above 160 dB
	Atlantic	0.02	32	0.03	39
	Southeast OCS	0.02	32	0.03	39
	Gulf of Mexico	0.08	29	0.13	44
	Hawaiian Archipelago	0.14	31	0.22	48
Mesoplodont beaked whales (all)	Gulf of Mexico, Gulf of Maine	0	50	0.04	87
	Mid-Atlantic Bight	0	31	0.01	37
	Northwest Continental Shelf, Southern California Bight, Southwest Continental Shelf	0.06	38	0.08	41
	Southeast OCS	0.08	31	0.12	37
	Northeast OCS	0.09	31	0.13	37
North Atlantic right whale	Georges Bank	0.01	92	0.01	114
	Mid-Atlantic Bight	0.02	92	0.02	114
	Gulf of Maine	0.02	92	0.03	114
	New England	0.03	92	0.04	114
Northern elephant seal	SE Alaska, Aleutians, Northwest Continental Shelf, Southwest Continental Shelf, Southern California Bight, Gulf of Alaska	3.79	131	4.18	170
Northern fur seal	Southwest Continental Shelf, Southern California Bight	27.73	125	32.69	132
	Bering, Aleutians, SE Alaska, Gulf of Alaska	31.09	131	36.55	178
Northern bottlenose whale	Northeast OCS	0	37	0.01	42

Species	Regions	Exposures <30kHz	Time (s) above 160 dB	Exposures <200kHz	Time (s) above 160 dB
Northern right whale dolphin	Northwest Continental Shelf, Southern California Bight, Southwest Continental Shelf	6.83	38	8.78	41
Offshore killer whale	Northwest Continental Shelf, Southwest Continental Shelf, Southern California Bight	0.01	36	0.02	44
Pacific white-sided dolphin	Gulf of Alaska, SE Alaska, Aleutians	1.11	36	1.79	39
	Northwest Continental Shelf, Southern California Bight, Southwest Continental Shelf	4.56	36	7.35	40
Pantropical spotted dolphin	Northeast OCS	0.01	42	0.01	50
	Atlantic	0.03	42	0.04	50
	Southeast Continental Shelf	0.03	42	0.05	50
	Southeast OCS	0.06	42	0.09	50
	Gulf of Mexico	1.35	33	1.87	46
	Hawaiian Archipelago	14.54	31	24.48	59
Pilot whale, long finned	Gulf of Mexico	0.02	35	0.03	39
	Gulf of Maine	0.05	35	0.07	39
	Southeast Continental Shelf	0.08	35	0.10	39
	Southeast OCS	0.16	35	0.20	39
	Atlantic	0.22	35	0.29	39
	New England	0.27	35	0.35	39
	Georges Bank	0.28	35	0.36	39
	Mid-Atlantic Bight	0.29	35	0.38	39
	Northeast OCS	0.35	35	0.45	39

Species	Regions	Exposures <30kHz	Time (s) above 160 dB	Exposures <200kHz	Time (s) above 160 dB
Pilot whale, short finned	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	0.01	43	0.02	52
	Gulf of Mexico	0.02	33	0.03	52
	Gulf of Maine	0.04	35	0.04	39
	Hawaiian Archipelago	0.04	39	0.06	79
	Southeast Continental Shelf	0.05	35	0.06	39
	Southeast OCS	0.11	35	0.13	39
	Atlantic	0.15	35	0.18	39
	New England	0.19	35	0.22	39
	Georges Bank	0.19	35	0.22	39
	Mid-Atlantic Bight	0.20	35	0.23	39
	Northeast OCS	0.24	35	0.28	39
Polar bear	Bering, Chukchi	0.08	80	0.10	102
	Beaufort	0.14	80	0.18	102
Pygmy killer whale	Gulf of Mexico	0.02	46	0.03	31
	Hawaiian Archipelago	1.29	37	2.91	39
Pygmy sperm whale	Caribbean	0	33	0.01	38
	Southeast Continental Shelf	0	33	0.01	38
	Gulf of Mexico	0.02	32	0.04	53
	Northeast OCS	0.10	33	0.14	38
	Southeast OCS	0.11	33	0.16	38
	Hawaiian Archipelago	16.55	41	28.08	77
	Aleutians	0.02	37	0.02	43

Species	Regions	Exposures <30kHz	Time (s) above 160 dB	Exposures <200kHz	Time (s) above 160 dB
Resident killer whale	Bering	0.04	37	0.05	43
	Gulf of Alaska	0.07	37	0.09	43
	SE Alaska	0.07	37	0.10	43
Ribbon seal	Aleutians, Bering, Chukchi, Beaufort, Gulf of Alaska	1.28	131	1.41	170
Rice's whale	Gulf of Mexico	0	55	0.01	109
Ringed seal	Bering, Chukchi	1.37	131	1.52	170
Risso’s dolphin	Gulf of Maine	0.02	125	0.02	107
	Gulf of Mexico	0.07	70	0.10	89
	Southeast Continental Shelf	0.10	125	0.13	107
	Southeast OCS	0.12	125	0.15	107
	Hawaiian Archipelago	0.13	45	0.17	70
	Southern California Bight, Northwest Continental Shelf, Southwest Continental Shelf	0.18	33	0.24	40
	Mid-Atlantic Bight	0.23	125	0.29	107
	Georges Bank	0.34	125	0.42	107
	New England	0.54	125	0.67	107
	Northeast OCS	0.57	125	0.70	107
Rough-toothed dolphin	Mid-Atlantic Bight	0	71	0.01	100
	Northeast OCS	0.02	71	0.03	100
	Southeast Continental Shelf	0.04	71	0.05	100
	Atlantic	0.04	71	0.06	100
	Southeast OCS	0.04	71	0.07	100

Species	Regions	Exposures <30kHz	Time (s) above 160 dB	Exposures <200kHz	Time (s) above 160 dB
	Gulf of Mexico	0.08	49	0.15	118
	Hawaiian Archipelago	14.64	35	29.74	88
Sea otter, CA	Southwest Continental Shelf	3.73	233	4.29	248
Sea otter, SC	Gulf of Alaska	1.11	173	1.29	212
Sea otter, SE	SE Alaska	3.18	173	3.65	212
Sea otter, SW	Aleutians	1.44	173	1.68	212
Sea otter, WA	Northwest Continental Shelf	1.75	233	2.01	248
Sei whale	Hawaiian Archipelago	0	39	0.01	70
	Mid-Atlantic Bight	0.01	96	0.01	119
	New England	0.01	96	0.01	119
	Northeast OCS	0.01	96	0.01	119
	Southern California Bight, Northwest Continental Shelf, Southwest Continental Shelf	0.02	42	0.02	45
	Georges Bank	0.02	96	0.03	119
	Gulf of Maine	0.03	96	0.04	119
Short-beaked common dolphin	Atlantic	0.01	74	0.02	91
	Southeast Continental Shelf	0.02	74	0.03	91
	Southeast OCS	0.20	74	0.28	91
	Gulf of Maine	0.47	74	0.64	91
	Northeast OCS	1.76	74	2.41	91
	Mid-Atlantic Bight	4.74	74	6.50	91
	Georges Bank	5.59	74	7.65	91
	New England	6.50	74	8.90	91

Species	Regions	Exposures <30kHz	Time (s) above 160 dB	Exposures <200kHz	Time (s) above 160 dB
	Southern California Bight, Southwest Continental Shelf, Northwest Continental Shelf	21.76	32	32.15	38
Sowerby's beaked whale	Mid-Atlantic Bight	0	36	0.01	40
	Southeast OCS	0.08	36	0.12	40
	Northeast OCS	0.09	36	0.13	40
Sperm whale	New England	0	28	0.01	28
	Georges Bank	0.01	28	0.01	28
	Hawaiian Archipelago	0.01	28	0.01	28
	Southeast OCS	0.02	28	0.04	28
	Southern California Bight, Northwest Continental Shelf, Southwest Continental Shelf	0.03	45	0.04	46
	Gulf of Mexico	0.03	44	0.05	86
	Northeast OCS	0.04	28	0.06	28
Spinner dolphin	Atlantic	0.01	37	0.01	41
	Southeast OCS	0.01	37	0.01	41
	Northeast OCS	0.01	37	0.01	41
	Hawaiian Archipelago	0.21	62	0.29	124
	Gulf of Mexico	0.22	29	0.34	47
Spotted seal	Bering, Chukchi, Aleutians, Beaufort	16.75	131	18.49	170
Steller sea lion	Gulf of Alaska, SE Alaska, Bering, Aleutians	0.41	131	0.49	170
	Northwest Continental Shelf	6.37	131	7.51	170
Striped dolphin	Mid-Atlantic Bight	0.11	32	0.16	39

Species	Regions	Exposures <30kHz	Time (s) above 160 dB	Exposures <200kHz	Time (s) above 160 dB
	Georges Bank	0.11	32	0.17	39
	Gulf of Mexico	0.12	33	0.19	50
	New England	0.14	32	0.22	39
	Southeast OCS	0.24	32	0.37	39
	Northeast OCS	3.81	32	5.9	39
	Northwest Continental Shelf, Southwest Continental Shelf, Southern California Bight	5.57	35	7.28	36
	Hawaiian Archipelago	35.14	32	49.28	56
Transient killer whale	Gulf of Alaska	0	37	0.01	43
	Aleutians	0.01	37	0.01	43
	SE Alaska, Northwest Continental Shelf	0.03	36	0.04	44
True's beaked whale	Mid-Atlantic Bight	0	36	0.01	40
	Southeast OCS	0.08	36	0.12	40
	Northeast OCS	0.09	36	0.13	40
Walrus	Chukchi, Bering, Aleutians	0.65	80	0.82	102

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Appendix A. Acoustics

Basic Acoustics

Sound travels as a mechanical wave through media by oscillation of the media's particles, including liquids (water), solids (e.g., seabed sediments), or gas (air). Without a medium, sound cannot exist. Sound in water and air:

- travels as longitudinal P-waves, where the direction of particle motion is parallel to the direction of propagation, and
- consists of alternating compressions and rarefactions.

Sound in rock and sediments:

- travels as both longitudinal P-waves and transverse S-waves, where the direction of particle motion is perpendicular to the direction of propagation.
- P waves travel faster than S waves and arrive at receivers first.

Sounds Properties

Wavelength: spatial distance between two successive 'peaks' in a propagating wave: λ [m]. It is related to sound speed c and frequency f by $\lambda = c/f$ (Figure A-1).

Frequency: rate of oscillation as the number of cycles per second: f [Hz: Hertz]; $1\ Hz = 1/s$

Period: duration of 1 cycle: $T = 1/f$ [s]. It is related to wavelength by $T = \lambda/c$

Amplitude: magnitude of the largest departure from its equilibrium value of an acoustic variable (ANSI, S1.1-2013). High amplitude corresponds to high intensity.

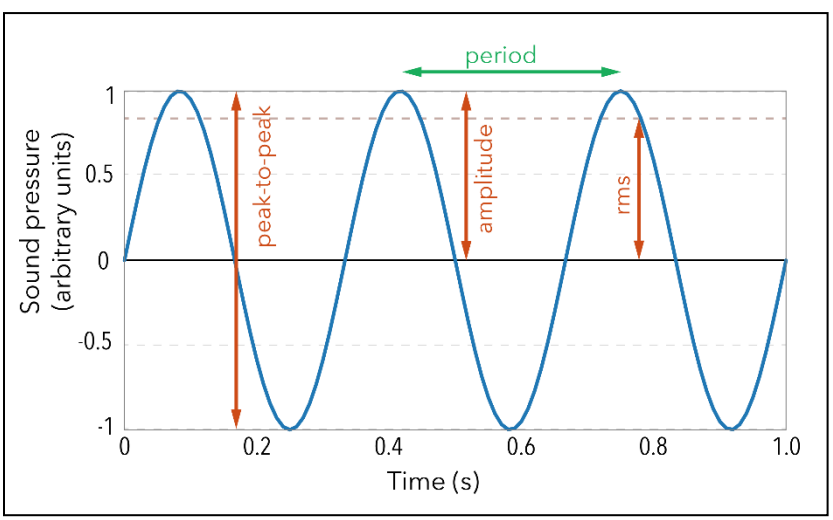

Figure A-1. A cosine wave with a peak value (i.e., amplitude) of 1, peak-to-peak value of 2, rms value of 0.71, period of 0.33 s, and frequency of 3 Hz.

Speed: the distance travelled per unit time $c = \lambda/T = \lambda \times f$ where c = the speed of sound [m/s], f = frequency (Hz), and λ = wavelength (m).

Pulse Length: For impulsive (pulsed) sound (e.g., airguns, pile driving), the pulse length is often taken as the 90 % pulse energy duration $T_{90\%}$, which is the time between the 5 % and 95 % points on the cumulative energy curve. $SPL_{rms90\%}$ is computed by averaging p2 from $T_{5\%}$ to $T_{95\%}$ (Figure A-2).

Duty Cycle: The fraction of time that a source is 'on'. e.g., a source transmitting for 2 hours per day has a duty cycle of 2/24 = 0.08 = 8 %.

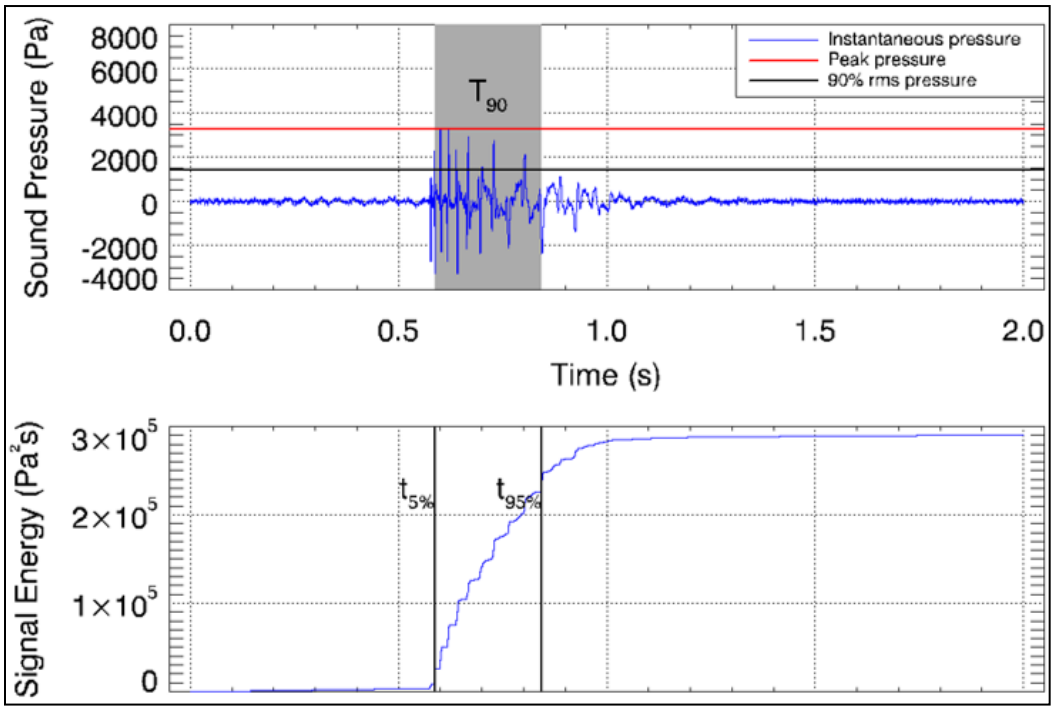

Figure A-2. The rms90 value is computed using the rms square pressure over T90, the period between the time of 5% and 95% of the cumulative square pressure

Signal components: time domain and frequency domain

The Fourier Transform: Signals in time (time domain) can be expressed in terms of their frequency components (frequency domain). The Fourier Transform computes the spectral (frequency) content of a signal *h(t)*:

$$H(f) = \int_{-\infty}^{+\infty} h(t)\, \mathrm{e}^{-2\pi \mathrm{i} f t} \mathrm{d}t$$

And, the Inverse Fourier transform computes the time-domain signal, *h(t)*, from the spectral components *H(t)*:

$$h(t) = \int_{-\infty}^{+\infty} H(t)\, \mathrm{e}^{2\pi \mathrm{i} f t} \mathrm{d}t$$

Transmission Loss

The propagation of sound through the environment was modelled by predicting the acoustic transmission loss—a measure, in decibels, of the decrease in sound level between a source and a receiver some distance away. Geometric spreading of acoustic waves is the predominant way by which transmission loss

occurs. Transmission loss also happens when the sound is absorbed and scattered by the seawater, and absorbed scattered, and reflected at the water surface and within the seabed. Transmission loss depends on the acoustic properties of the ocean and seabed; its value changes with frequency.

If the acoustic source level (SL), expressed in dB re 1 µPa @ 1 m, and transmission loss (TL), in dB, at a given frequency are known, then the received level (RL) at a receiver location can be calculated in dB by:

$$RL = SL - TL$$

Pulsed Versus Non-Pulsed Sounds

Anthropogenic sounds can affect marine life in a variety of ways. Numerous scientific reviews and workshops over the past 40 years have investigated these effects (Payne and Webb, 1971; Fletcher and Busnel; 1978; Richardson et al., 1995; MMC, 2007; Nowacek et al., 2007; Southall et al., 2007; Weilgart, 2007; Tyack, 2008). Anthropogenic sounds that could affect marine life are generally divided into two main categories when they are investigated: pulsed divided into single and multiple, and non-pulsed sounds (Southall et al., 2007). Pulsed or impulsive sounds include pile driving and airgun shots as well as some sonar; non-pulsed, continuous-types of sounds include certain sonar and vessel propulsion sounds and machinery sounds. Numerous definitions and mathematical distinctions distinguish pulsed from non-pulsed sounds (Burdic, 2003). Southall et al. (2007) adopted a measurement-based distinction originally proposed by Harris (1998) that if measurements between the continuous and impulse sound level meter settings differ by ≥ 3 dB, a sound is pulsed, whereas if the difference is < 3 dB the sound is non-pulsed. The distinction between these two sound types, however, is not always obvious. Certain signals, for example those from acoustic deterrent or harassment devices, share properties of both pulsed and non-pulsed sounds. A signal near a source could be categorized as a pulse, but due to propagation effects as it moves farther from the source, it could be categorized as non-pulsed (e.g., Greene and Richardson, 1988).

Following guidance from the NMFS, high-resolution geophysical sources can be either impulsive or non-impulsive. NMFS has performed qualitative classification of the impulsiveness of these sources. NMFS has determined that sparkers and boomers are classified as impulsive sources, while sub-bottom profilers and multi-beam echosounders are non-impulsive. This classification is based on NMFS' qualitative assessment of the generated waveforms (pers comm, Benjamin Laws [NMFS] 2020).

Acoustics Metrics

Underwater sound pressure amplitude is measured in decibels (dB) relative to a fixed reference pressure of p_0 = 1 µPa. Because the perceived loudness of sound, especially pulsed sound such as from seismic airguns, pile driving, and sonar, is not generally proportional to the instantaneous acoustic pressure, several sound level metrics are commonly used to evaluate sound and its effects on marine life. Here we provide specific definitions of relevant metrics used in the accompanying report. Where possible, we follow the American National Standard Institute and International Organization for Standardization definitions and symbols for sound metrics (e.g., ISO, 2017; ANSI, R2013), but these standards are not always consistent.

The zero-to-peak sound pressure, or peak sound pressure (PK or $L_{p,pk}$; dB re 1 µPa), is the decibel level of the maximum instantaneous acoustic pressure in a stated frequency band attained by an acoustic pressure signal, $p(t)$:

$$L_{\mathrm{p,pk}} = 10\log_{10}\frac{\max|p^2(t)|}{p_0^2} = 20\log_{10}\frac{\max|p(t)|}{p_0} \tag{1}$$

PK is often included as a criterion for assessing whether a sound is potentially injurious; however, because it does not account for the duration of an acoustic event, it is generally a poor indicator of perceived loudness.

The peak-to-peak sound pressure (PK-PK or $L_{p,pk\text{-}pk}$; dB re 1 µPa) is the difference between the maximum and minimum instantaneous sound pressure, possibly filtered in a stated frequency band, attained by an impulsive sound, *p(t)*:

$$L_{\mathrm{p,pk\text{-}pk}} = 10\log_{10}\frac{[\max(p(t)) - \min(p(t))]^2}{p_0^2} \tag{2}$$

The sound pressure level (SPL or L_p; dB re 1 µPa) is the root-mean-square (rms) pressure level in a stated frequency band over a specified time window (*T*; s). It is important to note that SPL always refers to an rms pressure level and therefore not instantaneous pressure:

$$L_{\mathrm{p}} = 10\log_{10}\left(\frac{1}{T}\int_T g(t)\,p^2(t)\,dt \Big/ p_0^2\right) \tag{3}$$

where *g(t)* is an optional time weighting function. In many cases, the start time of the integration is marched forward in small time steps to produce a time-varying SPL function. For short acoustic events, such as sonar pulses and marine mammal vocalizations, it is important to choose an appropriate time window that matches the duration of the signal. For in-air studies, when evaluating the perceived loudness of sounds with rapid amplitude variations in time, the time weighting function *g(t)* is often set to a decaying exponential function that emphasizes more recent pressure signals. This function mimics the leaky integration nature of mammalian hearing. For example, human-based fast time-weighted SPL ($L_{p,fast}$) applies an exponential function with time constant 125 ms. A related simpler approach used in underwater acoustics sets *g(t)* to a boxcar (unity amplitude) function of width 125 ms; the results can be referred to as $L_{p,boxcar\ 125ms}$. Another approach, historically used to evaluate SPL of impulsive signals underwater, defines *g(t)* as a boxcar function with edges set to the times corresponding to 5% and 95% of the cumulative square pressure function encompassing the duration of an impulsive acoustic event. This calculation is applied individually to each impulse signal, and the results have been referred to as 90% SPL ($L_{p,90\%}$).

The sound exposure level (SEL or L_E; dB re 1 µPa2·s) is the time-integral of the squared acoustic pressure over a duration (*T*):

$$L_{\mathrm{E}} = 10\log_{10}\left(\int_T p^2(t)\,dt \Big/ T_0 p_0^2\right) \tag{4}$$

where T_0 is a reference time interval of 1 s. SEL continues to increase with time when non-zero pressure signals are present. It is a dose-type measurement, so the integration time applied must be carefully considered for its relevance to impact to the exposed recipients.

SEL can be calculated over a fixed duration, such as the time of a single event or a period with multiple acoustic events. When applied to pulsed sounds, SEL can be calculated by summing the SEL of the *N* individual pulses. For a fixed duration, the square pressure is integrated over the duration of interest. For multiple events, the SEL can be computed by summing (in linear units) the SEL of the *N* individual events:

$$L_{\mathrm{E,N}} = 10\log_{10}\sum_{i=1}^{N} 10^{\frac{L_{E,i}}{10}} \tag{5}$$

Because the SPL(T_{90}) and SEL are both computed from the integral of square pressure, these metrics are related numerically by the following expression, which depends only on the duration of the time window *T*:

$$L_{\mathrm{p}} = L_{\mathrm{E}} - 10\log_{10}(T) \tag{6}$$

$$L_{\mathrm{p90}} = L_{\mathrm{E}} - 10\log_{10}(T_{90}) - 0.458 \tag{7}$$

where the 0.458 dB factor accounts for the 10% of pulse SEL missing from the SPL(T_{90}) integration time window.

Energy equivalent SPL (L_{eq}; dB re 1 µPa) denotes the SPL of a stationary (constant amplitude) sound that generates the same SEL as the signal being examined, *p(t)*, over the same time period, *T*:

$$L_{\mathrm{eq}} = 10\log_{10}\left(\frac{1}{T}\int_{T} p^2(t)\,dt \Big/ p_0^2\right) \tag{8}$$

The equations for SPL and the energy-equivalent SPL are numerically identical. Conceptually, the difference between the two metrics is that the SPL is typically computed over short periods (typically of one second or less) and tracks the fluctuations of a non-steady acoustic signal, whereas the L_{eq} reflects the average SPL of an acoustic signal over time periods typically of one minute to several hours.

If applied, the frequency weighting of an acoustic event should be specified, as in the case of M-weighted SEL (e.g., L_E, $L_{FC,24h}$) or auditory-weighted SPL ($L_{p,ht}$). The use of fast, slow, or impulse exponential-time-averaging or other time-related characteristics should also be specified.

In the present report, audiogram-weighted, fast-averaged SPL ($L_{p,ht,F}$) is defined by the exponential function from Plomp and Bouman (1959):

$$\begin{aligned} L_{\mathrm{p,ht}} &= L_{E,\mathrm{ht,per\text{-}pulse}} - 10\log_{10}(d/0.9)\ , \\ L_{\mathrm{p,ht,F}} &= L_{p,\mathrm{ht}} + 10\log_{10}\frac{1-e^{-d/\tau}}{1-e^{-T/\tau}} \end{aligned} \tag{9}$$

where *d* is the duration in seconds, τ is the time constant of 0.125 s representing marine mammal auditory integration time, $L_{p,ht}$ is the audiogram-weighted SPL over pulse duration, and *T* is the pulse repetition period. This metric accounts for the hearing sensitivity of specific species through frequency weighting,

and results in reduced perceived loudness (i.e., sensation level) for pulses shorter than auditory integration time (τ).

Decidecade Band Analysis

The distribution of a sound's power with frequency is described by the sound's spectrum. The sound spectrum can be split into a series of adjacent frequency bands. Splitting a spectrum into 1 Hz wide bands, called passbands, yields the power spectral density of the sound. This splitting of the spectrum into passbands of a constant width of 1 Hz, however, does not represent how animals perceive sound.

Because animals perceive exponential increases in frequency rather than linear increases, analyzing a sound spectrum with passbands that increase exponentially in size better approximates real-world scenarios. In underwater acoustics, a spectrum is commonly split into decidecade bands, which are approximately one-third of an octave (base 2) wide and often referred to as 1/3-octave-bands. Each octave represents a doubling in sound frequency. The center frequency of the *i*th band, $f_c(i)$, is defined as:

$$f_{\mathrm{c}}(i) = 10^{\frac{i}{10}} \tag{1}$$

and the low (f_{lo}) and high (f_{hi}) frequency limits of the *i*th band are defined as:

$$f_{\mathrm{lo},i} = 10^{\frac{-1}{20}} f_{\mathrm{c}}(i) \quad \text{and} \quad f_{\mathrm{hi},i} = 10^{\frac{1}{20}} f_{\mathrm{c}}(i) \tag{2}$$

The decidecade bands become wider with increasing frequency, and on a logarithmic scale the bands appear equally spaced (Figure A-3).

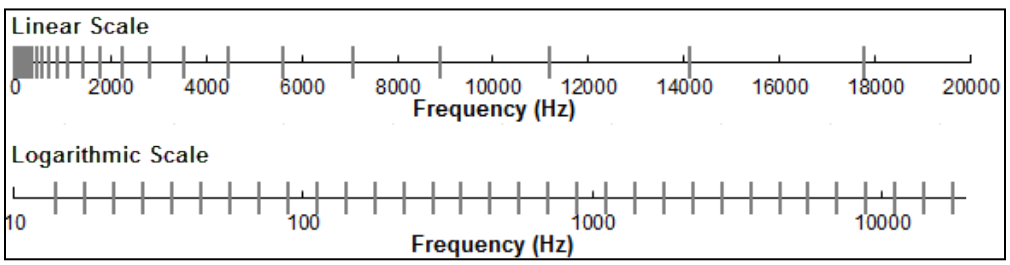

Figure A-3. Decidecade frequency bands (vertical lines) shown on a linear frequency scale and a logarithmic scale

The sound pressure level in the *i*th band ($L_{p,i}$) is computed from the spectrum $S(f)$ between $f_{lo,i}$ and $f_{hi,i}$:

$$L_{\mathrm{p},i} = 10 \log_{10} \int_{f_{\mathrm{lo},i}}^{f_{\mathrm{hi},i}} S(f)\, df \tag{3}$$

Summing the sound pressure level of all the bands yields the broadband sound pressure level:

$$\text{Broadband SPL} = 10 \log_{10} \sum_{i} 10^{\frac{L_{p,i}}{10}} \tag{4}$$

Figure A-4 shows an example of how the decidecade band sound pressure levels compare to the sound pressure spectral density levels of an ambient noise signal. Because the decidecade bands are wider with increasing frequency, the decidecade band SPL is higher than the spectral levels, especially at higher frequencies. Acoustic modeling of decidecade bands requires less computation time than 1 Hz bands and still resolves the frequency-dependence of the sound source and the propagation environment.

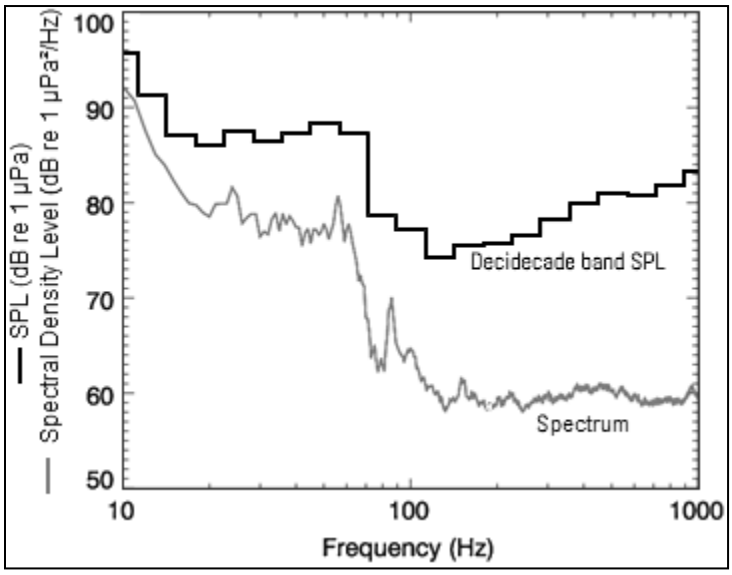

Figure A-4. Sound pressure spectral density levels and the corresponding decidecade band sound pressure levels of example ambient noise shown on a logarithmic frequency scale

Appendix B. Marine Mammal Impact Criteria

The Marine Mammal Protection Act (MMPA) (16 U.S.C. 1362) prohibits the take of marine mammals. The MMPA defines the term "take" as: to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal. The MMPA defines harassment in two categories relevant to anthropogenic activity. These are:

- (Level A) Any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild, and
- (Level B) Any act of pursuit, torment or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing a disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild.

To assess the potential impacts of the active underwater acoustic sound sources, it is necessary to first establish acoustic exposure criteria for which takes could result. In 2016, NMFS issued a Technical Guidance document that provides acoustic thresholds for onset of permanent threshold shift (PTS) in marine mammal hearing for most sound sources, that was then updated in 2018 (NMFS 2016, NMFS 2018). NMFS also provided guidance on the use of weighting functions when applying injury (Level A) criteria. NMFS Guidance recommends the use of a dual criterion for assessing exposures, including a peak (unweighted/flat) sound level metric (PK) and a cumulative sound exposure level (SEL) metric with frequency weighting (Table B-1). Both acoustic criteria and weighting function application are divided into functional hearing groups within the Technical Guidance and Navy effects criteria (low-, mid-, and high-frequency cetaceans, phocid pinnipeds, other carnivores, and sirenia) that species are assigned to, based on their respective hearing ranges (Finneran et al. 2017, [NMFS] National Marine Fisheries Service (US) 2018).

The publication of ISO 18405 Underwater Acoustics–Terminology (ISO, 2017) provided a dictionary of underwater bioacoustics standards ([ANSI] American National Standards Institute and [ASA] Acoustical Society of America S1.1-2013). The definitions and conventions discussed here follow ISO (2017) except where stated otherwise (Table B-1).

Table B-1. Summary of relevant acoustic terminology used by US regulators

Metric	NOAA (NMFS, 2018)	This report (ISO, 2017)	
		Main Text/Tables	Equations
Sound pressure level	n/a	SPL	L_p
Peak pressure level	PK	PK	L_{pk}
Cumulative sound exposure level	SEL_{cum}	SEL	L_E

The SEL_{cum} metric as used by the NMFS describes the sound energy received by a receptor over a period of 24 hours. Accordingly, following the ISO standard, this will be denoted as SEL in this report, except for in tables and equations where L_E will be used alongside SEL to account for its use in mathematical equations.

Marine Mammal Hearing Groups

Current data and predictions show that marine mammal species differ in their hearing capabilities, in absolute hearing sensitivity as well as frequency band of hearing (Richardson et al. 1995, Wartzok and Ketten 1999, Southall et al. 2007, Au and Hastings 2008). While hearing measurements are available for a small number of species based on captive animal studies, direct measurements of many odontocetes and all mysticetes do not exist. As a result, hearing ranges for many odontocetes are grouped with similar species, and predictions for mysticetes are based on other methods including: anatomical studies and modeling (Houser et al. 2001, Parks et al. 2007, Tubelli et al. 2012, Cranford and Krysl 2015), vocalizations (see reviews in Richardson et al. 1995, Wartzok and Ketten 1999, Au and Hastings 2008), taxonomy, and behavioral responses to sound (Dahlheim and Ljungblad 1990, see review in Reichmuth et al. 2007) In 2007, Southall et al. proposed that marine mammals be divided into hearing groups. This division was updated in 2016 and 2018 by NMFS using more recent best available science (Table B-2).

Table B-2. Marine mammal hearing groups

Hearing Group	Generalized hearing range*
Low-frequency (LF) cetaceans: (mysticetes or baleen whales)	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans: (odontocetes: delphinids, beaked whales)	150 Hz to 160 kHz
High-frequency (HF) cetaceans: (other odontocetes)	275 Hz to 160 kHz
Phocid pinnipeds in water (PW)	50 Hz to 86 kHz
Other carnivores in water (OW)	60 Hz to 39 kHz
Sirenia (SI)	150 Hz to 40 kHz

Sources: NMFS 2018; Sills et al., 2014; Blackstock et al. 2017

* The generalized hearing range for all species within a group. Individual hearing will vary.

Marine Mammal Auditory Weighting Functions

The potential for anthropogenic sounds to impact marine mammals is largely dependent on whether the sound occurs at frequencies that an animal can hear well, unless the sound pressure level is so high that it can cause physical tissue damage regardless of frequency. Weighting functions are applied to the sound spectra under consideration to weight the importance of received sound levels at particular frequencies in a manner reflective of an animal's sensitivity to those frequencies (Nedwell and Turnpenny 1998, Nedwell et al. 2007). In this study, multiple weighting functions were used. Southall et al. (2007) were first to suggest weighting functions and functional hearing groups for marine mammals. The weighting functions from Southall et al. (2007) were referred to as m-weighting. For this analysis, the Technical Guidance issued by NOAA (NMFS 2018), which included weighting functions and associated thresholds, was used for determining the ranges for potential injury to marine mammals.

Southall et al. (2007) Frequency Weighting Functions

Auditory weighting functions for marine mammals, called M-weighting functions, were proposed by Southall et al. (2007). These M-weighting functions are applied in a similar way as A-weighting for noise level assessments for humans. Functions were defined for five hearing groups of marine mammals:

- Low-frequency (LF) cetaceans—mysticetes (baleen whales)
- Mid-frequency (MF) cetaceans—some odontocetes (toothed whales)
- High-frequency (HF) cetaceans—odontocetes specialized for using high-frequencies
- Pinnipeds in water (Pw)—seals, sea lions, and walrus
- Pinnipeds in air (not addressed here)

The M-weighting functions have unity gain (0 dB) through the passband and their high and low frequency roll-offs are approximately –12 dB per octave. The amplitude response in the frequency domain of each M-weighting function is defined by:

$$G(f) = -20\log_{10}\left[\left(1+\frac{a^2}{f^2}\right)\left(1+\frac{f^2}{b^2}\right)\right] \quad (1)$$

where *G(f)* is the weighting function amplitude (in dB) at the frequency *f* (in Hz), and *a* and *b* are the estimated lower and upper hearing limits, respectively, which control the roll-off and passband of the weighting function. The parameters *a* and *b* are defined uniquely for each hearing group (Table B-3). Figures Figure B-1and Figure B-2 show the auditory weighting functions recommended by Southall et al. (2007).

Table B-3. Parameters for the auditory weighting functions recommended by Southall et al. (2007).

Functional Hearing Group	*a* (Hz)	*b* (Hz)
Low-frequency cetaceans	7	22,000
Mid-frequency cetaceans	150	160,000
High-frequency cetaceans	200	180,000
Pinnipeds in water	75	75,000

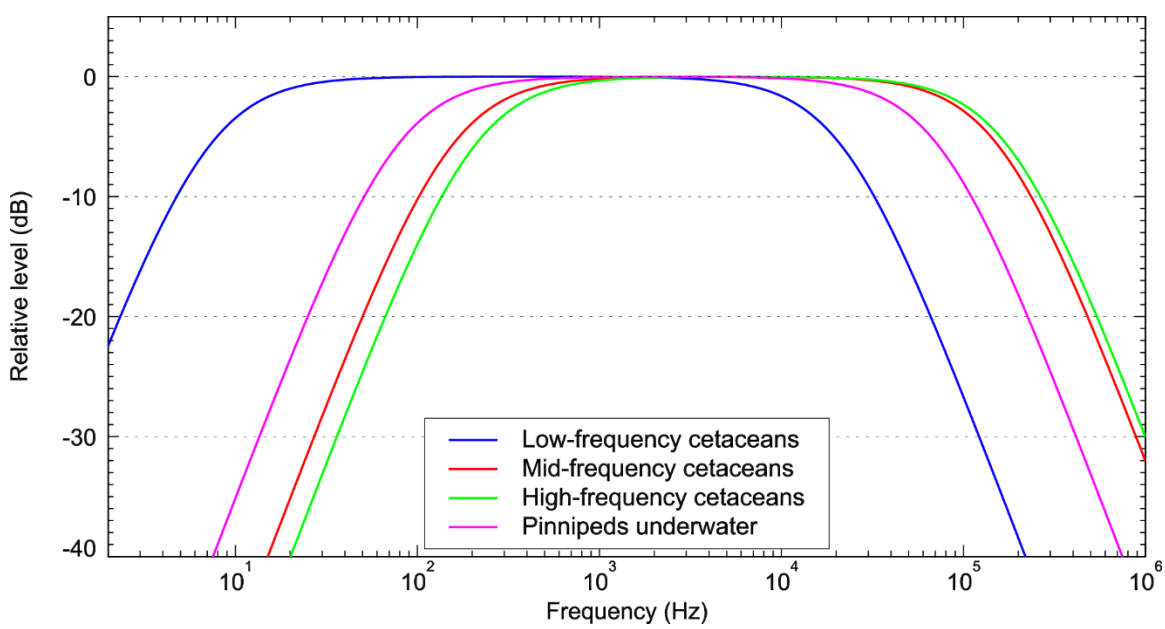

Figure B-1. Auditory weighting functions for the functional marine mammal hearing groups as recommended by Southall et al. (2007)

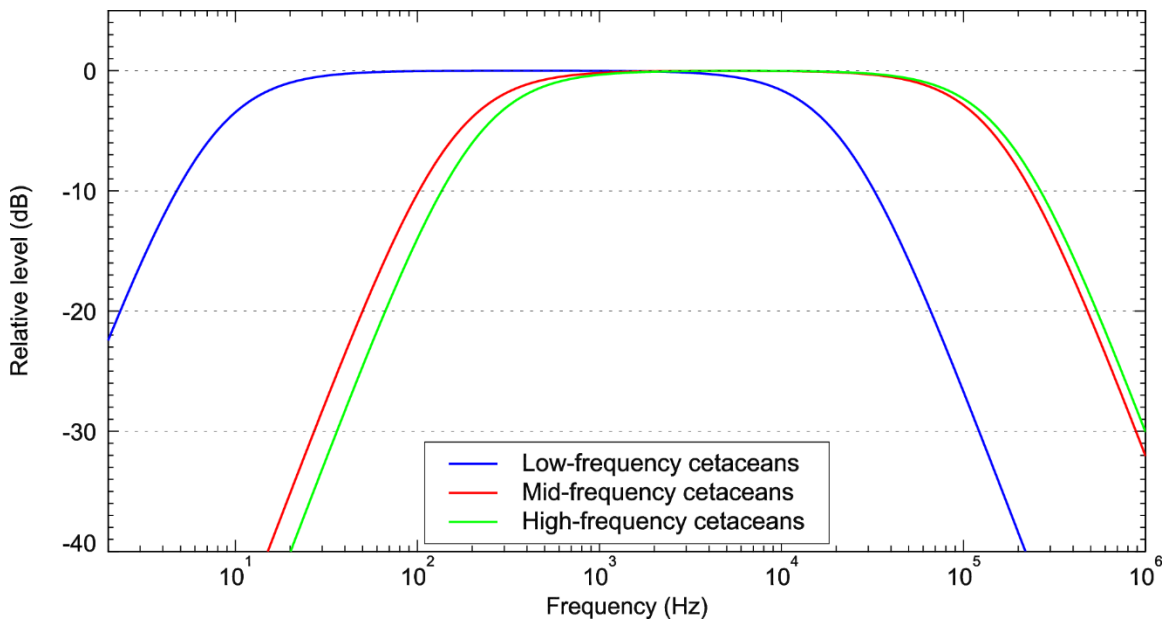

Figure B-2. Auditory weighting functions for the low-, mid-, and high-frequency cetacean hearing groups as recommended by Southall et al. (2007).

NMFS (2018) Frequency Weighting Functions

In 2015, a U.S. Navy technical report by Finneran (2015) recommended new auditory weighting functions. The auditory weighting functions for marine mammals are applied in a similar way as A-weighting for noise level assessments for humans. The new frequency-weighting functions are expressed as:

$$G(f) = K + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\} \quad (1)$$

Finneran (2015) proposed five functional hearing groups for marine mammals in water: low-, mid- and high-frequency cetaceans (LF, MF, and HF cetaceans, respectively), phocid pinnipeds, and otariid pinnipeds. The parameters for these frequency-weighting functions were further modified the following year (Finneran 2016) and were adopted in NOAA's technical guidance that assesses acoustic impacts on marine mammals (NMFS 2018). The updates did not affect the content related to either the definitions of M-weighting functions or the threshold values. Table B-4 lists the frequency-weighting parameters for each hearing group. Figure B-3 shows the resulting frequency-weighting curves.

Table B-4. Parameters for the auditory weighting functions recommended by NMFS (2018).

Functional Hearing Group	*a*	*b*	f_1 (Hz)	f_2 (Hz)	*K* (dB)
Low-frequency cetaceans	1.0	2	200	19,000	0.13
Mid-frequency cetaceans	1.6	2	8,800	110,000	1.20
High-frequency cetaceans	1.8	2	12,000	140,000	1.36
Phocid pinnipeds in water	1.0	2	1,900	30,000	0.75
Other carnivores in water	2.0	2	940	25,000	0.64
Sirenia	1.8	2	4,300	25,000	2.62

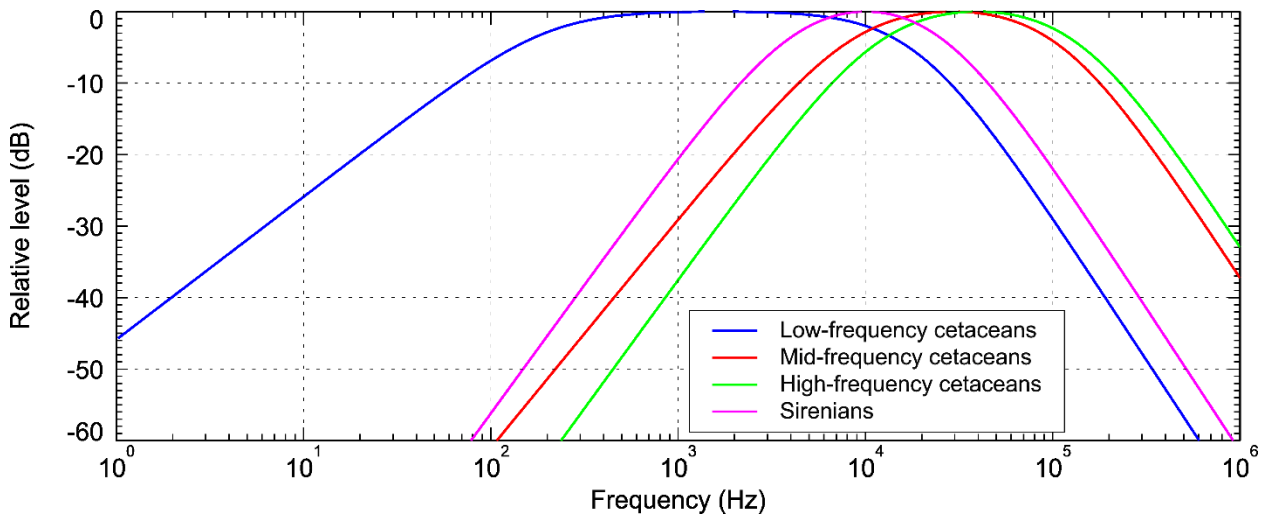

Figure B-3. Auditory weighting functions for the low-, mid-, and high-frequency cetacean and sirenian hearing groups as recommended by NMFS (2018). Sirenian weighting function is from Blackstock et al. (2017)

Injury Exposure Criteria

Injury to the hearing apparatus of a marine mammal may result from a fatiguing stimulus measured in terms of SEL, which considers the sound level and duration of the exposure signal. Intense sounds may also damage hearing independent of duration, so an additional metric of peak pressure (PK) is also used to assess acoustic exposure injury risk. A permanent threshold shift (PTS) in hearing may be considered injurious but there are no published data on the sound levels that cause PTS in marine mammals. There are data that indicate the received sound levels at which temporary threshold shift (TTS) occurs, and PTS onset may be extrapolated from TTS onset level and an assumed growth function (Southall et al. 2007). The NMFS (2018) criteria incorporate the best available science to estimate PTS onset in marine mammals from sound energy accumulated over 24 hours (SEL), or very loud, instantaneous peak sound pressure levels. These dual threshold criteria of SEL and PK are used to calculate marine mammal exposures (Table B-5).

Table B-5. Summary of relevant injury onset acoustic thresholds (NMFS 2018).

Hearing Group	PTS onset thresholds* (received level)	
	Non-impulsive	Impulsive
Low-frequency (LF) cetaceans	$L_{E,\,LF}$, 24h: 199 dB	L_{pk}, flat: 219 dB $L_{E,\,LF}$, 24h: 183 dB
Mid-frequency (MF) cetaceans	$L_{E,\,MF}$, 24h: 198 dB	L_{pk}, flat: 230 dB $L_{E,\,MF}$, 24h: 185 dB
High-frequency (HF) cetaceans	$L_{E,\,HF}$, 24h: 173 dB	L_{pk}, flat: 202 dB $L_{E,\,HF}$, 24h: 155 dB
Phocid seals in water (PW)	$L_{E,\,PW}$, 24h: 201 dB	L_{pk}, flat: 218 dB $L_{E,\,PW}$, 24h: 185 dB

Hearing Group	PTS onset thresholds* (received level)	
	Non-impulsive	Impulsive
Other carnivores in water (OW)	$L_{E,\ OW}$, 24h: 219 dB	L_{pk}, flat: 232 dB $L_{E,\ OW}$, 24h: 203 dB
Sirenia (SI)	$L_{E,\ SI}$, 24h: 206 dB	L_{pk}, flat: 226 dB $L_{E,\ SI}$, 24h: 190 dB

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.

L_{pk}, flat–peak sound pressure is flat weighted or unweighted and has a reference value of 1 µPa

L_E – denotes cumulative sound exposure over a 24-hour period and has a reference value of 1 $\mu Pa^2 s$

The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting.

Behavioral Disruption Exposure Criteria

Numerous studies on marine mammal behavioral responses to sound exposure have not resulted in consensus in the scientific community regarding the appropriate metric for assessing behavioral reactions. It is recognized that the context in which the sound is received affects the nature and extent of responses to a stimulus (Southall et al. 2007, Ellison and Frankel 2012), and because of the complexity and variability of marine mammal behavioral responses to acoustic exposure, NMFS has not yet released technical guidance on behavioral thresholds for use in calculating animal exposures (NMFS 2018). NMFS currently uses a step function to assess behavioral impact (NOAA 2005). A 50 percent probability of inducing behavioral responses at an SPL of 160 dB re 1 µPa was derived from the HESS (1999) report, which was based on the responses of migrating mysticete whales to airgun sounds (Malme et al. 1983, Malme et al. 1984). The HESS team recognized that behavioral responses to sound may occur at lower levels, but significant responses were only likely to occur above a SPL of 140 dB re 1 µPa.

Appendix C. Acoustic Models

Geometric Models

Spherical Spreading Loss: Near the source, where sound can propagate uniformly in all directions:

$$PL = 20 \log_{10}(R/1 \text{ m}) \text{ dB}$$

Cylindrical Spreading Loss: In very shallow water, sound cannot propagate as a spherical wave in all directions, but only as a cylindrical wave bound by the sea floor and the sea surface.

$$PL = constant + 10 \log_{10}(R/1 \text{ m}) \text{ dB}$$

Combined Spreading Loss: In general, sound propagates spherically near the source, whereas at long range, after a few bottom reflections, the propagation becomes cylindrical. If the transition range is Rc the propagation loss can be approximate by

$$= 20 \log_{10}(Rc/1 \text{ m}) \text{ dB} + 10 \log_{10}(R/1 \text{ m}) \text{ dB}$$

Geometric models are the simplest and are taken as to be the most conservative. If the range to injury and behavior thresholds are short (i.e., on the scale of the vessel) when calculated using a geometric model, then the sources are unlikely to cause any more impacts than the vessels themselves.

Ranges found to be larger than 10 m, roughly approximate to the survey platform vessel sizes, were recalculated using a more accurate (and less conservative) model to calculate the ranges. If the ranges are on the order of the vessel, then the sources are considered to be no more impactful than the vessels themselves.

If the ranges for a source remain larger than the vessel when using models that consider the environment, then the sound fields were sampled using agent-based simulations (see animal movement modeling below). This approach gives the best estimate of the exposure level for marine species because it takes into account the 3D sound field and the behavior of the animals.

Cumulative Exposure from Survey Track

This section describes the methods used to estimate the horizontal distances to the National Marine Fisheries Service (NMFS) injury criteria (Appendix B). All sources were assessed with the non-impulsive source criteria.

NMFS provides a spreadsheet to calculate these distances, but it is not designed for high-resolution geophysical survey sources and does not consider seawater absorption or beam patterns, both of which can substantially influence received sound levels. To account for these effects, we model sound levels using Equations C-1 to C-9, as follows.

The sonar equation is used to calculate the sound pressure level:

$$\text{SPL}(r) = SL - PL(r)\,, \tag{C-1}$$

where *SPL* is the sound pressure level (dB re 1 μPa), *r* is the distance from the source (m), *SL* is the source level (dB re 1 μPa m), and *PL* is the propagation loss as a function of distance. Propagation loss is calculated using:

$$PL(r) = 20\log_{10}\left(\frac{r}{1\,m}\right)\ \text{dB} + \alpha(f)\cdot r/1000\,, \tag{C-2}$$

where $\alpha(f)$ is the absorption coefficient (dB/km) and f is frequency (kHz). The absorption coefficient is approximated by discarding the boric acid term from Ainslie (2010, p 29 equation 2.2):

$$\alpha(f) \approx 0.000339f^2 + 48.5f^2/(75.6^2 + f^2)\,. \tag{C-3}$$

When a range of frequencies is produced by a source, we use the lowest frequency for determining the absorption coefficient.

The source level is either its in-beam value (for angles within the −3 dB beamwidth) or a single representative out-of-beam value. This representative value is estimated by first calculating upper and lower bounds and then taking the average of these. We assume the beam pattern $b(u)$ is that of an unshaded circular transducer:

$$b(u) = (2\ J_1(u)/u)^2, \tag{C-4}$$

where $J_1(u)$ is a first order Bessel function of the first kind, whose argument is a function of off-axis angle θ and beamwidth (full width at half maximum) $\delta\theta$

$$u = u_0\frac{\sin\theta}{\sin\frac{\delta\theta}{2}}\,, \tag{C-5}$$

where $u_0 = 1.614$.

For the upper limit we choose the highest sidelobe level of the beam pattern, given by Ainslie (2010 p 265 Table 6.2):

$$B_{\max} = -17.6\ dB. \tag{C-6}$$

For the lower limit we consider the asymptotic behavior of the beam pattern in the horizontal direction

$$J_1(u) \sim \sqrt{\frac{2}{\pi u}}\cos\left(u - \frac{3\pi}{4}\right), \tag{C-7}$$

where

$$u = \frac{u_0}{\sin\frac{\delta\theta}{2}}\,. \tag{C-8}$$

In this way we obtain the lower limit as

$$B_{\min} = 10 \log_{10} \left(\frac{8}{\pi\, u_0^3} \sin^3 \frac{\delta\theta}{2} \right) \mathrm{dB}\,. \tag{C-9}$$

The out-of-beam source level is found by adding the arithmetic mean of $B_{\min}$ and $B_{\max}$ to the in-beam source level.

For broad beam sources (beamwidths larger than 90°), we assumed the source was omnidirectional. For intermediate beam sources (beamwidths between 36° and 90°), we interpolated the correction between the two methods. The resulting correction as a function of beamwidth is shown in Figure C-1.

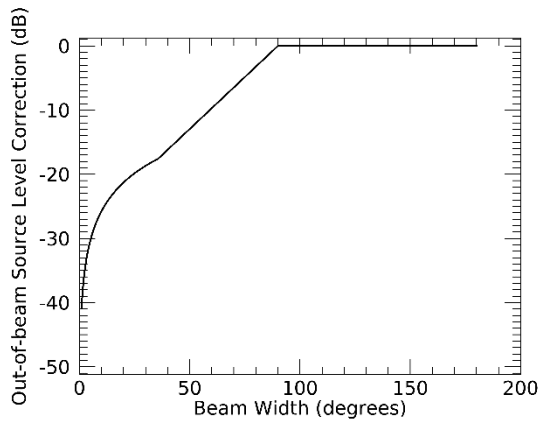

Figure C-1. Correction for calculating out-of-beam source level (i.e., in the horizontal direction) from in-beam source level, as a function of source beamwidth.

Separate impact ranges are calculated using the in-beam source level at the angle corresponding to the −3 dB half-width and the out-of-beam source level in the horizontal direction. The higher of the two sound levels was then selected for assessing impact distance.

Distances to peak thresholds were calculated using the peak source level and applying propagation loss from Equation (C-2. Peak levels were assessed for both in-beam and out-of-beam levels (the latter was assessed using the out-of-beam source level correction described previously).

For the weighted SEL thresholds, we performed the following steps:

Calculated weighted broadband source levels by assuming a flat spectrum between the source minimum and maximum frequency, weighted the spectrum according to the marine mammal hearing group weighting function

1. (NMFS 2018) , and summing across frequency. A 0.5 dB correction is added to the energy source level (ESL) because the 90 % energy pulse duration usually used to evaluate SL contains only 90 % of the pulse energy. The 0.5 dB correction ensures that all of the energy in the pulse is included.
2. Modeled propagation loss as a function of oblique range using Equation (C-2.
3. Modeled per-pulse SEL for a stationary receiver at a fixed distance off a straight survey line, using a vessel transit speed of 3.5 knots and source-specific pulse length and repetition rate. The off-line distance is referred to as the closest point of approach (CPA) and was performed for CPA distances between 1 m and 10 km. The survey line length was modeled as 10 km long (analysis

showed longer survey lines increased SEL by a negligible amount). SEL is calculated as $SPL + 10\log_{10}\frac{T}{1\,\mathrm{s}}$ dB, where T is the pulse duration.

4. Calculated the SEL for each survey line to produce curves of weighted SEL as a function of CPA distance.
5. Used the curves from Step 4 to estimate the CPA distance to the impact criteria.

This method accounts for the hearing sensitivity of the marine mammal group, seawater absorption, and beamwidth for downwards-facing transducers.

3-D Propagation Model Bellhop

JASCO's Marine Operations Noise Model (MONM) computes received SEL for directional impulsive sources at a specified source depth. Underwater sound propagation (i.e., transmission loss) was predicted with JASCO's Marine Operations Noise Model (MONM). This model computes sound propagation from highly-directional, high-frequency acoustic sources via the BELLHOP Gaussian beam acoustic ray-trace model (Porter and Liu 1994). This version of MONM accounts for sound attenuation due to energy absorption through ion relaxation and viscosity of water in addition to acoustic attenuation due to reflection at the medium boundaries and internal layers (Fisher and Simmons 1977). The former type of sound attenuation is important for frequencies higher than 5 kHz and cannot be neglected without noticeably affecting the model results. MONM incorporates the following site-specific environmental properties: a bathymetric grid of the modelled area, underwater sound speed as a function of depth, and a geoacoustic profile based on the overall stratified composition of the seafloor.

MONM treats frequency dependence by computing acoustic transmission loss at the center frequencies of 1/3-octave-bands. Sufficiently many 1/3-octave-bands, starting at 10 Hz, are modelled to include the majority of acoustic energy emitted by the source. At each center frequency, the transmission loss is modelled within each of the N vertical planes as a function of depth and range from the source. The 1/3-octave-band received per-pulse SELs are computed by subtracting the band transmission loss values from the directional source level in that frequency band. Composite broadband received SELs are then computed by summing the received 1/3-octave-band levels.

The received per-pulse SEL sound field within each vertical radial plane is sampled at various ranges from the source, generally with a fixed radial step size. At each sampling range along the surface, the sound field is sampled at various depths, with the step size between samples increasing with depth below the surface. The step sizes are chosen to provide increased coverage near the depth of the source and at depths of interest in terms of the sound speed profile. For areas with deep water, sampling is not performed at depths beyond those reachable by marine mammals. The received per-pulse SEL at a surface sampling location is taken as the maximum value that occurs over all samples within the water column, i.e., the maximum-over-depth received per-pulse SEL. These maximum-over-depth per-pulse SELs are presented as color contours around the source.

Three-dimensional Sound Field

Acoustic fields in three dimensions are generated from propagation loss calculated in two-dimensional (2-D) vertical planes aligned along radials covering a 360° swath from the source, an approach commonly referred to as N×2-D (Figure C-2). These vertical radial planes are separated by an angular step size of $\Delta\theta$, yielding N = 360°/$\Delta\theta$ planes. The three-dimensional sound fields are used for estimating acoustic exposure using animal movement modeling. Ranges to thresholds and example maximum-over-depth plan-view maps are generated for estimating exposure for some species and for illustrative purposes.

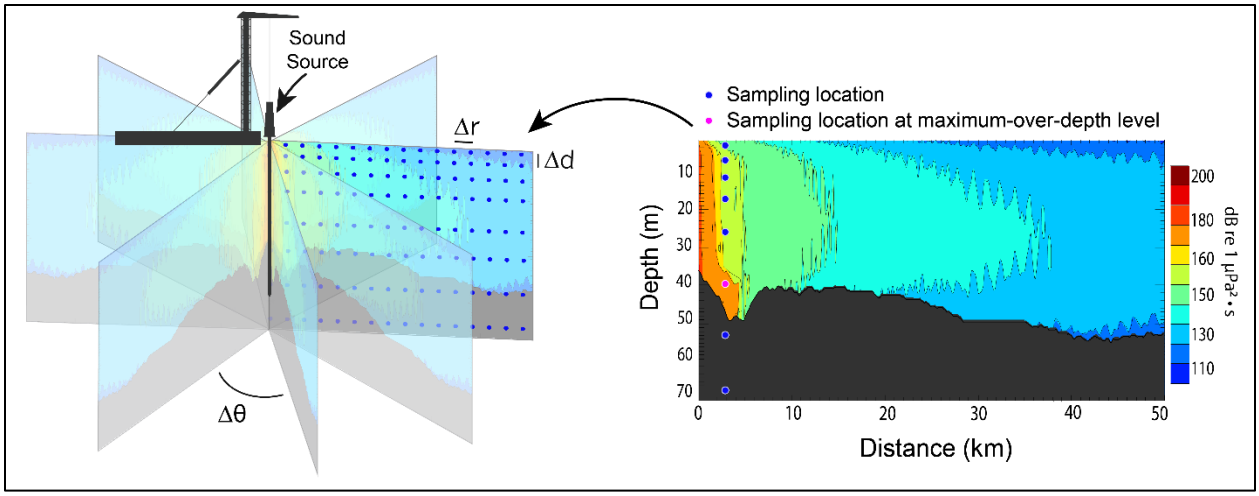

Figure C-2. Modeled three-dimensional sound field (N×2-D method) and maximum-over-depth modeling approach. Sampling locations are shown as blue dots on both figures. On the right panel, the pink dot represents the sampling location where the sound level is maximum over the water column. This maximum-over-depth level is used in calculating distances to sound level thresholds for some marine animals.

ACOUSTIC ENVIRONMENT

Bathymetry

Water depths throughout the modeled areas (Figure 2) were extracted from the SRTM15+ (v7.0) global bathymetry grid, a 30 arc-second grid rendered for the entire globe (Rodríguez et al. 2005). Bathymetry for each modeled location were extracted and re-gridded, by minimum curvature gridding, onto a Universal Transverse Mercator (UTM) Zone coordinate projection with a regular grid spacing of 250 × 250 m.

Geoacoustics

In a shallow environment, interactions between the acoustic field and the seabed are important and accurate geoacoustic profiles are needed for proper acoustic modeling. The interactions between the acoustic field and seabed become negligible in much deeper water. The generic geoacoustic profiles are therefore considered valid for the entire modeled areas around the study sites. The layers as deep as several hundreds of meters can affect the propagation of the low frequency waves. With the increase in frequency of the waves, the importance of deeper layers decreases and for frequencies well above 1 kHz, only the properties of the surficial layer are relevant.

With the absence of the detailed data on the physical properties of the bottom for the modeling area a simplified geoacoustic model is created consisting of one or more layers with constant thickness. The layer interfaces are parallel to the bottom surface. The geoacoustic properties for the modelled sites (Table C-1) were estimated from the average parameters based on the sediment model presented by (Buckingham 2005). The qualitative description of the modeled sediment is provided in Table C-1.

Sound Velocity Profile

The sound speed profiles for the modeled sites were derived from temperature and salinity profiles from the US Naval Oceanographic Office's Generalized Digital Environmental Model V 3.0 (GDEM; Teague et al. 1990, Carnes 2009). GDEM provides an ocean climatology of temperature and salinity for the world's oceans on a latitude-longitude grid with 0.25° resolution, with a temporal resolution of one month, based

on global historical observations from the US Navy's Master Oceanographic Observational Data Set (MOODS). The climatology profiles include 78 fixed depth points to a maximum depth of 6800 m (where the ocean is that deep). The GDEM temperature-salinity profiles were converted to sound speed profiles according to Coppens (1981). Monthly sound velocity profiles for each modeling location in Table C-1 were compared and grouped based on general characteristics of uniform, upward refracting, downward refracting, and the presence of a surface duct. Representative sound velocity profiles were selected for each site and profile group and presented in Table C-1.

Table C-1. Parameters for the modeled environments and source locations for each of the operational regions.

Region	Depth class	Mean water depth in region (m)	Time of Year	Source latitude	Source longitude	Source easting	Source northing	UTM Zone	Water depth at source (m)	Sediment type
Mid-Atlantic Bight	Mid-depth (<200 m)	32	Feb, May, Aug, Nov	37.5947	-74.8532	512958	4160854	18	34.8	Fine sand
Mid-Atlantic Bight	Deep (200-1000 m)	581.3	Feb, May, Aug, Nov	38.4818	-73.2590	651859	4260712	18	746.6	Silty clay
Southern New England	Mid-depth (<200 m)	55.4	Feb, May, Aug, Nov	39.5678	-72.8461	685019	4382000	18	60.4	Silty sand-sand-silty sand
Southern New England	Deep (200-1000 m)	507.6	Feb, May, Aug, Nov	39.9133	-70.8000	346154	4419689	19	529.6	Sand-silt-silty sand
Georges Bank	Mid-depth (<200 m)	71.8	Feb, Jul, Oct	41.1250	-67.0463	664006	4554473	19	63.6	Sand-silt-clay
Gulf of Maine	Mid-depth (<200 m)	123.3	Feb, May, Aug, Nov	43.3500	-70.1333	408150	4800307	19	101.4	Fine sand
Gulf of Maine	Deep (200-1000 m)	224.8	Feb, May, Aug, Nov	43.6166	-67.5783	614713	4830276	19	231.0	Sand-silt-clay
Offshore of NE Continental Shelf	Very deep (>1000 m)	3006.1	Jan, Apr, Aug	39.4128	-68.0757	579568	4362994	19	3128.3	Silty clay
SE Continental Shelf	Shallow (<10 m)	4.9	Jan, May, Sep	33.6193	-78.8529	699178	3722007	17	9.3	Coarse sand
SE Continental Shelf	Mid-depth (10-200 m)	40.2	Jan, May, Sep	30.7268	-80.5979	538496	3399397	17	32.7	Coarse sand
SE Continental Shelf	Deep (200-1000 m)	673.9	Jan, May, Sep	33.5673	-76.2855	380686	3714923	18	588.8	Coarse sand
Offshore of SE Continental Shelf	Very deep (>1000 m)	3613.5	Feb, Aug	35.7508	-72.6680	710859	3958812	18	3993.4	Coarse sand
Gulf of Mexico	Shallow (<10 m)	4.3	Mar, Sep	29.2090	-92.1296	584611	3231451	15	4.6	Coarse sand

Region	Depth class	Mean water depth in region (m)	Time of Year	Source latitude	Source longitude	Source easting	Source northing	UTM Zone	Water depth at source (m)	Sediment type
Gulf of Mexico	Mid-depth (10-200 m)	55.1	Mar, Sep	28.1456	-94.2046	381711	3113921	15	59.8	Silty sand
Gulf of Mexico	Deep (200-1000 m)	562.2	Mar, Sep	27.5753	-92.9326	506650	3050156	15	573.1	Silty clay
Gulf of Mexico	Very deep (>1000 m)	2368.6	Mar, Sep	27.6348	-87.5219	448517	3056858	16	2841.8	Silty clay
Atlantic	Shallow (<10 m)	6.3	Feb, Aug	24.8352	-80.6599	534366	2746748	17	7.1	Coarse sand-limestone
Atlantic	Mid-depth (10-200 m)	145.3	Feb, Aug	24.5390	-80.7623	524079	2713927	17	186.5	Silty sand-limestone
Atlantic	Deep (200-1000 m)	484.8	Feb, Aug	24.8217	-79.9265	608491	2745628	17	793.8	Silty clay-limestone
Caribbean	Shallow waters (<10 m)	5.7	Apr	17.9417	-66.0833	808975	1986156	19	8.2	Coarse sand
Caribbean	Mid-depth waters (10-200 m)	47.7	Apr	18.4151	-65.1397	273983	2037446	20	53.6	Fine sand
Caribbean	Deep (200-1000 m)	634.2	Apr	18.5665	-66.4132	773034	2054821	19	833.0	Sand-silt-clay
Caribbean	Very deep (>1000 m)	4672.3	Apr	16.1882	-67.3597	675354	1790450	19	4741.2	Clay-chalk-limestone
NW Continental Shelf	Shallow (<40 m)	34.9271	Jan, Aug	46.1202	-124.0281	420170	5108081	10	27.3	Silty sand
NW Continental Shelf	Mid-depth (40-200 m)	146.371	Jan, Aug	45.8811	-124.3948	391455	5081936	10	142.4	Clayey silt
NW Continental Shelf	Deep (200-1000 m)	522.757	Jan, Aug	45.8289	-124.7628	362782	5076680	10	468.1	Clay

Region	Depth class	Mean water depth in region (m)	Time of Year	Source latitude	Source longitude	Source easting	Source northing	UTM Zone	Water depth at source (m)	Sediment type
Offshore of NW Continental Shelf	Very deep (>1000 m)	2873.11	Jan, Aug	44.8730	-127.9698	581042	4969444	9	2873.4	Clay
SW Continental Shelf	Shallow (<40 m)	25.4811	Jan, Aug	37.7584	-122.6386	531506	4179148	10	17.8	Silt
SW Continental Shelf	Mid-depth (40-200 m)	81.6679	Jan, Aug	37.6034	-122.8711	511122	4161904	10	80.9	Clayey silt
SW Continental Shelf	Deep (200-1000 m)	599.619	Jan, Aug	37.1791	-122.9640	502942	4114880	10	559.7	Clay
Offshore of SW Continental Shelf	Very deep (>1000 m)	4562.61	Jan, Aug	34.9436	-125.2905	290516	3869276	10	4565.7	Clay
Southern California Bight	Shallow (<40 m)	43.2099	Jan, Aug	33.6692	-118.1843	389948	3726208	11	24.3	Clayey silt
Southern California Bight	Mid-depth (40-200 m)	103.829	Jan, Aug	33.3537	-119.6642	251868	3693800	11	88.8	Sandy silt
Southern California Bight	Deep (200-1000 m)	1641.28	Jan, Aug	32.8963	-118.9432	317999	3641588	11	1706.5	Silty clay
Southern California Bight	Very deep (>1000 m)	4162.58	Mar, Aug	31.1572	-122.4600	551230	3447213	10	4203.7	Clay
Gulf of Alaska	Shallow (<40 m)	29.7873	Apr	59.5724	-153.1316	492188	6603884	5	29.7	Sandy silt
Gulf of Alaska	Mid-depth (40-200 m)	149.487	Feb, May, Jul, Oct	58.5103	-151.3493	595799	6486829	5	159.0	Silt
Gulf of Alaska	Deep (200-1000 m)	412.386	Feb, May, Jul, Oct	57.7399	-149.7447	336207	6403149	6	496.0	Clay
Gulf of Alaska	Very deep (>1000 m)	4754.57	Feb, May, Aug, Nov	56.0760	-149.8199	352916	6219932	6	4756.7	Sand
SE Alaska	Shallow (<40 m)	68.7436	Feb, May, Jul, Dec	55.7083	-133.7089	580743	6174452	8	17.8	Sand

Region	Depth class	Mean water depth in region (m)	Time of Year	Source latitude	Source longitude	Source easting	Source northing	UTM Zone	Water depth at source (m)	Sediment type
SE Alaska	Mid-depth (40-200 m)	144.935	Feb, May, Jul, Dec	55.3571	-134.1236	555167	6134956	8	142.1	Sand-silt-clay
SE Alaska	Deep (200-1000 m)	842.99	Feb, May, Aug, Nov	55.1856	-134.5288	529645	6115704	8	535.9	Clay
SE Alaska	Very deep (>1000 m)	2558.31	Feb, May, Aug, Nov	55.0412	-135.4916	468147	6099589	8	2560.4	Clay
Eastern Bering Sea	Shallow (<40 m)	20.4209	Apr	60.8590	-166.8350	399890	6748568	3	20.6	Sand
Eastern Bering Sea	Mid-depth (40-200 m)	96.4274	Jan, Aug	57.8367	-171.6659	460017	6410868	2	97.1	Silt
Eastern Bering Sea	Deep (200-1000 m)	577.871	Jan, Aug	56.5601	-172.4380	411226	6269460	2	687.3	Clayey silt
Aleutian Islands	Very deep (>1000 m)	4054.28	Jan, Aug	51.7074	-171.1949	486155	5728616	2	4057.5	Clay
Chukchi Sea	Mid-depth (<200 m)	49.77	Aug	69.2817	-167.9131	384499	7688498	3	43.4	Clay-silt
Hawaiian Islands	Mid-depth (<200 m)	77.8535	Jun	23.8290	-166.1610	381572	2635816	3	3.0	Silt-clay
Hawaiian Islands	Deep (200-1000 m)	804.206	Jun	23.8945	-166.5071	346387	2643420	3	717.4	Silt-cla
Hawaiian Islands	Very deep (>1000 m)	3313.23	Jun	24.1842	-166.3916	358413	2675448	3	3264.7	Silt-cla
Marianna Islands	Mid-depth (<200 m)	621.351	Jun	12.7690	144.3530	212510	1413101	55	51.6	Silt-cla
Marianna Islands	Deep (200-1000 m)	727.148	Jun	13.3771	144.8568	267732	1479927	55	780.2	Sand-silt-clay
Marianna Islands	Very deep (>1000 m)	5189.39	Jun	13.5941	146.0131	393104	1503113	55	5314.2	Silt-clay

Region	Depth class	Mean water depth in region (m)	Time of Year	Source latitude	Source longitude	Source easting	Source northing	UTM Zone	Water depth at source (m)	Sediment type
Samoa	Mid-depth (<200 m)	1001.65	Jun	-14.2312	-170.5529	548306	8426605	2	83.9	Silt-clay
Samoa	Deep (200-1000 m)	1301.54	Jun	-14.1282	-169.6637	644362	8437628	2	558.7	Silt-clay
Samoa	Very deep (>1000 m)	4912.22	Jun	-13.4724	-169.7600	634325	8510196	2	5001.4	Sand-silt-clay

Animal Movement Modeling

The JASCO Animal Simulation Model Including Noise Exposure (JASMINE) was used to predict the probability of exposure of animals to sound arising from proposed project activities. Sound exposure models such as JASMINE use simulated animals (animats) to sample the predicted 3-D sound fields with movement rules derived from animal observations (see below). The parameters used for forecasting realistic behaviors (e.g., diving, foraging, aversion, and surface times) are determined and interpreted from marine species studies (e.g., tagging studies) where available, or reasonably extrapolated from related species. With animats programmed to behave like marine species that may be present near a project area, the predicted sound fields are sampled in a way that real animals are expected to experience (Figure C-4). The output of the simulation is the exposure history for each animat within the simulation. An individual animat's sound exposure levels are summed over a specified duration, i.e., 24 hours, to determine its total received acoustic energy (SEL) and maximum received PK and SPL. These received levels are then compared to the threshold criteria (see Appendix B). The number of animats predicted to receive sound levels exceeding the thresholds indicates the probability of such exposures and can be interpreted as the percentage of the population expected to exceed threshold or scaled by the real-world density estimates for each species to obtain the mean number of real-world animals expected to receive above-threshold sound levels. A fuller description of animal movement modeling and the parameters used in the JASMINE simulations is provided below.

Animal Movement and Exposure Modeling

To assess the risk of impacts from exposure, an estimate of received sound levels for the animals in the area during operation of the project is required. Animals move and sound fields may be complex. The sound received by an animal is a function of where the animal is at any given time. To a reasonable approximation, the location of the sound source(s) is known, and acoustic modeling can be used to predict the 3D sound field. The location and movement of animals within the sound field, however, is unknown. Realistic animal movement within sound fields can be simulated. Repeated random sampling (Monte Carlo method simulating many animals within the operations area) is used to estimate the sound exposure history of the population of simulated animals (animats) during operations.

Monte Carlo methods provide a heuristic approach for determining the probability distribution function (PDF) of complex situations, such as animals moving in a sound field. The probability of an event's occurrence is determined by the frequency with which it occurs in the simulation. The greater the number of samples, in this case the more animats, the better the approximation of the PDF. Animats are randomly placed, or seeded, within the simulation boundary at a specified density (animats/km^2). Higher densities provide a finer PDF estimate resolution but require more computational resources. To ensure good representation of the PDF, the animat density is set as high as practical allowing for computation time (1 animat/km^2 in this study). The animat density is generally much higher than the real-world density to ensure good representation of the PDF. Typically, the resulting PDF is scaled using the real-world density to determine the number of real-world animals expected to exceed a threshold.

Several models for marine mammal movement have been developed (Ellison et al. 1987, Frankel et al. 2002, Houser 2006). These models use an underlying Markov chain to transition from one state to another based on probabilities determined from measured swimming behavior. The parameters may represent simple states, such as the speed or heading of the animal, or complex states, such as likelihood of participating in foraging, play, rest, or travel. Attractions and aversions to variables like anthropogenic sounds and different depth ranges can be included in the models.

JASMINE was based on the open-source marine mammal movement and behavior model (3 MB; Houser 2006) and used to predict the exposure of animats (virtual marine mammals) to sound arising from sound sources in simulated representative surveys. Inside JASMINE, the sound source location mimics the movement of the source vessel through the proposed survey pattern. Animats are programmed to behave like the marine animals likely to be present in the survey area. The parameters used for forecasting realistic behaviors (e.g., diving, foraging, aversion, and surface times.) are determined and interpreted from marine species studies (e.g., tagging studies) where available, or reasonably extrapolated from related species. An individual animat's modeled sound exposure levels are summed over the total simulation duration, such as 24 hours or the entire simulation, to determine its total received energy and then compared to the assumed threshold criteria.

Animal Movement Parameters

JASMINE uses previously measured behavior to forecast behavior in new situations and locations. The parameters used for forecasting realistic behavior are determined (and interpreted) from marine species studies (e.g., tagging studies). Each parameter in the model is described as a probability distribution. When limited or no information is available for a species parameter, a Gaussian or uniform distribution may be chosen for that parameter. For the Gaussian distribution, the user determines the mean and standard deviation of the distribution from which parameter values are drawn. For the uniform distribution, the user determines the maximum and minimum distribution from which parameter values are drawn. When detailed information about the movement and behavior of a species are available, a user-created distribution vector, including cumulative transition probabilities, may be used (referred to here as a vector model; Houser, 2006). Different sets of parameters can be defined for different behavior states. The probability of an animat starting out in or transitioning into a given behavior state can in turn be defined in terms of the animat's current behavioral state, depth, and the time of day. In addition, each travel parameter and behavioral state has a termination function that governs how long the parameter value or overall behavioral state persists in simulation.

The parameters used in JASMINE describe animal movement in both the vertical and horizontal planes. The parameters relating to travel in these two planes are briefly described below. (The species-specific parameters used in this study are listed below).

Travel sub-models

- **Direction**: determines an animat's choice of direction in the horizontal plane. Sub-models are available for determining the heading of animats, allowing for movement to range from strongly biased to undirected. A random walk model can be used for behaviors with no directional preference, such as feeding and playing. In a random walk, all bearings are equally likely at each parameter transition time step. A correlated random walk can be used to smooth the changes in bearing by using the current heading as the mean of the distribution from which to draw the next heading. An additional variant of the correlated random walk is available that includes a directional bias for use in situations where animals have a preferred absolute direction, such as migration. A user-defined vector of directional probabilities can also be input to control animat heading. For more detailed discussion of these parameters, see Houser (2006) and Houser and Cross (1999).
- **Travel rate**: defines an animat's rate of travel in the horizontal plane. When combined with vertical speed and dive depth, the dive profile of the animat is produced.

Dive sub-models

- **Ascent rate**: defines an animat's rate of travel in the vertical plane during the ascent portion of a dive.
- **Descent rate**: defines an animat's rate of travel in the vertical plane during the descent portion of a dive.
- **Depth**: defines an animat's maximum dive depth.
- **Bottom following**: determines whether an animat returns to the surface once reaching the ocean floor, or whether it follows the contours of the bathymetry.
- **Reversals**: determines whether multiple vertical excursions occur once an animat reaches the maximum dive depth. This behavior is used to emulate the foraging behavior of some marine mammal species at depth. Reversal-specific ascent and descent rates may be specified.
- **Surface interval**: determines the duration an animat spends at, or near, the surface before diving again.

Exposure Integration Time

The interval over which acoustic exposure (SEL) should be integrated and maximal exposure (SPL) determined is not well defined. Both Southall et al. (2007)and the NMFS (2018) recommend a 24-hour accumulation period but state that there may be situations where this is not appropriate (e.g., a high-level source and confined population). Resetting the integration after 24 hours can lead to overestimating the number of individual animals exposed because individuals can be counted multiple times during an operation. The type of animal movement engine used in this study simulates realistic movement using swimming behavior collected over relatively short periods (hours to days) and does not include large-scale movement such as migratory circulation patterns. Therefore, the simulation time is limited to a few weeks, the approximate scale of the collected data (Houser 2006). For this study, three-day simulations (i.e., 72 hours) were modeled for each scenario. The average number of animats exposed above each threshold considered was calculated for each 24-hour period of the three-day simulation.

Ideally, a simulation area is large enough to encompass the entire range of a population so that any animal that could approach the survey area during an operation is included. However, there are limits to the simulation area, and computational overhead increases with area. For practical reasons, the simulation area is limited in this analysis to a maximum distance of 30 km (18.6 miles) from the simulated survey. To represent the most impactful scenarios, simulations were designed so that survey activities overlapped species range (Figure C-3). In the simulation, every animat that reaches a border is replaced by another animat entering at the opposing border, e.g., an animat crossing the northern border of the simulation is replaced by one entering the southern border at the same longitude. When this action places the animat in an inappropriate water depth, the animat is randomly re-seeded in a location suited to its species definition. The exposures of all animats (including those leaving the simulation and those entering) are kept for analysis. This approach maintains a consistent animat density and allows for longer integration periods in simulation areas smaller than the population's range.

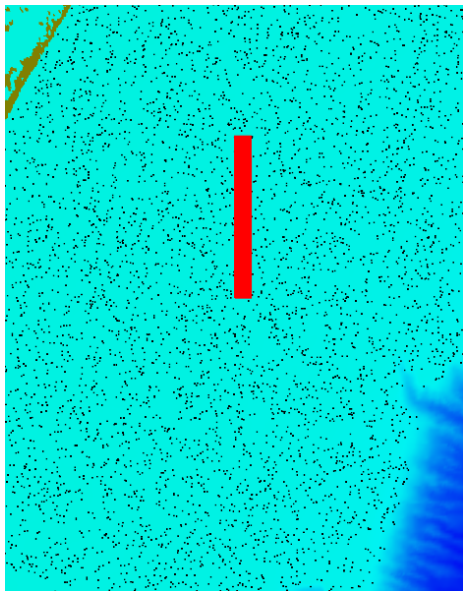

Figure C-3. Example animat seeding and source tracks for the Mid-Atlantic region. Atlantic spotted dolphin.

The parameters used to create marine mammal animat movement in JASMINE for each species are listed below. Table C-2 through Table C-38 show the behavioral state, variable within the behavioral state, the value/distribution/range of the variable, and the source for determining the variable. Note that different species may have different behavioral states.

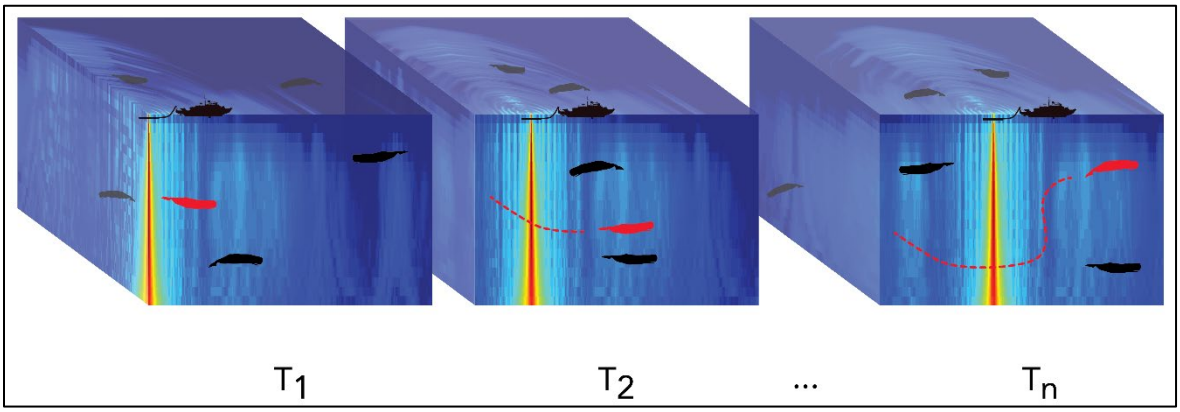

Figure C-4. Graphic of animats in a moving sound field. Example animat (red) shown moving with each time step. The acoustic exposure of each animat is determined by where it is in the sound field, and its exposure history is accumulated as the simulation steps through time.

There are several species of marine mammals that may be present in the vicinity of the proposed survey locations, including several endangered species (sperm whales and several mysticetes), and the critically endangered North Atlantic right whales. Details for each of the marine mammal species evaluated in this study are listed below.

Table C-2. *Atlantic spotted dolphins*: Data values and references input in JASMINE to create diving behavior(number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Behavior1	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Random 0.08 – 5.69	Davis et al. (1996)
	Ascent rate (m/s)	Gaussian 1.15 (0.8)	Davis et al. (1996)
	Descent rate (m/s)	Gaussian 1.23 (0.48)	Davis et al. (1996)
	Dive depth (m)	Random 0.0 – 60.0	Davis et al. (1996)
	Bottom following	Yes	Griffin et al. (2005)
	Reversals	Gaussian 2.0 (2.0)	Griffin et al. (2005)
	Probability of reversal	0.5	Approximated (Davis et al. 1996)
	Reversal ascent dive rate (m/s)	Gaussian 1.15 (0.8)	Davis et al. (1996)
	Reversal descent dive rate (m/s)	Gaussian 1.23 (0.48)	Davis et al. (1996)
	Time in reversal (s)	Gaussian 20.81 (21.5)	Griffin et al. (2005)
	Surface interval (s)	Gaussian 63.59 (52.66)	Griffin et al. (2005)
General	Shore following (m)	4	Davis et al. (1996)
	Depth limit on seeding (m)	4.0 (minimum), 250.0 (maximum)	Davis et al. (1996)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-3. *Atlantic white-sided dolphin*: Data values and references input in JASMINE to create diving behavior(number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Day	Travel direction	Correlated random walk	Approximated
	Perturbation value	10.0	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.58 (1.02)	Mate et al. (1994)
	Ascent rate (m/s)	Gaussian 0.42 (0.24)	Spotted dolphin value (Scott and Chivers 2009)
	Descent rate (m/s)	Gaussian 0.58 (0.34)	Spotted dolphin value (Scott and Chivers 2009)
	Average depth (m)	Gaussian 22.1 (15.71)	Spotted dolphin value (Scott and Chivers 2009)
	Bottom following	Yes	Approximated spotted dolphin value (Scott and Chivers 2009)
	Reversals	Not implemented	Approximated spotted dolphin value (Scott and Chivers 2009)
	Surface interval (s)	Gaussian 68.4 (304.8)	Spotted dolphin value–(Scott and Chivers 2009)
	Bout duration (s)	Sigmoidal T_{50} = 3600, k = 7	Approximated spotted dolphin value (Scott and Chivers 2009)
Night	Travel direction	Correlated random walk	Approximated
	Perturbation value	10.0	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.58 (1.02)	Mate et al. (1994)
	Ascent rate (m/s)	Gaussian 0.74 (0.41)	Spotted dolphin value (Scott and Chivers 2009)
	Descent rate (m/s)	Gaussian 0.93 (0.54)	Spotted dolphin value (Scott and Chivers 2009)

Behavior	Variable	Value	Reference
	Average depth (m)	Gaussian 24.0 (27.1)	Spotted dolphin value (Scott and Chivers 2009)
	Bottom following	Not implemented	Approximated spotted dolphin value (Scott and Chivers 2009)
	Reversals	Gaussian 3.0 (1.0)	Approximated spotted dolphin value (Scott and Chivers 2009)
	Probability of reversal	0.5	Approximated spotted dolphin value (Scott and Chivers 2009)
	Reversal ascent dive rate (m/s)	Gaussian 0.74 (0.41)	Spotted dolphin value (Scott and Chivers 2009)
	Reversal descent dive rate (m/s)	Gaussian 0.93 (0.54)	Spotted dolphin value (Scott and Chivers 2009)
	Time in reversal (s)	Gaussian 39.0 (55.2)	Spotted dolphin value (Scott and Chivers 2009)
	Surface interval (s)	Gaussian 49.8 (108.6)	Spotted dolphin value (Scott and Chivers 2009)
	Bout duration (s)	Sigmoidal T_{50} = 3600, k = 7	Approximated spotted dolphin value (Scott and Chivers 2009)
General	Shore following (m)	2	Approximated spotted dolphin value (Scott and Chivers 2009)
	Depth limit on seeding (m)	2 (minimum), 300 (maximum)	Approximated spotted dolphin value (Scott and Chivers 2009)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-4. *Beluga whale*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Foraging	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Houser (2006)
	Termination coefficient	0.2	Houser (2006)
	Travel rate (m/s)	Random 0.4 – 0.6	Martin et al. (1998)
	Ascent rate (m/s)	Gaussian 1.7 (0.02)	Martin et al. (1998)
	Descent rate (m/s)	Gaussian 1.68 (0.04)	Martin et al. (1998)
	Dive depth (m)	Random 40.0 – 956.0	Hauser et al. (2015)
	Bottom following	Not implemented	Not implemented
	Reversals	Not implemented	Martin et al. (1998)
	Surface interval (s)	Gaussian 43.8 (2.0)	Frost et al. (1985)
	Bout duration (s)	Gaussian 21600.0 (1800.0)	Approximated
Travel	Travel direction	Vector model	Proxy: Bottlenose dolphin
	Travel rate (m/s)	Vector model	Proxy: Bottlenose dolphin
	Ascent rate (m/s)	Gaussian 2.1 (0.3)	Proxy: Bottlenose dolphin
	Descent rate (m/s)	Gaussian 1.6 (0.2)	Proxy: Bottlenose dolphin
	Dive depth (m)	Gaussian 7.0 (3.0)	Proxy: Bottlenose dolphin
	Bottom following	Not implemented	Not implemented
	Reversals	Not implemented	Averaged over dive profiles (Martin et al. 1998)
	Surface interval (s)	Gaussian 3.0 (2.0)	Frost et al. (1985)
	Bout duration (s)	Gaussian 21600.0 (1800.0)	Approximated
General	Shore following (m)	2	Approximated
	Depth limit on seeding (m)	2.0 (minimum), 11000.0 (maximum)	Approximated

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-5. *Blainville's beaked whale*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Deep Foraging Dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.34 (0.5)	Approximated
	Ascent rate (m/s)	Gaussian 0.7 (0.1)	Tyack et al. (2006)
	Descent rate (m/s)	Gaussian 1.6 (0.2)	Baird et al. (2006b)
	Dive depth (m)	Gaussian 1408.0 (210.0)	Tyack et al. (2006)
	Bottom following	Yes	Baird et al. (2006b)
	Reversals	Gaussian 6.0 (2.0)	Tyack et al. (2006)
	Probability of reversal	0.9	Approximated
	Reversal ascent dive rate (m/s)	Gaussian 0.7 (0.2)	Tyack et al. (2006)
	Reversal descent dive rate (m/s)	Gaussian 1.5 (0.1)	Approximated
	Time in reversal (s)	Gaussian 40.0 (20.0)	Madsen et al. (2005)
	Surface interval (s)	Gaussian 1200.0 (996.0)	Madsen et al. (2005)
	Bout duration (s)	Sigmoidal T_{50} = 3534, k = 10	Tyack et al. (2006)
Shallow Dive – day	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.37 (0.5)	Approximated
	Ascent rate (m/s)	Gaussian 0.3 (0.2)	Tyack et al. (2006) Baird et al. (2006b)
	Descent rate (m/s)	Gaussian 0.3 (0.2)	Baird et al. (2006b)
	Dive depth (m)	Gaussian 304.0 (61.0)	Tyack et al. (2006) Baird et al. (2006b)
	Bottom following	Not implemented	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 126.0 (500.0)	Tyack et al. (2006)
	Bout duration (s)	Gaussian 3780 (1860)	Tyack et al. (2006)
	Travel direction	Correlated random walk	Approximated

Behavior	Variable	Value	Reference
Shallow Dive – night	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.32 (0.5)	Approximated
	Ascent rate (m/s)	Gaussian 0.3 (0.2)	Tyack et al. (2006) Baird et al. (2006b)
	Descent rate (m/s)	Gaussian 0.3 (0.2)	Tyack et al. (2006) Baird et al. (2006b)
	Dive depth (m)	Gaussian 241.0 (61.0)	Tyack et al. (2006)
	Bottom following	Not implemented	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 144.0 (2000.0)	Tyack et al. (2006)
	Bout duration (s)	Gaussian 3780 (1860)	Tyack et al. (2006)
General	Shore following (m)	10	10
	Depth limit on seeding (m)	633.0 (minimum), 80000.0 (maximum)	Baird et al. (2006) Waring et al. (2001)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-6. *Blue whale*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Non-foraging (deep)	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 2.78 (1.39)	Sears and Perrin (2009)
	Ascent rate (m/s)	Gaussian 2.1 (0.52)	Croll et al. (2001)
	Descent rate (m/s)	Gaussian 2.2 (0.38)	Croll et al. (2001)
	Dive depth (m)	Gaussian 154.3 (38.8)	Croll et al. (2001)
	Bottom following	Not implemented	Approximated Watwood and Buonantony (2012)
	Reversals	Gaussian 1.5 (0.5)	Acevedo-Gutierrez et al. (2002)
	Probability of reversal	0.7	Approximated Watwood and Buonantony (2012)
	Reversal ascent dive rate (m/s)	Gaussian 0.7 (0.2)	Watwood and Buonantony (2012)
	Reversal descent dive rate (m/s)	Gaussian 0.7 (0.2)	Watwood and Buonantony (2012)
	Time in reversal (s)	Gaussian 90.0 (30.0)	Acevedo-Gutierrez et al. (2002)
	Surface interval (s)	Gaussian 78.0 (30.2)	Acevedo-Gutierrez et al. (2002)
	Bout duration (s)	Gaussian 600 (120): 1900 – 0600 hr Gaussian 3600 (420): 0600 – 1900 hr	Approximated Watwood and Buonantony (2012)
Non-foraging (shallow)	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 2.78 (1.39)	Sears and Perrin (2009)
	Ascent rate (m/s)	Gaussian 2.1 (0.52)	Croll et al. (2001)
	Descent rate (m/s)	Gaussian 2.2 (0.38)	Croll et al. (2001)
	Dive depth (m)	Gaussian 154.3 (38.8)	Croll et al. (2001)

Behavior	Variable	Value	Reference
	Bottom following	Not implemented	Approximated (Watwood and Buonantony 2012)
	Reversals	Gaussian 1.5 (0.5)	Approximated (Watwood and Buonantony 2012)
	Surface interval (s)	Gaussian 78.0 (30.2)	Acevedo-Gutierrez et al. (2002)
	Bout duration (s)	Gaussian 600 (120): 1900 – 0600 hr Gaussian 3600 (420): 0600 – 1900 hr	Approximated (Watwood and Buonantony 2012)
Foraging	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.25 (0.42)	Sears and Perrin (2009)
	Ascent rate (m/s)	Gaussian 1.6 (0.5)	Goldbogen et al. (2011)
	Descent rate (m/s)	Gaussian 2.6 (0.5)	Goldbogen et al. (2011)
	Dive depth (m)	Gaussian 201.0 (52.0)	Goldbogen et al. (2011)
	Bottom following	Not implemented	Approximated (Watwood and Buonantony 2012)
	Reversals	Gaussian 3.5 (1.1)	Goldbogen et al. (2011)
	Probability of reversal	0.7	Approximated (Watwood and Buonantony 2012)
	Reversal ascent dive rate (m/s)	Gaussian 2.4 (0.9)	Croll et al. (2001)
	Reversal descent dive rate (m/s)	Gaussian 1.5 (0.4)	Croll et al. (2001)
	Time in reversal (s)	Gaussian 300.0 (60.0)	Approximated (Watwood and Buonantony 2012)
	Surface interval (s)	Gaussian 162.0 (66.0)	Goldbogen et al. (2011)
	Bout duration (s)	Gaussian 3600.0 (1800.0)	Approximated (Watwood and Buonantony 2012)

Behavior	Variable	Value	Reference
General	Shore following (m)	200	Approximated (Branch et al. 2007)
	Depth limit on seeding (m)	200.0 (minimum), 8000.0 (maximum)	Approximated (Branch et al. 2007)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-7. *Bottlenose dolphin*: Data values and references input in JASMINE to create diving behavior(number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Foraging	Travel direction	Vector model	Ward (1999)
	Travel rate (m/s)	Vector model	Ward (1999)
	Ascent rate (m/s)	Gaussian 2.1 (0.3)	Houser et al. (2010)
	Descent rate (m/s)	Gaussian 1.6 (0.2)	Houser et al. (2010)
	Dive depth (m)	Gaussian 25 (5)	Hastie et al. (2006)
	Bottom following	Yes	Approximated (Watwood and Buonantony 2012)
	Reversals	Gaussian 2.0 (2.0)	Approximated
	Probability of reversal	0.5	Approximated
	Reversal ascent dive rate (m/s)	Gaussian 1.15 (0.8)	(Houser 2006)
	Reversal descent dive rate (m/s)	Gaussian 1.23 (0.48)	(Houser 2006)
	Time in reversal (s)	Gaussian 20.81 (21.5)	(Houser 2006)
	Surface interval (s)	Gaussian 63.59 (52.66)	(Houser 2006)
	Bout duration (s)	Gaussian 252 (210)	Ward (1999)
Playing	Travel direction	Vector model	Ward (1999)
	Travel rate (m/s)	Vector model	Ward (1999)
	Ascent rate (m/s)	Gaussian 2.1 (0.3)	Houser et al. (2010)
	Descent rate (m/s)	Gaussian 1.6 (0.2)	Houser et al. (2010)
	Average depth (m)	Gaussian 7 (3)	Würsig and Würsig (1979), Hastie et al. (2006)
	Bottom following	Yes	Approximated (Watwood and Buonantony 2012)

Behavior	Variable	Value	Reference
	Reversals	Not implemented	Approximated (Watwood and Buonantony 2012)
	Surface interval (s)	Gaussian 3 (2)	Approximated (Watwood and Buonantony 2012)
	Bout duration (s)	Gaussian 138 (54)	Ward (1999)
Resting	Travel direction	Vector model	Ward (1999)
	Travel rate (m/s)	Vector model	Ward (1999)
	Ascent rate (m/s)	Gaussian 0.5 (0.1)	Approximated (Watwood and Buonantony 2012)
	Descent rate (m/s)	Gaussian 0.5 (0.1)	Approximated (Watwood and Buonantony 2012)
	Dive depth (m)	Random, max = 2	Approximated (Watwood and Buonantony 2012)
	Bottom following	Not implemented	Approximated (Watwood and Buonantony 2012)
	Reversals	Not implemented	Approximated (Watwood and Buonantony 2012)
	Surface interval (s)	Gaussian 3 (2)	Approximated (Watwood and Buonantony 2012)
	Bout duration (s)	Gaussian 174 (96)	Ward (1999)
Socializing	Travel direction	Vector model	Ward (1999)
	Travel rate (m/s)	Vector model	Ward (1999)
	Ascent rate (m/s)	Gaussian 2.1 (0.3)	Houser et al. (2010)
	Descent rate (m/s)	Gaussian 1.6 (0.2)	Houser et al. (2010)

Behavior	Variable	Value	Reference
	Dive depth (m)	Random, max = 10	Hastie et al. (2006) Würsig and Würsig (1979)
	Bottom following	Yes	Approximated (Watwood and Buonantony 2012)
	Reversals	Not implemented	Approximated (Watwood and Buonantony 2012)
	Surface interval (s)	Gaussian 3 (2)	Approximated (Watwood and Buonantony 2012)
	Bout duration (s)	Gaussian 204 (174)	Ward (1999)
Travel	Travel direction	Vector model	Ward (1999)
	Travel rate (m/s)	Vector model	Ward (1999)
	Ascent rate (m/s)	Gaussian 2.1 (0.3)	Houser et al. (2010)
	Descent rate (m/s)	Gaussian 1.6 (0.2)	Houser et al. (2010)
	Average depth (m)	Gaussian 7 (3)	Hastie et al. (2006) Würsig and Würsig (1979)
	Bottom following	Yes	Approximated (Watwood and Buonantony 2012)
	Reversals	Not implemented	Approximated (Watwood and Buonantony 2012)
	Surface interval (s)	Gaussian 3 (2)	Approximated (Watwood and Buonantony 2012)
	Bout duration	Gaussian 306 (276)	Ward (1999)
General	Shore following (m)	2.1	Approximated (Watwood and Buonantony 2012)

Behavior	Variable	Value	Reference
	Depth limit on seeding (m)	2.1 (minimum), 1000 (maximum)	Approximated (Watwood and Buonantony 2012)

Approximated: Value based on the best fit for diving profile. Those values were not available from literature but were estimated producing a diving profile similar to D-tag results for example.

Table C-8. *Bryde's whale*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Deep	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Random 0.8 – 1.53	Murase et al. (2015)
	Ascent rate (m/s)	Gaussian 0.95 (0.55)	Alves et al. (2010)
	Descent rate (m/s)	Gaussian 1.25 (0.4)	Alves et al. (2010)
	Dive depth (m)	Gaussian 134.0 (61.5)	Alves et al. (2010)
	Bottom following	Not implemented	Approximated
	Reversals	Gaussian 1.5 (1.5)	Alves et al. (2010)
	Probability of reversal	0.7	Approximated
	Reversal ascent dive rate (m/s)	Gaussian 0.95 (0.55)	Alves et al. (2010)
	Reversal descent dive rate (m/s)	Gaussian 1.25 (0.4)	Alves et al. (2010)
	Time in reversal (s)	Gaussian 50.1 (45.3)	Alves et al. (2010)
	Surface interval (s)	Random 120.0 – 300.0	Alves et al. (2010)
	Bout duration (s)	Gaussian 600 (120): 1900 – 0600 h Gaussian 3600 (420): 0600 – 1900 h	Approximated
Shallow	Travel direction	Correlated random walk	Ward (1999)
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Random 0.8 – 1.53	Murase et al. (2015)
	Ascent rate (m/s)	Gaussian 0.95 (0.55)	Alves et al. (2010)
	Descent rate (m/s)	Gaussian 1.25 (0.4)	Alves et al. (2010)
	Dive depth (m)	Random 1.0 – 40.0	Alves et al. (2010)
	Bottom following	Not implemented	Approximated
	Reversals	Not implemented	Approximated

Behavior	Variable	Value	Reference
	Surface interval (s)	Random 141.0 – 236.0	Di Sciara (1983)
	Bout duration (s)	Gaussian 0 (0): 1900 – 0600 h Gaussian 3600 (420): 0600 – 1900 h	Approximated
General	Shore following (m)	20	Gonçalves et al. (2016)
	Depth limit on seeding (m)	20.0 (minimum), 3000.0 (maximum)	Gonçalves et al. (2016)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-9. *Cuvier's beaked whale*: Data values and references input in JASMINE to create diving behavior(number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Deep Foraging Dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.5 (0.5)	Approximated (Schorr et al. 2009)
	Ascent rate (m/s)	Gaussian 0.69 (0.19)	Baird et al. (2006b), Tyack et al. (2006)
	Descent rate (m/s)	Gaussian 1.47 (0.13)	Baird et al. (2006b), Tyack et al. (2006)
	Dive depth (m)	Gaussian 1070.0 (317.0)	Tyack et al. (2006)
	Bottom following	Not implemented	(Baird et al. 2006b)
	Reversals	Gaussian 20.0 (2.0)	Approximated (Baird et al. 2006b)
	Probability of reversal	0.95	Approximated (Baird et al. 2006b)
	Reversal ascent dive rate (m/s)	Gaussian 0.8 (0.2)	Approximated (Baird et al. 2006b)
	Reversal descent dive rate (m/s)	Gaussian 0.8 (0.2)	Approximated (Baird et al. 2006b)
	Time in reversal (s)	Gaussian 40.0 (20.0)	Tyack et al. (2006)
	Surface interval (s)	Gaussian 474.0 (996.0)	Baird et al. (2006b)
	Bout duration (s)	Sigmoidal T50 = 1200.0, k = 10.0	MacLeod and D'Amico (2006)
Shallow Dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.5 (0.5)	Approximated (Schorr et al. 2009)
	Ascent rate (m/s)	Gaussian 0.61 (0.2)	Baird et al. (2006b), Tyack et al. (2006)
	Descent rate (m/s)	Gaussian 0.53 (0.24)	Baird et al. (2006b), Tyack et al. (2006)

Behavior	Variable	Value	Reference
	Dive depth (m)	Gaussian 221.0 (100.0)	Tyack et al. (2006)
	Bottom following	Not implemented	(Baird et al. 2006b)
	Reversals	Not implemented	Tyack et al. (2006)
	Surface interval (s)	Gaussian 474.0 (996.0)	(Baird et al. 2006b)
	Bout duration (s)	Gaussian 3780.0 (1860.0)	Tyack et al. (2006)
General	Shore following (m)	1000	(Baird et al. 2006b)
	Depth limit on seeding (m)	1381 (minimum), 80000.0 (maximum)	(Baird et al. 2006b)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-10. *Manatee*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Feeding	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Houser (2006)
	Termination coefficient	0.2	Houser (2006)
	Travel rate (m/s)	Gaussian 0.42 (0.12)	Approximated, based on Deutsch (2003)
	Ascent rate (m/s)	Gaussian 0.28 (0.1)	**Chilvers et al. (2004)** (s.d.: best guess)
	Descent rate (m/s)	Gaussian 0.57 (0.1)	**Chilvers et al. (2004)** (s.d.: best guess)
	Dive depth (m)	Gaussian 3.0 (5.0)	**Chilvers et al. (2004)** (s.d.: best guess)
	Bottom following	Not implemented	Not implemented
	Reversals	Random 3.0 – 5.0	Approximated
	Probability of reversal	0.3	Approximated
	Reversal ascent dive rate (m/s)	Random 0.01 – 0.02	Approximated
	Reversal descent dive rate (m/s)	Random 0.01 – 0.02	Approximated
	Time in reversal (s)	Random 10.0 – 66.0	Whiting (2002)
	Surface interval (s)	Gaussian 13.0 (1.0)	Whiting (2002)
	Bout duration (s)	Sigmoidal T_{50} = 1200, k = 10	Approximated
Travelling-Migrating	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.32 (0.12)	Deutsch et al. 2003
	Ascent rate (m/s)	Gaussian 0.24 (0.1)	**Chilvers et al. (2004)** (s.d.: best guess)
	Descent rate (m/s)	Gaussian 0.24 (0.1)	**Chilvers et al. (2004)** (s.d.: best guess)
	Dive depth (m)	Gaussian 5.0 (3.0)	**Chilvers et al. (2004)** (s.d.: best guess)

Behavior	Variable	Value	Reference
	Bottom following	Not implemented	Not implemented
	Reversals	Random 3.0 – 5.0	Approximated
	Probability of reversal	0.3	Approximated
	Reversal ascent dive rate (m/s)	Random 0.01 – 0.02	Approximated
	Reversal descent dive rate (m/s)	Random 0.01 – 0.02	Approximated
	Time in reversal (s)	Random 10.0 – 66.0	Whiting (2002)
	Surface interval (s)	Gaussian 13.0 (1.0)	Whiting (2002)
	Bout duration (s)	Gaussian 3780 (1860)	Approximated
General	Shore following (m)	1	Hodgson (2004)
	Depth limit on seeding (m)	1.0 (minimum), 40.0 (maximum)	Marsh et al. (2012)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-11. *Dwarf sperm whale*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Deep Foraging Dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Houser et al. (2006)
	Termination coefficient	0.2	Houser et al. (2006)
	Travel rate (m/s)	Gaussian 1.5 (0.5)	Approximated
	Ascent rate (m/s)	Gaussian 0.69 (0.19)	(weighted from Baird et al. 2006b, Tyack et al. 2006)
	Descent rate (m/s)	Gaussian 1.47 (0.13)	(weighted from Baird et al. 2006b, Tyack et al. 2006)
	Dive depth (m)	Gaussian 1070.0 (317.0)	(Tyack et al. 2006)
	Bottom following	Not implemented	Approximated
	Reversals	Gaussian 10.0 (2.0)	**(Best estimate from Tyack et al. 2006)**
	Probability of reversal	0.95	Approximated
	Reversal ascent dive rate (m/s)	Gaussian 0.8 (0.2)	(Approximated based on Blainville' s beaked whale data in Madsen et al. 2005)
	Reversal descent dive rate (m/s)	Gaussian 0.8 (0.2)	Not implemented
	Time in reversal (s)	Gaussian 40.0 (20.0)	**(Best estimate from Tyack et al. 2006)**
	Surface interval (s)	Gaussian 474.0 (996.0)	**(Tyack et al. 2006)**
	Bout duration (s)	Sigmoidal T_{50} = 1200.0, k = 10.0	Approximated
Shallow Dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Houser et al. (2006)
	Termination coefficient	0.2	Houser et al. (2006)
	Travel rate (m/s)	Gaussian 1.5 (0.5)	Approximated
	Ascent rate (m/s)	Gaussian 0.61 (0.2)	(weighted from Baird et al. 2006b, Tyack et al. 2006)
	Descent rate (m/s)	Gaussian 0.53 (0.24)	(weighted from Baird et al. 2006b, Tyack et al. 2006)
	Dive depth (m)	Gaussian 221.0 (100.0)	**(Tyack et al. 2006)**

Behavior	Variable	Value	Reference
	Bottom following	Not implemented	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 474.0 (996.0)	**(Tyack et al. 2006)**
	Bout duration (s)	Gaussian 3780.0 (1860.0)	**(Tyack et al. 2006)**
General	Shore following (m)	200	Kaschner et al. (2006)
	Depth limit on seeding (m)	200.0 (minimum), 11000.0 (maximum)	Kaschner et al. (2006)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-12. *False killer whale*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Behavior 1	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Houser et al. (2006)
	Termination coefficient	0.2	Houser et al. (2006)
	Travel rate (m/s)	Random 0.08 – 5.69	Approximated from Atlantic spotted dolphin (Davis et al. 1996)
	Ascent rate (m/s)	Gaussian 1.15 (0.8)	Approximated from Atlantic spotted dolphin (Griffin et al. 2005)
	Descent rate (m/s)	Gaussian 1.23 (0.48)	Approximated from Atlantic spotted dolphin (Griffin et al. 2005)
	Dive depth (m)	Random 1.0 – 60.0	Approximated from Atlantic spotted dolphin (Davis et al. 1996)
	Bottom following	Not implemented	Approximated
	Reversals	Gaussian 2.0 (2.0)	Approximated
	Probability of reversal	0.5	Approximated
	Reversal ascent dive rate (m/s)	Gaussian 1.15 (0.8)	Approximated from Atlantic spotted dolphin (Griffin et al. 2005)
	Reversal descent dive rate (m/s)	Gaussian 1.23 (0.48)	Approximated from Atlantic spotted dolphin (Griffin et al. 2005)
	Time in reversal (s)	Gaussian 20.81 (21.5)	Approximated from Atlantic spotted dolphin (Griffin et al. 2005)
	Surface interval (s)	Gaussian 63.59 (52.66)	Approximated from Atlantic spotted dolphin (Griffin et al. 2005)
General	Shore following (m)	100	(Baird 2018)
	Depth limit on seeding (m)	100.0 (minimum), 8000.0 (maximum)	(Baird 2018); approximated

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-13. *Fin whale*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Non-foraging shallow	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.6 (0.6)	Lafortuna et al. (2003)
	Ascent rate (m/s)	Gaussian 2.1 (0.3)	Croll et al. (2001)
	Descent rate (m/s)	Gaussian 3.0 (0.2)	Croll et al. (2001)
	Dive depth (m)	Gaussian 46.0 (4.8)	Croll et al. (2001)
	Bottom following	Not implemented	Approximated (Watwood and Buonantony 2012)
	Reversals	Gaussian 3.1 (1.1)	Approximated (Watwood and Buonantony 2012)
	Probability of reversal	0.95	Approximated (Watwood and Buonantony 2012)
	Reversal ascent dive rate (m/s)	Gaussian 1.7 (0.4)	Approximated (Croll et al. 2001)
	Reversal descent dive rate (m/s)	Gaussian 1.4 (0.5)	Approximated (Croll et al. 2001)
	Time in reversal (s)	Gaussian 13.7 (2.8)	Approximated (Croll et al. 2001)
	Surface interval (s)	Gaussian 123.8 (42.3)	Acevedo-Gutierrez et al. (2002)
	Bout duration (s)	Sigmoidal T_{50} = 10, k = 10	Approximated (Watwood and Buonantony 2012)
Non-foraging Deep	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.7 (0.5)	Lafortuna et al. (2003)
	Ascent rate (m/s)	Gaussian 1.7 (0.4)	Croll et al. (2001)

Behavior	Variable	Value	Reference
	Descent rate (m/s)	Gaussian 2.0 (0.2)	Croll et al. (2001)
	Dive depth (m)	Gaussian 120 (33.5)	Croll et al. (2001)
	Bottom following	Not implemented	Approximated (Watwood and Buonantony 2012)
	Reversals	Not implemented	Approximated (Watwood and Buonantony 2012)
	Surface interval (s)	Gaussian 80 (19.2)	Acevedo-Gutiérrez et al. (2002)
	Bout duration (s)	Sigmoidal T_{50} = 15, k = 15	Approximated (Watwood and Buonantony 2012)
Foraging Shallow	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.6 (0.6)	Goldbogen et al. (2006)
	Ascent rate (m/s)	Gaussian 2.1 (0.3)	Goldbogen et al. (2006)
	Descent rate (m/s)	Gaussian 3.0 (0.2)	Goldbogen et al. (2006)
	Dive depth (m)	Gaussian 46.0 (4.8)	Croll et al. (2001)
	Bottom following	Not implemented	Approximated (Watwood and Buonantony 2012)
	Reversals	Gaussian 3.1 (1.1)	Croll et al. (2001) Goldbogen et al. (2006)
	Probability of reversal	0.95	Approximated (Watwood and Buonantony 2012)
	Reversal ascent dive rate (m/s)	Gaussian 1.7 (0.4)	Croll et al. (2001)
	Reversal descent dive rate (m/s)	Gaussian 1.4 (0.5)	Croll et al. (2001)
	Time in reversal (s)	Gaussian 13.7 (2.8)	Croll et al. (2001)

Behavior	Variable	Value	Reference
	Surface interval (s)	Gaussian 123.8 (42.3)	Acevedo-Gutiérrez et al. (2002)
	Bout duration (s)	Sigmoidal T_{50} = 30, k = 15	Approximated (Watwood and Buonantony 2012)
Foraging Deep	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.6 (0.6)	Goldbogen et al. (2006)
	Ascent rate (m/s)	Gaussian 2.1 (0.3)	Goldbogen et al. (2006)
	Descent rate (m/s)	Gaussian 3.0 (0.2)	Goldbogen et al. (2006)
	Dive depth (m)	Gaussian 248.0 (18.0)	Goldbogen et al. (2006)
	Bottom following	Not implemented	Approximated (Watwood and Buonantony 2012)
	Reversals	Gaussian 3.1 (1.1)	Croll et al. (2001) Goldbogen et al. (2006)
	Probability of reversal	0.95	Approximated (Watwood and Buonantony 2012)
	Reversal ascent dive rate (m/s)	Gaussian 1.7 (0.4)	Croll et al. (2001)
	Reversal descent dive rate (m/s)	Gaussian 1.4 (0.5)	Croll et al. (2001)
	Time in reversal (s)	Gaussian 13.7 (2.8)	Croll et al. (2001)
	Surface interval (s)	Gaussian 123.8 (42.3)	Acevedo-Gutiérrez et al. (2002)
	Bout duration (s)	Sigmoidal T_{50} = 50, k = 15	Approximated (Watwood and Buonantony 2012)
General	Shore following (m)	400	Approximated (Watwood and Buonantony 2012)

Behavior	Variable	Value	Reference
	Depth limit on seeding (m)	400.0 (minimum), 2000.0 (maximum)	Approximated (Watwood and Buonantony 2012)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-14. *Fraser's dolphin*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Day	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Houser et al. (2006)
	Termination coefficient	0.2	Houser et al. (2006)
	Travel rate (m/s)	Gaussian 3.035 (1.22)	(Au and Perryman 1982)
	Ascent rate (m/s)	Gaussian 0.6 (0.368)	Approximated from striped dolphin (Minamikawa et al. 2003)
	Descent rate (m/s)	Gaussian 0.538 (0.343)	Approximated from striped dolphin (Minamikawa et al. 2003)
	Dive depth (m)	Gaussian 22.6 (17.5)	Approximated from striped dolphin (Minamikawa et al. 2003)
	Bottom following	Not implemented	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 55.7 (32.1)	Approximated from striped dolphin (Minamikawa et al. 2003)
	Bout duration (s)	Sigmoidal T_{50} = 3600, k = 7	Approximated
Night	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Houser et al. (2006)
	Termination coefficient	0.2	Houser et al. (2006)
	Travel rate (m/s)	Gaussian 3.035 (1.22)	(Au and Perryman 1982)
	Ascent rate (m/s)	Gaussian 0.6 (0.368)	Approximated from striped dolphin (Minamikawa et al. 2003)
	Descent rate (m/s)	Gaussian 0.538 (0.343)	Approximated from striped dolphin (Minamikawa et al. 2003)
	Dive depth (m)	Gaussian 22.6 (17.5)	Approximated from striped dolphin (Minamikawa et al. 2003)
	Bottom following	Not implemented	Approximated

Behavior	Variable	Value	Reference
	Reversals	Not implemented	Approximated
	Probability of reversal	0.5	Approximated
	Reversal ascent dive rate (m/s)	Gaussian 1.542 (0.709)	Approximated from striped dolphin (Minamikawa et al. 2003)
	Reversal descent dive rate (m/s)	Gaussian 1.463 (0.668)	Approximated from striped dolphin (Minamikawa et al. 2003)
	Time in reversal (s)	Gaussian 39.0 (55.2)	Approximated from striped dolphin (Minamikawa et al. 2003)
	Surface interval (s)	Gaussian 65.8 (32.0)	Approximated from striped dolphin (Minamikawa et al. 2003)
	Bout duration (s)	Sigmoidal T_{50} = 3600, k = 7	Approximated
General	Shore following (m)	1000	(Kaschner et al. 2016)
	Depth limit on seeding (m)	1000.0 (minimum), 8000.0 (maximum)	(Kaschner et al. 2016)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-15. *Gervais' beaked whale*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Deep Foraging Dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.34 (0.5)	Approximated
	Ascent rate (m/s)	Gaussian 0.7 (0.1)	Tyack et al. (2006)
	Descent rate (m/s)	Gaussian 1.6 (0.2)	Baird et al. (2006b)
	Dive depth (m)	Gaussian 1408.0 (210.0)	Tyack et al. (2006)
	Bottom following	Yes	Baird et al. (2006b)
	Reversals	Gaussian 6.0 (2.0)	Tyack et al. (2006)
	Probability of reversal	0.9	Approximated
	Reversal ascent dive rate (m/s)	Gaussian 0.7 (0.2)	Tyack et al. (2006)
	Reversal descent dive rate (m/s)	Gaussian 1.5 (0.1)	Approximated
	Time in reversal (s)	Gaussian 40.0 (20.0)	Madsen et al. (2005)
	Surface interval (s)	Gaussian 1200.0 (996.0)	Madsen et al. (2005)
	Bout duration (s)	Sigmoidal T_{50} = 3534, k = 10	Tyack et al. (2006)
Shallow Dive – day	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.37 (0.5)	Approximated
	Ascent rate (m/s)	Gaussian 0.3 (0.2)	Tyack et al. (2006) Baird et al. (2006b)
	Descent rate (m/s)	Gaussian 0.3 (0.2)	Tyack et al. (2006) Baird et al. (2006b)
	Dive depth (m)	Gaussian 304.0 (61.0)	Tyack et al. (2006)
	Bottom following	Not implemented	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 126.0 (500.0)	Tyack et al. (2006)

Behavior	Variable	Value	Reference
	Bout duration (s)	Gaussian 3780 (1860)	Tyack et al. (2006)
Shallow Dive – night	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.32 (0.5)	Approximated
	Ascent rate (m/s)	Gaussian 0.3 (0.2)	Tyack et al. (2006) Baird et al. (2006b)
	Descent rate (m/s)	Gaussian 0.3 (0.2)	Tyack et al. (2006) Baird et al. (2006b)
	Dive depth (m)	Gaussian 241.0 (61.0)	Tyack et al. (2006)
	Bottom following	Not implemented	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 144.0 (2000.0)	Tyack et al. (2006)
	Bout duration (s)	Gaussian 3780 (1860)	Tyack et al. (2006)
General	Shore following (m)	10	Approximated
	Depth limit on seeding (m)	633.0 (minimum), 80000.0 (maximum)	Baird et al. (2006) Waring et al. (2001)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-16. *Gray seal:* Data values and references input in JASMINE to create diving behavior(number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Square	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.111 (0.861)	Breed et al. (2009)
	Ascent rate (m/s)	Gaussian 0.9 (0.04)	Beck et al. (2003)
	Descent rate (m/s)	Gaussian 1.0 (0.03)	Beck et al. (2003)
	Average depth (m)	Gaussian 62 (3.5)	Beck et al. (2003)
	Bottom following	Not implemented	Approximated (Beck et al. 2003)
	Reversals	Not implemented	Approximated (Beck et al. 2003)
	Surface interval (s)	Gaussian 132 (7.2)	Approximated (Beck et al. 2003)
	Bout duration (s)	Gaussian 2700 (1800)	Approximated (Beck et al. 2003)
Right skewed square	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.111 (0.861)	Breed et al. (2009)
	Ascent rate (m/s)	Gaussian 0.6 (0.02)	Beck et al. (2003)
	Descent rate (m/s)	Gaussian 1.5 (0.05)	Beck et al. (2003)
	Average depth (m)	Gaussian 53.0 (3.9)	Beck et al. (2003)
	Bottom following	Yes	Approximated (Beck et al. 2003)
	Reversals	Not implemented	Approximated (Beck et al. 2003)
	Surface interval (s)	Gaussian 132 (7.2)	Approximated (Beck et al. 2003)

Behavior	Variable	Value	Reference
	Bout duration (s)	Gaussian 1200 (300)	Approximated (Beck et al. 2003)
Left skewed square	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.111 (0.861)	Breed et al. (2009)
	Ascent rate (m/s)	Gaussian 1.2 (0.12)	Beck et al. (2003)
	Descent rate (m/s)	Gaussian 0.4 (0.05)	Beck et al. (2003)
	Average depth (m)	Gaussian 32.0 (1.7)	Beck et al. (2003)
	Bottom following	Yes	Approximated (Beck et al. 2003)
	Reversals	Not implemented	Approximated (Beck et al. 2003)
	Surface interval (s)	Gaussian 132 (7.2)	Approximated (Beck et al. 2003)
	Bout duration (s)	Gaussian 1200 (300)	Approximated (Beck et al. 2003)
V-shaped	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.111 (0.861)	Breed et al. (2009)
	Ascent rate (m/s)	Gaussian 0.7 (0.11)	Beck et al. (2003)
	Descent rate (m/s)	Gaussian 0.5 (0.05)	Beck et al. (2003)
	Average depth (m)	Gaussian 26.0 (1.1)	Beck et al. (2003)
	Bottom following	Not implemented	Approximated (Beck et al. 2003)
	Reversals	Not implemented	Approximated (Beck et al. 2003)
	Surface interval (s)	Gaussian 132 (7.2)	Approximated (Beck et al. 2003)

Behavior	Variable	Value	Reference
	Bout duration (s)	Gaussian 600 (300)	Approximated (Beck et al. 2003)
Wiggle	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.111 (0.861)	Breed et al. (2009)
	Ascent rate (m/s)	Gaussian 0.9 (0.08)	Beck et al. (2003)
	Descent rate (m/s)	Gaussian 1.0 (0.04)	Beck et al. (2003)
	Average depth (m)	Gaussian 26.0 (1.1)	Beck et al. (2003)
	Bottom following	Not implemented	Approximated (Beck et al. 2003)
	Reversals	Random 2–4	Approximated (Beck et al. 2003)
	Probability of reversal	1.0	Approximated (Beck et al. 2003)
	Reversal ascent dive rate (m/s)	Gaussian 0.9 (0.08)	Beck et al. (2003)
	Reversal descent dive rate (m/s)	Gaussian 1.0 (0.04)	Beck et al. (2003)
	Time in reversal (s)	Random 30–90	Approximated (Beck et al. 2003)
	Surface interval (s)	Gaussian 132 (7.2)	Approximated (Beck et al. 2003)
	Bout duration	Gaussian 1800 (900)	Approximated (Beck et al. 2003)
General	Shore following (m)	0	Approximated (Jessopp et al. 2013)
	Depth limit on seeding (m)	0.0 (minimum), 1000.0 (maximum)	Approximated (Jessopp et al. 2013)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-17. *Harbor porpoise*: Data values and references input in JASMINE to create diving behavior(number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Daytime	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.9 (0.3)	Otani et al. (2000)
	Ascent rate (m/s)	Gaussian 0.87 (0.38)	Westgate et al. (1995)
	Descent rate (m/s)	Gaussian 0.99 (0.34)	Westgate et al. (1995)
	Average depth (m)	Gaussian 22.5 (11.6)	Westgate et al. (1995)
	Bottom following	Yes	Approximated (Watwood and Buonantony 2012)
	Reversals	Gaussian 1 (0)	Approximated (Watwood and Buonantony 2012)
	Probability of reversal	0.84	Westgate et al. (1995)
	Reversal ascent dive rate (m/s)	Gaussian 0.0 (0.0)	Approximated (Watwood and Buonantony 2012)
	Reversal descent dive rate (m/s)	Gaussian 0.0 (0.0)	Approximated (Watwood and Buonantony 2012)
	Time in reversal (s)	Gaussian 20.5 (2.8)	Westgate et al. (1995)
	Surface interval (s)	Gaussian 31.6 (73.8)	Otani et al. (1998) Otani et al. (2000)
	Bout duration (s)	T_{50} = 600 (s), k = 1	Approximated (Watwood and Buonantony 2012)
Nighttime	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated

Behavior	Variable	Value	Reference
	Travel rate (m/s)	Gaussian 0.9 (0.3)	Westgate et al. (1995)
	Ascent rate (m/s)	Gaussian 1.34 (0.53)	Westgate et al. (1995)
	Descent rate (m/s)	Gaussian 1.44 (0.51)	Westgate et al. (1995)
	Average depth (m)	Gaussian 37.5 (12.5)	Westgate et al. (1995)
	Bottom following	Yes	Approximated (Watwood and Buonantony 2012)
	Reversals	Gaussian 1 (0)	Approximated (Watwood and Buonantony 2012)
	Probability of reversal	0.84	Approximated (Watwood and Buonantony 2012)
	Reversal ascent dive rate (m/s)	Gaussian 0.0 (0.0)	Approximated (Watwood and Buonantony 2012)
	Reversal descent dive rate (m/s)	Gaussian 0.0 (0.0)	Approximated (Watwood and Buonantony 2012)
	Time in reversal (s)	Gaussian 10.3 (13.9)	Westgate et al. (1995)
	Surface interval (s)	Gaussian 31.6 (73.8)	Otani et al. (1998) Otani et al. (2000)
	Bout duration (s)	T_{50} = 600 (s), k = 1	Approximated (Watwood and Buonantony 2012)
General	Shore following (m)	10	Approximated (Watwood and Buonantony 2012)
	Depth limit on seeding (m)	10 (minimum), 200 (maximum)	Osmek et al. (1996)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-18. *Harbor seal*: Data values and references input in JASMINE to create diving behavior(number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Type 0 dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.37 (0.39)	Lesage et al. (1999)
	Ascent rate (m/s)	Gaussian 0.71 (0.46)	Lesage et al. (1999)
	Descent rate (m/s)	Gaussian 0.76 (0.47)	Lesage et al. (1999)
	Average depth (m)	Gaussian 2 (1)	Lesage et al. (1999)
	Bottom following	Not implemented	Approximated (Watwood and Buonantony 2012)
	Reversals	Not implemented	Approximated (Watwood and Buonantony 2012)
	Surface interval (s)	Gaussian 10 (2)	Lesage et al. (1999)
	Bout duration (s)	Gaussian 198 (1674)	Approximated (Watwood and Buonantony 2012)
Type 1 dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.48 (0.32)	Lesage et al. (1999)
	Ascent rate (m/s)	Gaussian 1.13 (0.16)	Lesage et al. (1999)
	Descent rate (m/s)	Gaussian 1.12 (0.19)	Lesage et al. (1999)
	Dive depth (m)	Gaussian 76.51 (21.14)	Approximated (Folkow et al. 2004, Nordøy et al. 2008)
	Bottom following	Yes	Approximated (Folkow et al. 2004, Nordøy et al. 2008)
	Reversals	Gaussian 5 (2)	Approximated (Watwood and Buonantony 2012)

Behavior	Variable	Value	Reference
	Probability of reversal	0.08	Lesage et al. (1999)
	Reversal ascent dive rate (m/s)	Gaussian 1.13 (0.16)	Approximated (Watwood and Buonantony 2012)
	Reversal descent dive rate (m/s)	Gaussian 1.12 (0.19)	Approximated (Watwood and Buonantony 2012)
	Time in reversal (s)	Gaussian 5 (2)	Approximated (Watwood and Buonantony 2012)
	Surface interval (s)	Gaussian 42.6 (23.5)	Lesage et al. (1999)
	Bout duration (s)	Gaussian 654 (1314)	Approximated (Watwood and Buonantony 2012)
Type 2 dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.37 (0.39)	Lesage et al. (1999)
	Ascent rate (m/s)	Gaussian 0.61 (0.25)	Lesage et al. (1999)
	Descent rate (m/s)	Gaussian 0.66 (0.27)	Lesage et al. (1999)
	Average depth (m)	Gaussian 12.2 (9.07)	Lesage et al. (1999)
	Bottom following	Not implemented	Approximated (Watwood and Buonantony 2012)
	Reversals	Not implemented	Approximated (Watwood and Buonantony 2012)
	Surface interval (s)	Gaussian 43.8 (60.7)	Lesage et al. (1999)
	Bout duration (s)	Gaussian 138 (180)	Approximated (Watwood and Buonantony 2012)
Type 3 dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated

Behavior	Variable	Value	Reference
	Travel rate (m/s)	Gaussian 0.89 (0.42)	Lesage et al. (1999)
	Ascent rate (m/s)	Gaussian 0.85 (0.23)	Lesage et al. (1999)
	Descent rate (m/s)	Gaussian 0.64 (0.25)	Lesage et al. (1999)
	Average depth (m)	Gaussian 51.85 (21.56)	Lesage et al. (1999)
	Bottom following	Yes	Approximated (Watwood and Buonantony 2012)
	Reversals	Gaussian 5 (2)	Approximated (Watwood and Buonantony 2012)
	Probability of reversal	0.08	Lesage et al. (1999)
	Reversal ascent dive rate (m/s)	Gaussian 0.85 (0.23)	Approximated (Watwood and Buonantony 2012)
	Reversal descent dive rate (m/s)	Gaussian 0.64 (0.25)	Approximated (Watwood and Buonantony 2012)
	Time in reversal (s)	Gaussian 5 (1)	Approximated (Watwood and Buonantony 2012)
	Surface interval (s)	Gaussian 40.2 (31.0)	Lesage et al. (1999)
	Bout duration (s)	Gaussian 252 (306)	Approximated (Watwood and Buonantony 2012)
Type 4 dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.5 (0.32)	Lesage et al. (1999)
	Ascent rate (m/s)	Gaussian 0.38 (0.18)	Lesage et al. (1999)
	Descent rate (m/s)	Gaussian 0.76 (0.19)	Lesage et al. (1999)
	Average depth (m)	Gaussian 27.27 (10.14)	Lesage et al. (1999)
	Bottom following	Yes	Lesage et al. (1999)

Behavior	Variable	Value	Reference
	Reversals	Gaussian 5 (2)	Approximated (Watwood and Buonantony 2012)
	Probability of reversal	0.08	Lesage et al. (1999)
	Reversal ascent dive rate (m/s)	Gaussian 0.38 (0.18)	Approximated (Watwood and Buonantony 2012)
	Reversal descent dive rate (m/s)	Gaussian 0.76 (0.19)	Approximated (Watwood and Buonantony 2012)
	Time in reversal (s)	Gaussian 5 (1)	Approximated (Watwood and Buonantony 2012)
	Surface interval (s)	Gaussian 38.6 (34.8)	Lesage et al. (1999)
	Bout duration	Gaussian 306 (498)	Approximated (Watwood and Buonantony 2012)
Type 5 dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.21 (0.31)	Lesage et al. (1999)
	Ascent rate (m/s)	Gaussian 0.80 (0.34)	Lesage et al. (1999)
	Descent rate (m/s)	Gaussian 0.70 (0.17)	Lesage et al. (1999)
	Average depth (m)	Gaussian 65.14 (31.07)	Lesage et al. (1999)
	Bottom following	Not implemented	Lesage et al. (1999)
	Reversals	Gaussian 5 (2)	Approximated (Watwood and Buonantony 2012)
	Probability of reversal	0.08	Lesage et al. (1999)
	Reversal ascent dive rate (m/s)	Gaussian 0.80 (0.34)	Lesage et al. (1999)
	Reversal descent dive rate (m/s)	Gaussian 0.70 (0.17)	Lesage et al. (1999)

Behavior	Variable	Value	Reference
	Time in reversal (s)	Gaussian 5 (1)	Approximated (Watwood and Buonantony 2012)
	Surface interval (s)	Gaussian 44.8 (31.9)	Lesage et al. (1999)
	Bout duration	Gaussian 414 (1122)	Approximated (Watwood and Buonantony 2012)
General	Shore following (m)	2.1	Approximated (Watwood and Buonantony 2012)
	Depth limit on seeding (m)	2.1 (minimum), 250 (maximum)	Lowry et al. (2001) Gjertz et al. (2001) Lander et al. (2002)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-19. *Harp seal*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.48 (0.32)	Harbor seal surrogate – Dive type 1 (Lesage et al. 1999)
	Ascent rate (m/s)	Gaussian 0.85 (0.1)	Folkow et al. (2004)
	Descent rate (m/s)	Gaussian 0.85 (0.1)	Folkow et al. (2004)
	Dive depth (m)	Gaussian 76.51 (21.14)	Approximated (Folkow et al. 2004, Nordøy et al. 2008)
	Bottom following	Yes	Approximated (Folkow et al. 2004, Nordøy et al. 2008)
	Reversals	Gaussian 5.0 (2.0)	Harbor seal surrogate – Dive type 1 (Lesage et al. 1999)
	Probability of reversal	0.88	Harbor seal surrogate – Dive type 1 (Lesage et al. 1999)
	Reversal ascent dive rate (m/s)	Gaussian 0.85 (0.1)	Folkow et al. (2004)
	Reversal descent dive rate (m/s)	Gaussian 0.85 (0.1)	Folkow et al. (2004)
	Time in reversal (s)	Gaussian 5.0 (1.0)	Harbor seal surrogate – Dive type 1 (Lesage et al. 1999)
	Surface interval (s)	Gaussian 42.6 (23.5)	Harbor seal surrogate – Dive type 1 (Lesage et al. 1999)
General	Shore following (m)	0	Approximated (harbor seal surrogate - Watwood and Buonantony 2012)

Behavior	Variable	Value	Reference
	Depth limit on seeding (m)	0.0 (minimum), 700.0 (maximum)	Harbor seal surrogate – Lowry et al. (2001) Gjertz et al. (2001) Lander et al. (2002)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-20. *Humpback whale*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Migrating	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.8 (0.25)	Meynecke et al. (2013) Murase et al. (2015)
	Ascent rate (m/s)	Gaussian 1.9 (0.25)	Dolphin (1987)
	Descent rate (m/s)	Gaussian 1.7 (0.7)	Dolphin (1987)
	Dive depth (m)	Gaussian 45 (10)	Smith et al. (2012)
	Bottom following	Not implemented	Approximated (based on figure in Dunlop et al. 2013)
	Reversals	Gaussian 7 (3)	Alves et al. (2010)
	Probability of reversal	1	Approximated (based on figure in Dunlop et al. 2013)
	Reversal ascent dive rate (m/s)	Gaussian 0.1 (0.1)	Approximated (based on figure in Dunlop et al. 2013)
	Reversal descent dive rate (m/s)	Gaussian 0.1 (0.1)	Approximated (based on figure in Dunlop et al. 2013)
	Time in reversal (s)	Gaussian 60 (15)	Approximated (based on figure in Dunlop et al. 2013)
	Surface interval (s)	Gaussian, 60 (27)	Dolphin (1987)
	Bout Duration	Sigmoidal T_{50} = 60, k = 7.0	Approximated based on (Goldbogen et al. 2008)
General	Shore following (m)	10	Approximated (based on Smith et al. 2012)
	Depth limit on seeding (m)	20 (minimum), 70 (maximum)	Approximated (based on Smith et al. 2012)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-21. *Killer whale*: Data values and references input in JASMINE to create diving behavior(number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Shallow	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 2.0 (1.61)	Dahlheim and White (2010)
	Ascent rate (m/s)	Gaussian 1.832 (1.448)	Baird (1994)
	Descent rate (m/s)	Gaussian 1.822 (1.51)	Baird (1994)
	Dive depth (m)	Gaussian 8.0 (2.0)	Miller et al. (2010)
	Bottom following	Not implemented	Approximated
	Reversals	Not implemented	Approximated (Miller et al. 2010)
	Surface interval (s)	Gaussian 3.0 (2.0)	Approximated (Miller et al. 2010)
	Bout duration (s)	Sigmoidal T50 = 300, k = 7: 1900 – 0600 h Sigmoidal T50 = 600, k = 7: 0600 – 1900 h	Approximated (Miller et al. 2010)
Deep	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 2.0 (1.61)	Dahlheim and White (2010)
	Ascent rate (m/s)	Gaussian 1.832 (1.448)	Baird (1994)
	Descent rate (m/s)	Gaussian 1.822 (1.51)	Baird (1994)
	Dive depth (m)	Gaussian 40.0 (20.0)	Baird (1994)
	Bottom following	Not implemented	Approximated
	Reversals	Gaussian 3.5 (1.5)	Approximated (Miller et al. 2010)
	Probability of reversal	1	Approximated (Miller et al. 2010)
	Reversal ascent dive rate (m/s)	Gaussian 1.832 (1.448)	Baird (1994)

Behavior	Variable	Value	Reference
	Reversal descent dive rate (m/s)	Gaussian 1.822 (1.51)	Baird (1994)
	Time in reversal (s)	Gaussian 10.0 (1.0)	Approximated (Miller et al. 2010)
	Surface interval (s)	Gaussian 3.0 (2.0)	Approximated (Miller et al. 2010)
	Bout duration (s)	Gaussian 300 (7): 1800 – 0600 hr Gaussian 600 (7): 0600 – 1800 h	Approximated (Miller et al. 2010)
General	Shore following (m)	100	Approximated
	Depth limit on seeding (m)	100.0 (minimum), 6000.0 (maximum)	Approximated

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-22. *Long-finned pilot whale*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Deep – Night	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.3 (0.8)	Bloch et al. (2003)
	Ascent rate (m/s)	Gaussian 2.02 (0.68)	Baird et al. (2002)
	Descent rate (m/s)	Gaussian 1.75 (0.34)	Baird et al. (2002)
	Dive depth (m)	Random 50.0 – 828.0	Heide-Jørgensen et al. (2002)
	Bottom following	Not implemented	Approximated (figure in Baird et al. 2002)
	Reversals	Gaussian 3.0 (1.0)	Approximated (figure in Baird et al. 2002)
	Probability of reversal	0.8	Approximated (figure in Baird et al. 2002)
	Reversal ascent dive rate (m/s)	Gaussian 0.02 (0.02)	Approximated (figure in Baird et al. 2002)
	Reversal descent dive rate (m/s)	Gaussian 0.02 (0.02)	Approximated (figure in Baird et al. 2002)
	Time in reversal (s)	Gaussian 50.0 (30.0)	Approximated (figure in Baird et al. 2002)
	Surface interval (s)	Gaussian 480.0 (30.0)	Approximated (Baird et al. 2002)
	Bout duration (s)	Gaussian 600 (300)	Approximated (figure in Baird et al. 2002)
Shallow – Day	Travel direction	Random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.3 (0.8)	Bloch et al. (2003)
	Ascent rate (m/s)	Gaussian 2.02 (0.68)	Baird et al. (2002)
	Descent rate (m/s)	Gaussian 1.75 (0.34)	Baird et al. (2002)
	Dive depth (m)	Gaussian 15.0 (3.0)	Heide-Jørgensen et al. (2002)

Behavior	Variable	Value	Reference
	Bottom following	Not implemented	Approximated (figure in Baird et al. 2002)
	Reversals	Not implemented	Approximated (figure in Baird et al. 2002)
	Surface interval (s)	Gaussian 30.0 (30.0)	Approximated (figure in Baird et al. 2002)
	Bout duration (s)	Gaussian 3000 (600)	Approximated (figure in Baird et al. 2002)
General	Shore following (m)	100	Approximated (Mate et al. 2005)
	Depth limit on seeding (m)	100.0 (minimum), 3000.0 (maximum)	Approximated (Mate et al. 2005)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-23. *Melon-headed whale*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Deep – Night	Travel direction	Correlated random walk	Approximated Soury (1996)
	Perturbation value	10	Approximated Soury (1996)
	Termination coefficient	0.2	Approximated Soury (1996)
	Travel rate (m/s)	Gaussian 1.3 (0.8)	(Bloch et al. 2003)
	Ascent rate (m/s)	Gaussian 2.02 (0.68)	Approximated from long-finned pilot whales (Baird et al. 2002)
	Descent rate (m/s)	Gaussian 1.75 (0.34)	Approximated from long-finned pilot whales (Baird et al. 2002)
	Dive depth (m)	Random 150.0 – 400.0	(Joyce et al. 2016)
	Bottom following	Not implemented	Approximated
	Reversals	Gaussian 3.0 (1.0)	Approximated
	Probability of reversal	0.8	Approximated
	Reversal ascent dive rate (m/s)	Gaussian 0.02 (0.02)	Approximated
	Reversal descent dive rate (m/s)	Gaussian 0.02 (0.02)	Approximated
	Time in reversal (s)	Gaussian 50.0 (30.0)	Approximated
	Surface interval (s)	Gaussian 480.0 (30.0)	Approximated from long-finned pilot whales (Baird et al. 2002)
	Bout duration (s)	Gaussian 600 (300)	Approximated
Shallow – Day	Travel direction	Correlated random walk	Approximated (Soury 1996)
	Perturbation value	10	Approximated (Soury 1996)
	Termination coefficient	0.2	Approximated (Soury 1996)

Behavior	Variable	Value	Reference
	Travel rate (m/s)	Gaussian 1.3 (0.8)	Approximated from long-finned pilot whales (Bloch et al. 2003)
	Ascent rate (m/s)	Gaussian 2.02 (0.68)	Approximated from long-finned pilot whales (Baird et al. 2002)
	Descent rate (m/s)	Gaussian 1.75 (0.34)	Approximated from long-finned pilot whales (Baird et al. 2002)
	Dive depth (m)	Gaussian 100.0 (15.0)	(Joyce et al. 2016)
	Bottom following	Not implemented	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 30.0 (30.0)	Approximated
	Bout duration (s)	Gaussian 3000 (600)	Approximated
General	Shore following (m)	200	(Kaschner et al. 2016)
	Depth limit on seeding (m)	200.0 (minimum), 11000.0 (maximum)	(Kaschner et al. 2016)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-24. *Mesoplodont beaked whales*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Deep foraging dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.5 (0.5)	(Baird et al. 2006b)
	Ascent rate (m/s)	Gaussian 0.79 (0.13)	Baird et al. (2006a), Tyack et al. (2006)
	Descent rate (m/s)	Gaussian 1.45 (0.2)	Baird et al. (2006a), Tyack et al. (2006)
	Dive depth (m)	Gaussian 835.0 (143.0)	Tyack et al. (2006)
	Bottom following	Not implemented	(Baird et al. 2006b)
	Reversals	Gaussian 20.0 (2.0)	Tyack et al. (2006)
	Probability of reversal	0.95	Approximated
	Reversal ascent dive rate (m/s)	Gaussian 0.8 (0.2)	Madsen et al. (2005)
	Reversal descent dive rate (m/s)	Gaussian 0.8 (0.2)	Madsen et al. (2005)
	Time in reversal (s)	Gaussian 40.0 (20.0)	Tyack et al. (2006)
	Surface interval (s)	Gaussian 228.0 (276.0)	Tyack et al. (2006)
	Bout duration (s)	Sigmoidal T50 = 1200.0, k = 600.0	Tyack et al. (2006)
Shallow dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.5 (0.5)	(Baird et al. 2006b)
	Ascent rate (m/s)	Gaussian 0.35 (0.2)	Baird et al. (2006a), Tyack et al. (2006)
	Descent rate (m/s)	Gaussian 0.34 (0.2)	Baird et al. (2006a), Tyack et al. (2006)
	Dive depth (m)	Gaussian 71.0 (52.0)	Tyack et al. (2006)

Behavior	Variable	Value	Reference
	Bottom following	Not implemented	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 228.0 (276.0)	Tyack et al. (2006)
	Bout duration (s)	Gaussian 3780.0 (1860.0)	Tyack et al. (2006)
General	Shore following (m)	633	Waring et al. (2001), Baird et al. (2006b)
	Depth limit on seeding (m)	633.0 (minimum), 100000.0 (maximum)	Waring et al. (2001), Baird et al. (2006b)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-25. *Minke whale:* Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Feeding dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 3.25 (0.3)	Approximated (Blix and Folkow 1995)
	Ascent rate (m/s)	Gaussian 2.1 (0.3)	Approximated (fin whale - Goldbogen et al. 2011)
	Descent rate (m/s)	Gaussian 3 (0.2)	Approximated (fin whale - Goldbogen et al. 2011)
	Dive depth (m)	Gaussian 35 (20)	Approximated (based on figure in Blix and Folkow 1995)
	Bottom following	Not implemented	Approximated (Blix and Folkow 1995)
	Reversals	Gaussian 3.1 (1.1)	Approximated (fin whale - Croll et al. 2001, Goldbogen et al. 2006)
	Probability of reversal	0.95	Approximated (Blix and Folkow 1995)
	Reversal ascent dive rate (m/s)	Gaussian 1.7 (0.4)	Fin whale–Croll et al. (2001)
	Reversal descent dive rate (m/s)	Gaussian 1.4 (0.5)	Fin whale–Croll et al. (2001)
	Time in reversal (s)	Gaussian 13.7 (2.8)	Fin whale–Croll et al. (2001)
	Surface interval (s)	Gaussian 66.1 (96.7)	Stockin et al. (2001)
	Bout duration (s)	Gaussian 1500 (500)	Approximated (based on figure in Blix and Folkow 1995)
Cruising dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated

Behavior	Variable	Value	Reference
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 3.25 (0.3)	Approximated (Blix and Folkow 1995)
	Ascent rate (m/s)	Gaussian 1.7 (0.4)	Approximated (fin whale - Goldbogen et al. 2011)
	Descent rate (m/s)	Gaussian 2.0 (0.2)	Approximated (fin whale - Goldbogen et al. 2011)
	Dive depth (m)	Gaussian 15 (10)	Approximated (based on figure in Blix and Folkow 1995)
	Bottom following	Not implemented	Approximated (based on figure in Blix and Folkow 1995)
	Reversals	Not implemented	Approximated (based on figure in Blix and Folkow 1995)
	Surface interval (s)	Gaussian 66.1 (96.7)	Stockin et al. (2001)
	Bout duration (s)	Gaussian 1000 (600)	Approximated (based on figure in Blix and Folkow 1995)
Sleeping	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 3.25 (0.3)	Approximated (Blix and Folkow 1995)
	Ascent rate (m/s)	Gaussian 1.7 (0.4)	Approximated (fin whale - Goldbogen et al. 2011)
	Descent rate (m/s)	Gaussian 2.0 (0.2)	Approximated (fin whale - Goldbogen et al. 2011)

Behavior	Variable	Value	Reference
	Dive depth (m)	Gaussian 10 (5)	Approximated (based on figure in Blix and Folkow 1995)
	Bottom following	Not implemented	Approximated (based on figure in Blix and Folkow 1995)
	Reversals	Not implemented	Approximated (based on figure in Blix and Folkow 1995)
	Surface interval (s)	Gaussian 66.1 (96.7)	Stockin et al. (2001)
	Bout duration (s)	Gaussian 2000 (400)	Approximated (based on figure in Blix and Folkow 1995)
Unknown	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 3.25 (0.3)	Approximated (Blix and Folkow 1995)
	Ascent rate (m/s)	Gaussian 1.7 (0.4)	Approximated (fin whale - Goldbogen et al. 2011)
	Descent rate (m/s)	Gaussian 2.0 (0.2)	Approximated (fin whale - Goldbogen et al. 2011)
	Dive depth (m)	Gaussian 20 (10)	Approximated (based on figure in Blix and Folkow 1995)
	Bottom following	Not implemented	Approximated (based on figure in Blix and Folkow 1995)
	Reversals	Not implemented	Approximated (based on figure in Blix and Folkow 1995)
	Surface interval (s)	Gaussian 66.1 (96.7)	Stockin et al. (2001)

Behavior	Variable	Value	Reference
	Bout duration (s)	Gaussian 1500 (500)	Approximated (based on figure in Blix and Folkow 1995)
General	Shore following (m)	80	Approximated (Hooker et al. 1999)
	Depth limit on seeding (m)	80 (minimum), 200 (maximum)	Hooker et al. (1999)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-26. *North Atlantic right whale*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Foraging dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.47 (0.26)	Baumgartner and Mate (2003)
	Ascent rate (m/s)	Gaussian 1.47 (0.26)	Baumgartner and Mate (2003)
	Descent rate (m/s)	Gaussian 1.4 (0.3)	Baumgartner and Mate (2003)
	Dive depth (m)	Gaussian 121.2 (24.2)	Baumgartner and Mate (2003)
	Bottom following	Not implemented	Approximated (based on figure in Baumgartner and Mate 2003)
	Reversals	Gaussian 1.0 (0)	Approximated (based on figure in Baumgartner and Mate 2003)
	Probability of reversal	1.0	Approximated (based on figure in Baumgartner and Mate 2003)
	Reversal ascent dive rate (m/s)	Gaussian 0.01 (0.01)	Approximated (based on figure in Baumgartner and Mate 2003)
	Reversal descent dive rate (m/s)	Gaussian 0.01 (0.01)	Approximated (based on figure in Baumgartner and Mate 2003)
	Time in reversal (s)	Gaussian 420.0 (60)	Approximated (based on figure in Baumgartner and Mate 2003)
	Surface interval (s)	Gaussian 187.8 (59.4)	Baumgartner and Mate (2003)
	Bout duration (s)	Gaussian 3600 (600)	Approximated (based on figure in Baumgartner and Mate 2003)

Behavior	Variable	Value	Reference
V-shape	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.47 (0.26)	Baumgartner and Mate (2003)
	Ascent rate (m/s)	Gaussian 1.47 (0.26)	Baumgartner and Mate (2003)
	Descent rate (m/s)	Gaussian 1.4 (0.3)	Baumgartner and Mate (2003)
	Dive depth (m)	Gaussian 121.2 (24.2)	Baumgartner and Mate (2003)
	Bottom following	Not implemented	Approximated (based on figure in Baumgartner and Mate 2003)
	Reversals	Not implemented	Approximated (based on figure in Baumgartner and Mate 2003)
	Surface interval (s)	Gaussian 440 (120)	Baumgartner and Mate (2003)
	Bout duration (s)	Gaussian 1800 (600)	Approximated (based on figure in Baumgartner and Mate 2003)
Other	Travel direction	Correlated random walk	Approximated (based on fin whale - Watwood and Buonantony 2012)
	Perturbation value	10	Approximated (based on fin whale - Watwood and Buonantony 2012)
	Termination coefficient	0.2	Approximated (based on fin whale - Watwood and Buonantony 2012)
	Travel rate (m/s)	Gaussian 1.47 (0.26)	Baumgartner and Mate (2003)

Behavior	Variable	Value	Reference
	Ascent rate (m/s)	Gaussian 1.47 (0.26)	Baumgartner and Mate (2003)
	Descent rate (m/s)	Gaussian 1.4 (0.3)	Baumgartner and Mate (2003)
	Average depth (m)	Gaussian 121.2 (24.2)	Baumgartner and Mate (2003)
	Bottom following	Not implemented	Approximated (based on figure in Baumgartner and Mate 2003)
	Reversals	Random 1.0–10	Approximated (based on figure in Baumgartner and Mate 2003)
	Probability of reversal	0.3	Approximated (based on figure in Baumgartner and Mate 2003)
	Reversal ascent dive rate (m/s)	Gaussian 0.08 (0.05)	Approximated (based on figure in Baumgartner and Mate 2003)
	Reversal descent dive rate (m/s)	Gaussian 0.01 (0.01)	Approximated (based on figure in Baumgartner and Mate 2003)
	Time in reversal (s)	Gaussian 200 (60)	Approximated (based on figure in Baumgartner and Mate 2003)
	Surface interval (s)	Gaussian 440 (120)	Approximated (based on figure in Baumgartner and Mate 2003)
	Bout duration (s)	Gaussian 1200 (600)	Approximated (based on figure in Baumgartner and Mate 2003)
General	Shore following (m)	30	Approximated (based on Baumgartner and Mate 2003)
	Depth limit on seeding (m)	30 (minimum), 200 (maximum)	Baumgartner and Mate (2005)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-27. *Pantropical spotted dolphin*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Day	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 2.39 (1.22)	Scott and Chivers (2009)
	Ascent rate (m/s)	Gaussian 0.42 (0.24)	Scott and Chivers (2009)
	Descent rate (m/s)	Gaussian 0.58 (0.34)	Scott and Chivers (2009)
	Dive depth (m)	Gaussian 22.1 (15.71)	Scott and Chivers (2009)
	Bottom following	Yes	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 68.4 (304.8)	Scott and Chivers (2009)
	Bout duration (s)	Sigmoidal T_{50} = 3600, k = 7	Approximated
Night	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.83 (1.54)	Scott and Chivers (2009)
	Ascent rate (m/s)	Gaussian 0.74 (0.41)	Scott and Chivers (2009)
	Descent rate (m/s)	Gaussian 0.93 (0.54)	Scott and Chivers (2009)
	Dive depth (m)	Gaussian 24.0 (27.1)	Scott and Chivers (2009)
	Bottom following	Not implemented	Approximated
	Reversals	Gaussian 3.0 (1.0)	Approximated
	Probability of reversal	0.5	Approximated
	Reversal ascent dive rate (m/s)	Gaussian 0.74 (0.41)	Scott and Chivers (2009)
	Reversal descent dive rate (m/s)	Gaussian 0.93 (0.54)	Scott and Chivers (2009)
	Time in reversal (s)	Gaussian 39.0 (55.2)	Approximated
	Surface interval (s)	Gaussian 49.8 (108.6)	Scott and Chivers (2009)
	Bout duration (s)	Sigmoidal T_{50} = 3600, k = 7	Approximated

Behavior	Variable	Value	Reference
General	Shore following (m)	200	Herzing and Elliser (2016)
	Depth limit on seeding (m)	200.0 (minimum), 100000.0 (maximum)	Approximated

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-28. *Pygmy killer whale*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Deep – Night	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.3 (0.8)	(Bloch et al. 2003)
	Ascent rate (m/s)	Gaussian 2.02 (0.68)	Approximated from long-finned pilot whales (Baird et al. 2002)
	Descent rate (m/s)	Gaussian 1.75 (0.34)	Approximated from long-finned pilot whales (Baird et al. 2002)
	Dive depth (m)	Random 150.0 – 400.0	(Joyce et al. 2016)
	Bottom following	Not implemented	Approximated
	Reversals	Gaussian 3.0 (1.0)	Approximated
	Probability of reversal	0.8	Approximated
	Reversal ascent dive rate (m/s)	Gaussian 0.02 (0.02)	Approximated
	Reversal descent dive rate (m/s)	Gaussian 0.02 (0.02)	Approximated
	Time in reversal (s)	Gaussian 50.0 (30.0)	Approximated
	Surface interval (s)	Gaussian 480.0 (30.0)	Approximated from long-finned pilot whales (Baird et al. 2002)
	Bout duration (s)	Gaussian 600 (300)	Approximated
Shallow – Day	Travel direction	Correlated random walk	Approximated (Soury 1996)
	Perturbation value	10	Approximated (Soury 1996)
	Termination coefficient	0.2	Approximated (Soury 1996)
	Travel rate (m/s)	Gaussian 1.3 (0.8)	Approximated from long-finned pilot whales (Bloch et al. 2003)

Behavior	Variable	Value	Reference
	Ascent rate (m/s)	Gaussian 2.02 (0.68)	Approximated from long-finned pilot whales (Baird et al. 2002)
	Descent rate (m/s)	Gaussian 1.75 (0.34)	Approximated from long-finned pilot whales (Baird et al. 2002)
	Dive depth (m)	Gaussian 100.0 (15.0)	(Joyce et al. 2016)
	Bottom following	Not implemented	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 30.0 (30.0)	Approximated
	Bout duration (s)	Gaussian 3000 (600)	Approximated
General	Shore following (m)	200	(Kaschner et al. 2016)
	Depth limit on seeding (m)	200.0 (minimum), 11000.0 (maximum)	(Kaschner et al. 2016)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-29. *Pygmy sperm whale*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Dive – Day	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.54 (0.607)	Scott et al. (2001)
	Ascent rate (m/s)	Gaussian 2.2 (0.2)	Aguilar Soto et al. (2009)
	Descent rate (m/s)	Gaussian 2.0 (0.2)	Aguilar Soto et al. (2009)
	Dive depth (m)	Gaussian 30.0 (20.0)	Wells et al. (2013)
	Bottom following	Yes	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 165.0 (69.0)	Sakai et al. (2011)
	Bout duration (s)	Gaussian 480 (60)	Approximated
General	Shore following (m)	10	Approximated
	Depth limit on seeding (m)	10.0 (minimum), 950.0 (maximum)	Approximated

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-30. *Risso's dolphin:* Data values and references input in JASMINE to create diving behavior(number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Shallow dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	2	Approximated
	Travel rate (m/s)	Gaussian 1.997 (1.058)	Wells et al. (2009)
	Ascent rate (m/s)	Gaussian 0.42 (0.24)	Spotted dolphin value (Scott and Chivers 2009)
	Descent rate (m/s)	Gaussian 0.58 (0.34)	Spotted dolphin value (Scott and Chivers 2009)
	Average depth (m)	Gaussian 8.0 (20.0)	Wells et al. (2009)
	Bottom following	Not implemented	Approximated spotted dolphin value (Scott and Chivers 2009)
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 11.0 (4.0)	Bearzi et al. (2011)
	Bout duration (s)	T_{50} = 3600 (s), k = 7	Approximated spotted dolphin value (Scott and Chivers 2009)
Deep dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	2	Approximated
	Travel rate (m/s)	Gaussian 1.997 (1.058)	Wells et al. (2009)
	Ascent rate (m/s)	Gaussian 0.74 (0.41)	Spotted dolphin value (Scott and Chivers 2009)
	Descent rate (m/s)	Gaussian 0.93 (0.54)	Spotted dolphin value (Scott and Chivers 2009)
	Average depth (m)	Random 20–500	Wells et al. (2009)

Behavior	Variable	Value	Reference
	Bottom following	Not implemented	Approximated spotted dolphin value (Scott and Chivers 2009)
	Reversals	Not implemented	Approximated spotted dolphin value (Scott and Chivers 2009)
	Surface interval (s)	Gaussian 11.0 (4.0)	Bearzi et al. (2011)
	Bout duration (s)	T_{50} = 3600 (s), k = 7	Approximated spotted dolphin value (Scott and Chivers 2009)
General	Shore following (m)	2	Approximated (Wells et al. 2009)
	Depth limit on seeding (m)	2 (minimum), 500 (maximum)	Approximated (Wells et al. 2009)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-31. *Rough-toothed dolphin*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Travel	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.25 (0.5)	Ritter (2002)
	Ascent rate (m/s)	Gaussian 0.42 (0.24)	Approximated (pantropical spotted dolphin)
	Descent rate (m/s)	Gaussian 0.58 (0.34)	Approximated (pantropical spotted dolphin)
	Dive depth (m)	Gaussian 6.0 (4.0)	Wells et al. (2008)
	Bottom following	Not implemented	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 68.4 (304.8)	Approximated (pantropical spotted dolphin)
	Bout duration (s)	Gaussian 30 (60)	Approximated
Shallow – Day	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 1.25 (0.5)	Ritter (2002)
	Ascent rate (m/s)	Gaussian 0.42 (0.24)	Approximated (pantropical spotted dolphin)
	Descent rate (m/s)	Gaussian 0.58 (0.34)	Approximated (pantropical spotted dolphin)
	Dive depth (m)	Gaussian 6.0 (4.0)	Wells et al. (2008)
	Bottom following	Not implemented	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 49.8 (108.6)	Wells and Gannon (2005)
	Bout duration (s)	Gaussian 60 (30): 1800 – 0600 h Gaussian 120 (30): 0600 – 1800 h	Approximated
General	Shore following (m)	2	Wells et al. (2008)

Behavior	Variable	Value	Reference
	Depth limit on seeding (m)	2.0 (minimum), 10000.0 (maximum)	Approximated

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-32. *Sea otter*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Forage	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Houser (2006)
	Termination coefficient	0.2	Houser (2006)
	Travel rate (m/s)	Random 0.4 – 0.6	Approximated, based on Bodkin et al. (2004)
	Ascent rate (m/s)	Gaussian 0.41 (0.04)	Bodkin et al. (2004)
	Descent rate (m/s)	Gaussian 0.38 (0.02)	Bodkin et al. (2004)
	Dive depth (m)	Gaussian 18.9 (4.6)	Bodkin et al. (2004)
	Bottom following	Not implemented	Not implemented
	Reversals	Not implemented	Approximated (bottom feeders)
	Surface interval (s)	Random 36.1 – 117.0	Tinker et al. (2008) Bodkin et al. (2004)
	Bout duration (s)	Gaussian 100 (1): 1800 – 0600 h Gaussian 3300 (90): 0600 – 1800 h	Approximated, (Laidre and Jameson 2006)
Travel	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Houser (2006)
	Termination coefficient	0.2	Houser (2006)
	Travel rate (m/s)	Gaussian 0.4 (0.3)	Approximated, based on (Bodkin et al. 2004)
	Ascent rate (m/s)	Gaussian 0.41 (0.04)	Bodkin et al. (2004)
	Descent rate (m/s)	Gaussian 0.38 (0.02)	Bodkin et al. (2004)
	Dive depth (m)	Gaussian 2.7 (0.2)	Bodkin et al. (2004)
	Bottom following	Not implemented	Bodkin et al. (2004)
	Reversals	Not implemented	Bodkin et al. (2004)
	Surface interval (s)	Random 43.0 – 53.0	Bodkin et al. (2004)
	Bout duration (s)	Gaussian 100 (1): 1800 – 0600 h Gaussian 600 (120): 0600 – 1800 h	Approximated

Behavior	Variable	Value	Reference
Resting	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Houser (2006)
	Termination coefficient	0.2	Houser (2006)
	Travel rate (m/s)	Random 0.0 – 0.0	Approximated
	Ascent rate (m/s)	Random 0.0 – 0.0	Approximated
	Descent rate (m/s)	Random 0.0 – 0.0	Approximated
	Dive depth (m)	Random 0.0 – 0.0	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 21600.0 (0.0)	Approximated
	Bout duration (s)	Gaussian 100 (1)	Approximated
General	Shore following (m)	2	Bodkin et al. (2004)
	Depth limit on seeding (m)	2.0 (minimum), 30.0 (maximum)	Bodkin et al. (2004)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-33. *Short-finned pilot whale*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Shallow	Travel direction	Random walk	Approximated Baird et al. (2003)
	Termination coefficient	0.2	Approximated Baird et al. (2003)
	Travel rate (m/s)	Gaussian 0.875 (0.572)	Wells et al. (2013)
	Ascent rate (m/s)	Gaussian 2.2 (0.2)	Aguilar Soto et al. (2009)
	Descent rate (m/s)	Gaussian 2.0 (0.2)	Aguilar Soto et al. (2009)
	Dive depth (m)	Gaussian 30.0 (20.0)	Wells et al. (2013)
	Bottom following	Not implemented	Wells et al. (2013)
	Reversals	Not implemented	Aguilar Soto et al. (2009)
	Surface interval (s)	Gaussian 165.0 (69.0)	Sakai et al. (2011)
	Bout duration (s)	Gaussian 3600 (420)	Approximated Baird et al. (2003)
Deep	Travel direction	Random walk	Approximated Baird et al. (2003)
	Termination coefficient	0.2	Approximated Baird et al. (2003)
	Travel rate (m/s)	Gaussian 0.875 (0.572)	Wells et al. (2013)
	Ascent rate (m/s)	Gaussian 3.2 (0.4)	
	Descent rate (m/s)	Gaussian 3.0 (0.4)	Aguilar Soto et al. (2009)
	Dive depth (m)	Gaussian 300.0 (100.0)	Wells et al. (2013)
	Bottom following	Not implemented	Wells et al. (2013)
	Reversals	Not implemented	Aguilar Soto et al. (2009)
	Surface interval (s)	Gaussian 165.0 (69.0)	Sakai et al. (2011)
	Bout duration (s)	Gaussian 3600 (420)	Approximated Baird et al. (2003)
General	Shore following (m)	10	Approximated Baird et al. (2003)

Behavior	Variable	Value	Reference
	Depth limit on seeding (m)	14.0 (minimum), 100000.0 (maximum)	Approximated Baird et al. (2003)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-34. *Short-beaked common dolphin*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Day	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 3.035 (1.22)	Au and Perryman (1982)
	Ascent rate (m/s)	Gaussian 0.6 (0.368)	Minamikawa et al. (2003)
	Descent rate (m/s)	Gaussian 0.538 (0.343)	Minamikawa et al. (2003)
	Dive depth (m)	Gaussian 22.6 (17.5)	Minamikawa et al. (2003)
	Bottom following	Not implemented	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 55.7 (32.1)	Minamikawa et al. (2003)
	Bout duration (s)	Sigmoidal T50 = 3600, k = 7	Approximated spotted dolphin value (Scott and Chivers 2009)
Night	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 3.035 (1.22)	Au and Perryman (1982)
	Ascent rate (m/s)	Gaussian 1.542 (0.709)	Minamikawa et al. (2003)
	Descent rate (m/s)	Gaussian 1.463 (0.668)	Minamikawa et al. (2003)
	Dive depth (m)	Gaussian 126.7 (120.9)	Minamikawa et al. (2003)
	Bottom following	Not implemented	Approximated
	Reversals	Gaussian 3.0 (2.0)	Approximated spotted dolphin value (Scott and Chivers 2009)
	Probability of reversal	0.5	Approximated spotted dolphin value (Scott and Chivers 2009)
	Reversal ascent dive rate (m/s)	Gaussian 1.542 (0.709)	Minamikawa et al. (2003)

Behavior	Variable	Value	Reference
	Reversal descent dive rate (m/s)	Gaussian 1.463 (0.668)	Minamikawa et al. (2003)
	Time in reversal (s)	Gaussian 39.0 (55.2)	Approximated spotted dolphin value (Scott and Chivers 2009)
	Surface interval (s)	Gaussian 65.8 (32.0)	Minamikawa et al. (2003)
	Bout duration (s)	Sigmoidal T50 = 3600, k = 7	Approximated spotted dolphin value (Scott and Chivers 2009)
General	Shore following (m)	200	Approximated spotted dolphin value (Scott and Chivers 2009)
	Depth limit on seeding (m)	200.0 (minimum), 8000.0 (maximum)	Approximated spotted dolphin value (Scott and Chivers 2009)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-35. *Sperm whale*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Deep foraging dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.88 (0.27)	Miller et al. (2004)
	Ascent rate (m/s)	Gaussian 1.3 (0.2)	Watwood et al. (2006)
	Descent rate (m/s)	Gaussian 1.1 (0.2)	Watwood et al. (2006)
	Average depth (m)	Gaussian 546.9 (130)	Watwood et al. (2006)
	Bottom following	Not implemented	Approximated (Watwood and Buonantony 2012)
	Reversals	Gaussian 8.2 (4.2)	Aoki et al. (2007)
	Probability of reversal	1	Approximated (Watwood and Buonantony 2012)
	Reversal ascent dive rate (m/s)	1.8 (0.5)	Aoki et al. (2007)
	Reversal descent dive rate (m/s)	1.8 (0.5)	Aoki et al. (2007)
	Time in reversal (s)	Gaussian 141 (82.7)	Aoki et al. (2007) Amano and Yoshioka (2003)
	Surface interval (s)	Gaussian 540.0 (180.0)	Watwood et al. (2006)
	Bout duration (s)	Gaussian 42012 (20820)	Approximated (Watwood and Buonantony 2012)
V Dive	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.88 (0.27)	Miller et al. (2004)
	Ascent rate (m/s)	Gaussian 0.67 (0.43)	Amano and Yoshioka (2003)

Behavior	Variable	Value	Reference
	Descent rate (m/s)	Gaussian 0.85 (0.05)	Amano and Yoshioka (2003)
	Average depth (m)	Gaussian 282.7 (69.9)	Amano and Yoshioka (2003)
	Bottom following	Not implemented	Approximated (Watwood and Buonantony 2012)
	Reversals	Not implemented	Approximated (Watwood and Buonantony 2012)
	Surface interval (s)	Gaussian 408 (114)	Approximated (Watwood and Buonantony 2012)
	Bout duration (s)	Gaussian 2286 (384)	Approximated (Watwood and Buonantony 2012)
Inactive bottom time	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.88 (0.27)	Miller et al. (2004)
	Ascent rate (m/s)	Gaussian 1.13 (0.07)	Amano and Yoshioka (2003)
	Descent rate (m/s)	Gaussian 1.4 (0.13)	Amano and Yoshioka (2003)
	Dive depth (m)	Gaussian 492.0 (74.6)	Amano and Yoshioka (2003)
	Bottom following	Not implemented	Approximated (Watwood and Buonantony 2012)
	Reversals	Gaussian 1 (0)	Approximated (Watwood and Buonantony 2012)
	Probability of reversal	1	Approximated (Watwood and Buonantony 2012)
	Reversal ascent dive rate (m/s)	0.1 (0.1)	Approximated (Watwood and Buonantony 2012)

Behavior	Variable	Value	Reference
	Reversal descent dive rate (m/s)	0.1 (0.1)	Approximated (Watwood and Buonantony 2012)
	Time in reversal (s)	Gaussian 1188 (174.6)	Amano and Yoshioka (2003)
	Surface interval (s)	Gaussian 546 (351)	Watwood et al. (2006)
	Bout duration (s)	Gaussian 6192 (4518)	Approximated (Watwood and Buonantony 2012)
Surface active	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.88 (0.27)	Miller et al. (2004)
	Ascent rate (m/s)	Gaussian 0.67 (0.43)	Amano and Yoshioka (2003)
	Descent rate (m/s)	Gaussian 0.85 (0.05)	Amano and Yoshioka (2003)
	Average depth (m)	Gaussian 25 (25)	Amano and Yoshioka (2003)
	Bottom following	Not implemented	Approximated (Watwood and Buonantony 2012)
	Reversals	Not implemented	Approximated (Watwood and Buonantony 2012)
	Surface interval (s)	Gaussian 408 (114)	Amano and Yoshioka (2003)
	Bout duration (s)	Gaussian 3744 (2370)	Approximated (Watwood and Buonantony 2012)
Surface inactive–head up	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0 (0)	Approximated (Watwood and Buonantony 2012)

Behavior	Variable	Value	Reference
	Ascent rate (m/s)	Gaussian 0.0 (0.0)	Approximated (Watwood and Buonantony 2012)
	Descent rate (m/s)	Gaussian 0.1 (0.1)	Miller et al. (2008)
	Dive depth (m)	Gaussian 8.6 (4.8)	Miller et al. (2008)
	Bottom following	Not implemented	Approximated (Watwood and Buonantony 2012)
	Reversals	Gaussian 1 (0)	Approximated (Watwood and Buonantony 2012)
	Probability of reversal	1	Approximated (Watwood and Buonantony 2012)
	Reversal ascent dive rate (m/s)	0 (0)	Miller et al. (2008)
	Reversal descent dive rate (m/s)	0 (0)	Miller et al. (2008)
	Time in reversal (s)	Gaussian 708 (522)	Miller et al. (2008)
	Surface interval (s)	Gaussian 462 (360)	Miller et al. (2008)
	Bout duration	T50 = 486 (s), k = 0.9	Approximated (Watwood and Buonantony 2012)
Surface inactive–head down	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0 (0)	Approximated (Watwood and Buonantony 2012)
	Ascent rate (m/s)	Gaussian 0.0 (0.0)	Approximated (Watwood and Buonantony 2012)

Behavior	Variable	Value	Reference
	Descent rate (m/s)	Gaussian 0.0 (0.0)	Approximated (Watwood and Buonantony 2012)
	Dive depth (m)	Gaussian 16.5 (4.9)	Miller et al. (2008)
	Bottom following	Not implemented	Approximated (Watwood and Buonantony 2012)
	Reversals	Gaussian 1 (0)	Approximated (Watwood and Buonantony 2012)
	Probability of reversal	1	Approximated (Watwood and Buonantony 2012)
	Reversal ascent dive rate (m/s)	0 (0)	Miller et al. (2008)
	Reversal descent dive rate (m/s)	0 (0)	Miller et al. (2008)
	Time in reversal (s)	Gaussian 804 (522)	Miller et al. (2008)
	Surface interval (s)	Gaussian 462 (360)	Miller et al. (2008)
	Bout duration	T50 = 486 (s), k = 0.9	Approximated (Watwood and Buonantony 2012)
General	Shore following (m)	1000	Herzing and Elliser (2016)
	Depth limit on seeding (m)	1000.0 (minimum), 8000.0 (maximum)	Herzing and Elliser (2016)

Approximated: Value based on the best fit for diving profile. Those values were not available from literature but were estimated producing a diving profile similar to D-tag results for example.

Table C-36. *Spinner dolphin*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Day	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.72 (0.83)	Würsig et al. (1994)
	Ascent rate (m/s)	Gaussian 0.42 (0.24)	Scott and Chivers (2009)
	Descent rate (m/s)	Gaussian 0.58 (0.34)	Scott and Chivers (2009)
	Dive depth (m)	Gaussian 22.1 (15.71)	Scott and Chivers (2009)
	Bottom following	Yes	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 68.4 (304.8)	Scott and Chivers (2009)
	Bout duration (s)	Sigmoidal T_{50} = 3600, k = 7	Approximated
Night	Travel direction	Random walk	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 0.875 (0.572)	Würsig et al. (1994)
	Ascent rate (m/s)	Gaussian 3.2 (0.4)	Scott and Chivers (2009)
	Descent rate (m/s)	Gaussian 3.0 (0.4)	Scott and Chivers (2009)
	Dive depth (m)	Gaussian 300.0 (100.0)	Scott and Chivers (2009)
	Bottom following	Not implemented	Approximated
	Reversals	Not implemented	Approximated
	Probability of reversal	0.5	Approximated
	Reversal ascent dive rate (m/s)	Gaussian 0.74 (0.41)	Scott and Chivers (2009)
	Reversal descent dive rate (m/s)	Gaussian 0.93 (0.54)	Scott and Chivers (2009)
	Time in reversal (s)	Gaussian 39.0 (55.2)	Approximated
	Surface interval (s)	Gaussian 49.8 (108.6)	Scott and Chivers (2009)
	Bout duration (s)	Sigmoidal T_{50} = 3600, k = 7	Approximated

Behavior	Variable	Value	Reference
General	Shore following (m)	200	Herzing and Elliser (2016)
	Depth limit on seeding (m)	200.0 (minimum), 100000.0 (maximum)	Approximated

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-37. *Striped dolphin*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Day	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 3.035 (1.22)	Au and Perryman (1982)
	Ascent rate (m/s)	Gaussian 0.6 (0.368)	Minamikawa et al. (2003)
	Descent rate (m/s)	Gaussian 0.538 (0.343)	Minamikawa et al. (2003)
	Dive depth (m)	Gaussian 22.6 (17.5)	Minamikawa et al. (2003)
	Bottom following	Not implemented	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 55.7 (32.1)	Minamikawa et al. (2003)
	Bout duration (s)	Sigmoidal T_{50} = 3600, k = 7	Approximated
Night	Travel direction	Correlated random walk	Approximated
	Perturbation value	10	Approximated
	Termination coefficient	0.2	Approximated
	Travel rate (m/s)	Gaussian 3.03 (1.22)	Au and Perryman (1982)
	Ascent rate (m/s)	Gaussian 1.542 (0.709)	Minamikawa et al. (2003)
	Descent rate (m/s)	Gaussian 1.463 (0.668)	Minamikawa et al. (2003)
	Dive depth (m)	Gaussian 126.7 (120.9)	Minamikawa et al. (2003)
	Bottom following	Not implemented	Approximated
	Reversals	Gaussian 3.0 (2.0)	Approximated
	Probability of reversal	0.5	Approximated
	Reversal ascent dive rate (m/s)	Gaussian 1.542 (0.709)	Approximated
	Reversal descent dive rate (m/s)	Gaussian 1.463 (0.668)	Minamikawa et al. (2003)
	Time in reversal (s)	Gaussian 39.0 (55.2)	Minamikawa et al. (2003)
	Surface interval (s)	Gaussian 65.8 (32.0)	Approximated
	Bout duration (s)	Sigmoidal T50 = 3600, k = 7	Approximated

Behavior	Variable	Value	Reference
General	Shore following (m)	200	Ringelstein et al. (2006)
	Depth limit on seeding (m)	200.0 (minimum), 700.0 (maximum)	Ringelstein et al. (2006)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Table C-38. *Walrus*: Data values and references input in JASMINE to create diving behavior (number values represent means [standard deviations] unless otherwise indicated).

Behavior	Variable	Value	Reference
Forage	Travel direction	Correlated random walk	Default
	Perturbation value	10	Houser (2006)
	Termination coefficient	0.2	Houser (2006)
	Travel rate (m/s)	Gaussian 0.5 (0.3)	Approximated, based on Gjertz et al. (2001)
	Ascent rate (m/s)	Gaussian 0.8 (0.3)	Gjertz et al. 2001
	Descent rate (m/s)	Gaussian 0.8 (0.3)	Gjertz et al. 2001
	Dive depth (m)	Gaussian 22.5 (11.5)	Gjertz et al. 2001
	Bottom following	Not implemented	Not implemented
	Reversals	Not implemented	Approximated (bottom feeders)
	Surface interval (s)	Random 6 – 240	Born et al. 2003
	Bout duration (s)	Gaussian 402 (96)	Born et al. 2003
Travel	Travel direction	Correlated random walk	Default
	Perturbation value	10	Houser (2006)
	Termination coefficient	0.2	Houser (2006)
	Travel rate (m/s)	Gaussian 0.5 (0.3)	Approximated, based on Gjertz et al. (2001)
	Ascent rate (m/s)	Gaussian 0.5 (0.3)	Gjertz et al. 2001
	Descent rate (m/s)	Gaussian 0.4 (0.2)	Gjertz et al. 2001
	Dive depth (m)	Gaussian 3.6 (3.4)	Gjertz et al. 2001
	Bottom following	Not implemented	Approximated
	Reversals	Not implemented	Approximated
	Surface interval (s)	Gaussian 60.0 (30.0)	Approximated, based on Born et al. 2003
	Bout duration (s)	Gaussian 162 (240)	Jay et al. (2001) (s.d.: Approximated)

Behavior	Variable	Value	Reference
General	Shore following (m)	1	Approximated (amphibious lifestyle)
	Depth limit on seeding (m)	1.0 (minimum), 500.0 (maximum)	Approximated (based on maximum dive depth)

Approximated: Value based on the best fit for diving profile. Those values were unavailable from literature, but they were estimated to produce a diving profile similar to D-tag results, for example.

Appendix D. Acoustic Sources

Table D-1. Acoustic sources and parameters provided by NOS operators.

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
CO-OPS	Throughout U.S.	Nortek	AWAC	Acoustic Release Interrogator	omni	26	UNK	omni	omni	184
CO-OPS	Throughout U.S.	Nortek	AWAC	Acoustic Release Interrogator	omni	25-32	UNK	omni	omni	180
NCCOS	Pacific Islands	Teledyne	Benthos	multi-frequency pinger	UNK	25-40	UNK	UNK	UNK	177
NCCOS	Gulf of Mexico	UNK	UNK	ADCP	Upward	>200	UNK	UNK	UNK	UNK
NCCOS	Hawaiian Archipelago	UNK	UNK	ADCP	Upward	UNK	UNK	UNK	UNK	UNK
NCCOS	Southeast Continental Shelf/GOM, Northeast Caribbean	Edgetech	Offshore 4410C Trackpoint II	Ultra-short baseline telemetry	UNK	4.5-30	UNK	UNK	UNK	193
OCS/ OMAO	Northwest CS, Southwest CS, SoCal Bight, and	Kongsberg	EM710 Mk1 0.5x1	MBES	Downward	70-100	CW/FM	0.5	140	225-229

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
	all Alaska Regions									
OCS/ OMAO	All Atlantic regions, Gulf of Mexico, and Carribbean	Kongsberg	EM710 Mk2 0.5x1	MBES	Downward	40-120	CW/FM	0.5	140	225-231
OCS/JHC	Northeast	Kongsberg	EM710	MBES	Downward	70-120	CW/FM	0.5	140	225-231
NCCOS	Southeast Continental Shelf/GOM, Northeast Caribbean	Datasonics DPL-275A Pinger Locator	DPL-275	pinger locator	UNK	25-32	UNK	UNK	UNK	180
NCCOS	northwest, southwest, southern atlantic bight, Southeast Continental Shelf/GOM, Northeast Caribbean	Applied Acoustics Engineering	1300A Series Micro Beacon	receiving beacon on the ROV	omni-directional	21.5-30.5	UNK	UNK	UNK	183
NCCOS	Global	UNK	UNK	WHOI acoustic mircromodem	omni-directional	25-Oct	UNK	UNK	UNK	185

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
NCCOS	Southeast Continental Shelf/GOM, Northeast Caribbean	LinkQuest	TN1505b transponder	Ultra-short baseline telemetry	omni-directional	31-43.2	UNK	UNK	UNK	185
NCCOS	northwest, southwest, southern atlantic bight, Southeast Continental Shelf/GOM, Northeast Caribbean	Teledyne	Ore Trackpoint III	Ultra-short baseline telemetry	omni-directional	8-30	UNK	UNK	UNK	190
NCCOS	Pacific Islands	Tracklink	5000 USBL	Ultra-short baseline telemetry	120 degrees	14.2-19.8	UNK	120	120	190
NCCOS	Southeast Continental Shelf/GOM, Northeast Caribbean	Link Quest	TrackLink 1500 HA System	Ultra-short baseline telemetry	120-150 degrees	31-43.2	UNK	UNK	UNK	UNK
NCCOS	Global	Tracklink navigation system	5000 MA	USBL tracking system	120 degrees, unknown	14.2-19.8	UNK	UNK	UNK	190

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
NCCOS	Southeast Continental Shelf/GOM, Northeast Caribbean	Edgetech	ORE Offshore 4377A transponder with depth telemetry	Ultra-short baseline telemetry	UNK	23-24	UNK	UNK	UNK	197
OCS/JHC	Northeast	EdgeTech	3200-XS w/ SB-0512i	SBP	Downward	0.5-12	FM	16-41	16-41	
NCCOS	southeast - GOM	Teledyne	RDI Ocean Surveyor	Acoustic Doppler Current Profiler (ADCP) System	downward	75-1200	UNK	UNK	UNK	UNK
CO-OPS	Throughout U.S.	TRDI	Workshorse/ Sentinel	ADCP	vertical	75	Broadban d Chirp	20	20	213
NCCOS	Southeast Continental Shelf/GOM, Northeast Caribbean	Tritech PA500/ 6-S	Tritech PA500/6-S	altimeter	UNK	500	UNK	6	6	UNK
NCCOS	Southeast Continental Shelf/GOM, Northeast Caribbean	Imagenex	881 sonar	imaging sonar	UNK	675	UNK	UNK	UNK	UNK
NCCOS	Southeast Continental Shelf/GOM,	Tritech PA500/6-S	Tritech PA500/6-S	altimeter	UNK	500	UNK	6	6	UNK

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
	Northeast Caribbean									
NCCOS	Southeast Continental Shelf/GOM, Northeast Caribbean	Imagenex	881 sonar	imaging sonar	UNK	675	UNK	UNK	UNK	UNK
NCCOS	Southeast Continental Shelf/GOM, Northeast Caribbean	Reson 7125	Reson 7125	multibeam sonar	downward 140 degrees (165)	400	UNK	1	0.5	UNK
OCS/ OMAO	All Atlantic regions, Gulf of Mexico, and Carribbean	RDI	Ocean Surveyor	ADCP	Downward	150	CW	UNK	UNK	220
NCCOS	Southeast Continental Shelf/GOM, Northeast Caribbean	UNK	UNK	Doppler velocity Logger	UNK	300	UNK	UNK	UNK	UNK
OCS/ OMAO	All Atlantic regions, Gulf of Mexico, and Carribbean	Knudsen	320 B/R	SBES/ SubBottom	Downward	3.5/12	CW/FM	28	28	213-222

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
OCS/JHC	Northeast	Custom cylinderical array echo sounder	N/A	MBES	Omni	100 – 500	UNK	360	20	226
CO-OPS	Throughout U.S.	TRDI	Workshorse/ Sentinel	ADCP	UNK	150	Broadband Chirp	20	20	233
NCCOS	Pacific Islands	Tritech	SeaKing digital HD sonar	digital HD CHIRP sonar	325kHz- 20 deg vertical, 3.0 deg horizontal 650kHz – 40deg vertical, 1.5 deg horizonta	325-650	UNK	ukinown	unknown	210
NCCOS	Global	Klein	3000	side scan sonar	Beam tilt 5°, 10°, 15°, 20°, 25° down, adjustable	100-500	UNK	0.7	40	234
NCCOS	Southeast - GOM	Teledyne	RDI bottom mounted	Acoustic Doppler Current Profiler (ADCP) System	upward	300-600	UNK	UNK	UNK	UNK
NCCOS	Global	RDI Workhorse Navigator	Workhorse Navigator	Acoustic Doppler Velocity Log	1.2 degrees	1200	UNK	UNK	UNK	214
OCS/JHC	Northeast	Teledyne Odom	CV100	SBES	Downward	100-750	CW	24-200	20/4	300 watts
NCCOS	Global	Teledyne Blueview	UNK	multibeam on ROV	Downward	1350	UNK	1	76	206-207

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
ORR / MDD	Potentially all, except Chukchi Sea, Beaufort Sea	Klein	3900	Side Scan Sonar	Horizontal	445-900	UNK	0.2	40	UNK
ORR / MDD	Potentially all, except Chukchi Sea, Beaufort Sea	EdgeTech	6205	Side Scan Sonar	Horizontal	520-1610	UNK	0.47	200	215
ORR / MDD	Potentially all, except Chukchi Sea, Beaufort Sea	Humminbird	898 SI	Side Scan Sonar – "Side Imaging"	Downward	200	UNK	UNK	UNK	UNK
ORR / MDD	Potentially all, except Chukchi Sea, Beaufort Sea	Marine Sonic	Sea Scan	Side Scan Sonar	Downward	300	UNK	UNK	UNK	UNK
ORR / MDD	Potentially all, except Chukchi Sea, Beaufort Sea	Teledyne BlueView	BlueView 3D Multibeam Scanning Sonar	ROV Imaging Sonar	Downward	900	UNK	UNK	UNK	UNK
OCS/ OMAO	All Atlantic regions, Gulf of Mexico,	Teledyne Odom	CV200	SBES	Downward	24-200	CW	24-200	20/4	20/4

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
	and Carribbean									
CO-OPS	Throughout U.S.	TRDI	Workshorse/ Sentinel	ADCP	UNK	300	Broadband Chirp	20	20	215
CO-OPS	Throughout U.S.	TRDI	Workshorse/ Sentinel	ADCP	UNK	600	Broadband Chirp	20	20	217
CO-OPS	Throughout U.S.	TRDI	Workshorse/ Sentinel	ADCP	Side-looking across channel, sensor mounted ~ 3m below surface	1200	Broadband Chirp	20	20	214
CO-OPS	Throughout U.S.	Nortek	Aquadopp	ADCP	"- Side-looking across channel, sensor mounted 2-3m below surface - Bottom mounted – upward looking, sensor mounted 15-30m below surface"	600	Narrowband Chirp	20	20	250
CO-OPS	Throughout U.S.	Nortek	Aquadopp	ADCP	"- Side-looking across channel, sensor mounted 2-3m below surface - Bottom mounted –	2000	Narrowband Chirp	20	20	250

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
					upward looking, sensor mounted 15-30m below surface"					
CO-OPS	Throughout U.S.	Nortek	AWAC	ADCP	"- Side-looking across channel, sensor mounted 2-3m below surface - Bottom mounted – upward looking, sensor mounted 15-30m below surface"	600	Narrowband Chirp	20	20	250
CO-OPS	Throughout U.S.	Nortek	AWAC	ADCP	"- Side-looking across channel, sensor mounted 2-3m below surface - Bottom mounted – upward looking, sensor mounted 15-30m below surface"	1000	Narrowband Chirp	20	20	250
OCS/ OMAO	Northwest CS, Southwest	Teledyne Odom	CV200	SB	Downward	50-200	CW	20/4	20/4	2 kW

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
	CS, SoCal Bight, and all Alaska Regions									
NCCOS	Pacific Islands	kongsberg-simrad	1007- 200 m altimeter	alitmeter	conical beamwidth	120-675	UNK	UNK	UNK	UNK
CO-OPS	Throughout U.S.	Lowrance Simrad Fathometer	UNK	SSS	Downward from surface	455-800	UNK	UNK	3.7	196
CO-OPS	Throughout U.S.	Aquatrak	4100/4110 SERIES	Water gauge acoustic sensor at many CO-OPS tide stations	Orientation is down, contained within a ½" PVC tube that is mounted inside a 4" PVC well	0.3	N/A	N/A	N/A	50
OCS/ OMAO	Northwest CS, Southwest CS, SoCal Bight, and all Alaska Regions	Kongsberg	EM2040	MBES	Downward	200-400	CW/FM	1.5/1/0.7	180-200	212
OCS/ OMAO	Northwest CS, Southwest CS, SoCal Bight, and	Kongsberg	EM2040	MBES	Downward	200-400	CW/FM	1.5/1/0.7	180-200	212

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
	all Alaska Regions									
OCS/ OMAO	Northwest CS, Southwest CS, SoCal Bight, and all Alaska Regions	Kongsberg	EM2040	MBES	Downward	200-400	CW/FM	1.5/1/0.7	180-200	212
OCS/ OMAO	Northwest CS, Southwest CS, SoCal Bight, and all Alaska Regions	Kongsberg	EM2040	MBES	Downward	200-400	CW/FM	1.5/1/0.7	180-200	212
OCS/ OMAO	Northwest CS, Southwest CS, SoCal Bight, and all Alaska Regions	Edgetech	4200MP	SSS	Side/Downward	300-600	CW/FM	0.5/0.3	50	UNK
OCS/ OMAO	Northwest CS, Southwest CS, SoCal Bight, and	Edgetech	4200MP	SSS	Side/Downward	300-600	CW/FM	0.5/0.3	50	UNK

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
	all Alaska Regions									
OCS/ OMAO	Northwest CS, Southwest CS, SoCal Bight, and all Alaska Regions	Edgetech	4200MP	SSS	Side/Downward	300-600	CW/FM	0.5/0.3	50	UNK
OCS/ OMAO	Northwest CS, Southwest CS, SoCal Bight, and all Alaska Regions	Edgetech	4200MP	SSS	Side/Downward	300-600	CW/FM	0.5/0.3	50	UNK
OCS/ OMAO	Northwest CS, Southwest CS, SoCal Bight, and all Alaska Regions	Kongsberg	EM2040	MBES	Downward	200-400	CW/FM	1.5/1/0.7	180-200	212
OCS/ OMAO	Northwest CS, Southwest CS, SoCal Bight, and	Kongsberg	EM2040	MBES	Downward	200-400	CW/FM	1.5/1/0.7	180-200	212

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
	all Alaska Regions									
OCS/ OMAO	Northwest CS, Southwest CS, SoCal Bight, and all Alaska Regions	Kongsberg	EM2040	MBES	Downward	200-400	CW/FM	1.5/1/0.7	180-200	212
OCS/ OMAO	Northwest CS, Southwest CS, SoCal Bight, and all Alaska Regions	Kongsberg	EM2040	MBES	Downward	200-400	CW/FM	1.5/1/0.7	180-200	212
OCS/ OMAO	Northwest CS, Southwest CS, SoCal Bight, and all Alaska Regions	Klein	5000 v1	SSS	Side/Downward	455	CW/FM	0.4	40	214.9
OCS/ OMAO	Northwest CS, Southwest CS, SoCal Bight, and	Klein	5000 v1	SSS	Side/Downward	455	CW/FM	0.4	40	214.9

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
	all Alaska Regions									
OCS/ OMAO	Northwest CS, Southwest CS, SoCal Bight, and all Alaska Regions	Klein	5000 v1	SSS	Side/Downward	455	CW/FM	0.4	40	214.9
OCS/ OMAO	Northwest CS, Southwest CS, SoCal Bight, and all Alaska Regions	Klein	5000 v1	SSS	Side/Downward	455	CW/FM	0.4	40	214.9
NCCOS	Global	UNK	UNK	Altimeter	UNK	170	UNK	UNK	UNK	UNK
NCCOS	Southeast Continental Shelf/GOM, Northeast Caribbean	Benthos	UAT-376 transponders	transponder	UNK	25-27	UNK	UNK	UNK	UNK
OCS/ OMAO	All Atlantic regions, Gulf of Mexico, and Caribbean	Kongsberg	EM2040	MBES	Downward	200-400	CW/FM	1.5/1/0.7	180-200	212

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
OCS/ OMAO	All Atlantic regions, Gulf of Mexico, and Caribbean	Kongsberg	EM2040	MBES	Downward	200-400	CW/FM	1.5/1/0.7	180-200	212
OCS/ OMAO	All Atlantic regions, Gulf of Mexico, and Caribbean	Kongsberg	EM2040	MBES	Downward	200-400	CW/FM	1.5/1/0.7	180-200	212
NCCOS	Pacific Islands	The Seabeam 3012 Phase 1 hybrid 12 kHz multibeam sonar bathymetric mapping system	3012 Phase 1 hybrid 12 kHz multibeam sonar bathymetric mapping system	3012 Phase 1 hybrid 12 kHz multibeam sonar bathymetric mapping system	Downward	UNK	UNK	UNK	UNK	UNK
ONMS	Olympic Coast NMS	Simrad	EM302	MBES	UNK	30	UNK	UNK	UNK	UNK
NCCOS	Gulf of Mexico	Reson	7125	MBES	UNK	40	UNK	UNK	UNK	UNK
ONMS	Channel Is NMS	Simrad	ME70	MBES	UNK	70	UNK	UNK	UNK	UNK
NCCOS	Gulf of Mexico	Simrad	EM710	MBES	UNK	100	UNK	UNK	UNK	UNK

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
OCS/ OMAO	All Atlantic regions, Gulf of Mexico, and Caribbean	Kongsberg	EA 60	SBES	Downward	200	CW	7	7	UNK
OCS/ OMAO	All Atlantic regions, Gulf of Mexico, and Caribbean	Klein	5000 v1	SSS	Side/Downward	455	CW/FM	0.4	40	214.9
OCS/ OMAO	All Atlantic regions, Gulf of Mexico, and Caribbean	Klein	5000 v2	SSS	Side/Downward	455	CW/FM	0.4	40	214.9
OCS/ OMAO	All Atlantic regions, Gulf of Mexico, and Caribbean	Klein	5000 v1	SSS	Side/Downward	455	CW/FM	0.4	40	214.9
OCS/ OMAO	All Atlantic regions, Gulf of Mexico, and Caribbean	Klein	5000 v1	SSS	Side/Downward	455	CW/FM	0.4	40	214.9
OCS/ OMAO	All Atlantic regions, Gulf of Mexico,	Kongsberg	EM2040	MBES	Downward	200-400	CW/FM	1.5/1/0.7	180-200	212

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
	and Caribbean									
OCS/ OMAO	All Atlantic regions, Gulf of Mexico, and Carribbean	Kongsberg	EM2040	MBES	Downward	200-400	CW/FM	1.5/1/0.7	180-200	212
OCS/ OMAO	All Atlantic regions, Gulf of Mexico, and Caribbean	Klein	5000 v2	SSS	Side/Downward	455	CW/FM	0.4	40	214.9
OCS/ OMAO	All Atlantic regions, Gulf of Mexico, and Caribbean	R2Sonics	2022	MBES	Downward	200-400	CW	0.9-2	160	UNK
OCS	Gulf of Mexico	Kongsberg	EM2040C	MBES	Downward	200-400	CW/FM	1 @ 400kHz	130	220
OCS	Gulf of Mexico	Edgetech	4125	SSS	Side/Downward	400-900	CW	0.46 / 0.28	50	220
OCS	Gulf of Mexico	Teledyne Odom	CV100	SBES	Downward	200	CW	8	8	UNK
OCS	Gulf of Mexico	Teledyne Odom	CV100	SBES	Downward	200	CW	8	8	UNK
OCS	Gulf of Mexico	Tritech	Starfish 450F	SSS	Side/Downward	450	FM	1.7	60	210

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
OCS	Gulf of Mexico	Teledyne Odom	CV200	SBES	Downward	200	CW	24-200	20/4	220
OCS	All regions	MarineSonics	Sea Scan ARC	SSS	Downward	600-1200	FM	0.4	24	UNK
OCS	All regions	Kongsberg	EM3002	MBES	Downward	300	CW	1	1	220
OCS	Southeast CS and Mid Atlantic Bight	Kongsberg	EM2040C	MBES	Downward	200-400	CW/FM	1 @ 400kHz	130	220
OCS	Southeast CS and Mid Atlantic Bight	Reson	T-20P	MBES	Downward	200-400	CW/FM	2/2	1/1	220
OCS	Southeast CS and Mid Atlantic Bight	Edgetech	4125	SSS	Side/Downward	400-900	CW	0.46 / 0.28	50	220
OCS	Southeast CS and Mid Atlantic Bight	Teledyne Odom	CV200	SBES	Downward	200	CM	24-200	20/4	220
OCS	Northwest CS	Kongsberg	EM2040C	MBES	Downward	200-400	CW/FM	1 @ 400kHz	130	220
OCS	Northwest CS	Kongsberg	3002	MBES	Downward	300	CW	1	1	220

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
OCS	Northwest CS	Edgetech	4125	SSS	Side/Downward	400-900	CW	0.46 / 0.28	50	220
OCS	Northwest CS	Teledyne Odom	CV200	SBES	Downward	200	CW	24-200	20/4	220
OCS	Gulf of Mexico	Kongsberg	EM3002	MBES	Downward	300	CW	1	1	220
OCS	Gulf of Mexico	Kongsberg	EM2040C	MBES	Downward	200-400	CW/FM	1 @ 400kHz	130	220
OCS	Gulf of Mexico	Edgetech	4125	SSS	Side/Downward	400-900	CW	0.46 / 0.28	50	220
OCS	Gulf of Mexico	Teledyne Odom	CV200	SBES	Downward	200	CW	24-200	20/4	220
OCS	Gulf of Maine, Southern New England, Mid Atlantic Bight	Kongsberg	3002	MBES	Downward	300	CW	1	1	220
OCS	Gulf of Maine, Southern New England, Mid Atlantic Bight	Edgetech	4125	SSS	Side/Downward	400-900	CW	0.46 / 0.28	50	220

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
OCS	Gulf of Maine, Southern New England, Mid Atlantic Bight	Kongsberg	EM2040C	MBES	Downward	200-400	CW/FM	1 @ 400kHz	130	220
OCS	Gulf of Maine, Southern New England, Mid Atlantic Bight	Teledyne Odom	CV200	SBES	Downward	200	CW	24-200	20/4	220
OCS	All Atlantic regions	Kongsberg	EM2040	MBES	Downward	200-400	CW/FM	0.5	200	218
OCS	All Atlantic regions	Edgetech	4200	SSS	Side/Downward	300-600	CW	0.5/0.26	50	220
OCS	All Atlantic regions	Teledyne Odom	CV200	SBES	Downward	200	CW	24-200	20/4	220
OCS/ Contractor	All regions	Teledyne Reson	7101	MBES	Downward	240	CW	2/1	140	220
OCS/ Contractor	All regions	Teledyne Reson	7125	MBES	Downward	200-400	CW/FM	2/1	140	220
OCS/ Contractor	All regions	R2Sonics	2024	MBES	Downward	200 – 400	CW/FM	0.5 – 1.0	160	UNK

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
OCS/NGI	Gulf of Mexico	Reson	7125	MBES	Downward	200 – 400	CW	2/1	140	220
OCS/NGI	Gulf of Mexico	Kongsberg	EM2040C	MBES	Downward	200 – 400	CW/FM	1	1	204.5
OCS/NGI	Gulf of Mexico	Norbit	iWBMS	MBES	Down	200-700	CW/FM	.9	0.9	UNK
OCS/JHC	Northeast	Klein	3500	PMBS	Side/Downward	455	FM	0.4	50	UNK
OCS/JHC	Northeast	Edgetech	6205	PMBS	Side/Downward	230	UNK	0.7	1	UNK
OCS/JHC	Northeast	PingDSP	3DSS	PMBS	Side/Downward	450	UNK	0.4	UNK	UNK
OCS/JHC	Northeast	Kongsberg	HISAS 2040	SAS	Side/Downward	220 – 280	UNK	UNK	UNK	UNK
OCS/JHC	Northeast	Kraken	AquaPix INSAS	SAS	Side/Downward	337	FM	UNK	UNK	UNK
OCS/JHC	Northeast	Kongsberg	EM2040	MBES	Downward	200-400	CW/FM	1.5/1/0.7	180-200	212
OCS/JHC	Northeast	Kongsberg	EM2040P	MBES	Downward	200-400	CW/FM	1.5/1/0.7	180-200	212
OCS/JHC	Northeast	Kongsberg	M3	MBES	Downward or Side Looking	500	FM/CW/ Doppler	3-30	120-140	UNK
OCS/JHC	Northeast	Teledyne Odom	MB1	MBES	Downward	170-220	CW	UNK	120	UNK
OCS/JHC	Northeast/ Southwest CS	Custom Sub-Bottom	N/A	SBP	Downward	1-10	FM	UNK	UNK	UNK

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
OCS/JHC	Northeast	Teledyne RDI	Workhorse Sentinel	ADCP	Downward/ Upward	300-1200	Doppler	20	20	UNK
OCS/JHC	Northeast	Teledyne Odom	MB2	MBES	Downward	200-460	CW	1.8	140	UNK
OCS/JHC	Northeast and Southeast CS	Teledyne Reson	7125	MBES	Downward	200-400	CW/FM	2/1	140	220
OCS/JHC	Northeast	Imagenix	Delta T	Imaging	Downward/Side Looking	260	CW	3	120	UNK
OCS/JHC	Northeast	Sound Metrics	Didson	Imaging	Downward/Side Looking	1100	CW	0.4	14	UNK
OCS/JHC	Northeast	Kongsberg	HISAS 1032	SAS	Side/Downward	60-120	UNK	UNK	UNK	UNK
OCS/ OMAO	All Atlantic regions, Gulf of Mexico, and Caribbean	Kongsberg	EA 60	SBES	Downward	12	CW	16	16	UNK
ONMS	Stellwagen Banks NMS	Simrad	ES60	SBES	UNK	12	UNK	UNK	UNK	UNK
OCS/ OMAO	All Atlantic regions, Gulf of Mexico, and Caribbean	Kongsberg	EA 60	SBES	Downward	38	CW	7	7	UNK

NOS Office	Region(s)	Manufacturer	Model	Type	Orientation	Frequencies (kHz)	Signal type (CW/FM/ Impulse)	Beamwidth (°)		Source Level (dB re 1uPa @ 1m)
								Alongtrack	Acrosstrack	
NCCOS	Southeast Continental Shelf/GOM, Northeast Caribbean	Edgetech	CHIRP	chirp subbottom profiler -	UNK	4-24	UNK	UNK	UNK	UNK
NCCOS	Southwest Continental Shelf	Simrad	EK60	SES	UNK	38	UNK	UNK	UNK	UNK
NCCOS	Southeast Continental Shelf/GOM, Northeast Caribbean	UNK	UNK	pinger is on the Glider	UNK	10	UNK	UNK	UNK	UNK
NCCOS	Southeast Continental Shelf/GOM, Northeast Caribbean	Helle pingers	UNK	pingers	UNK	25 – 27	UNK	UNK	UNK	UNK
ONMS	Stellwagen Banks NMS	Klein	3000	SSS	UNK	100	UNK	UNK	UNK	UNK
ONMS	Hawaii	Klein	3000	SSS	UNK	120	UNK	UNK	UNK	UNK
OCS/JHC	Northeast/ Southwest CS	Custom CBW	N/A	UNK	UNK	10-500	UNK	UNK	UNK	UNK

Appendix E. Animal Movement Modeling Results

Injury Exposures

Table E-1. Injurious exposures for each year broken down into two categories of active acoustic surveys for activities associated with proposed Alternative A summed over all simulated regions.

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Blue whale	0	0	0	0	0	0	0	0	0	0	0
Bowhead whale	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0
Common minke whale	0	0	0	0	0	0	0	0	0	0	0
Fin whale	0	0	0	0	0	0	0	0	0	0	0
Gray whale	0	0	0	0	0	0	0	0	0	0	0
Humpback whale	0	0	0	0	0	0	0	0	0	0	0
North Atlantic right whale	0	0	0	0	0	0	0	0	0	0	0
North Pacific right whale	0	0	0	0	0	0	0	0	0	0	0
Rice’s whale	0	0	0	0	0	0	0	0	0	0	0
Sei whale	0	0	0	0	0	0	0	0	0	0	0
Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Baird's beaked whale	0	0	0	0	0	0	0	0	0	0	0
Beluga whale	0	0	0	0	0	0	0	0	0	0	0
Gervais' beaked whale	0	0	0	0	0	0	0	0	0	0	0
Blainville's beaked whale	0	0	0	0	0	0	0	0	0	0	0
Mesoplodont beaked whales (all)	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	0	0	0	0	0	0	0	0	0	0	0
Common bottlenose dolphin	0	0	0	0	0	0	0	0	0	0	0
Cuvier's beaked whale	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0
Resident killer whale	0	0	0	0	0	0	0	0	0	0	0
Transient killer whale	0	0	0	0	0	0	0	0	0	0	0
Offshore killer whale	0	0	0	0	0	0	0	0	0	0	0
Long-beaked common dolphin	0	0	0	0	0	0	0	0	0	0	0

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Longman's (Indo-Pacific) beaked whale	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0
Northern right whale dolphin	0	0	0	0	0	0	0	0	0	0	0
Pacific white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0
Pantropical spotted dolphin	0	0	0	0	0	0	0	0	0	0	0
Pilot whale, long finned	0	0	0	0	0	0	0	0	0	0	0
Pilot whale, short finned	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	0	0	0
Short-beaked common dolphin	0	0	0	0	0	0	0	0	0	0	0
Sperm whale	0	0	0	0	0	0	0	0	0	0	0
Sowerby's beaked whale	0	0	0	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Striped dolphin	0	0	0	0	0	0	0	0	0	0	0
White-beaked dolphin	0	0	0	0	0	0	0	0	0	0	0
True's beaked whale	0	0	0	0	0	0	0	0	0	0	0
Dwarf sperm whale	0.44	0.23	0.53	0.26	0.44	0.23	0.53	0.14	0.53	0.14	3.47
Pygmy sperm whale	0.24	0.05	0.42	0.06	0.24	0.03	0.42	0.05	0.42	0.05	1.98
Dall's porpoise	0.54	0.58	0.54	0.55	0.54	0.55	0.54	0.55	0.54	0.55	5.48
Harbor porpoise	1.45	3.64	1.02	4.17	1.46	3.65	1.02	3.40	1.02	3.40	24.23
Bearded seal	0	0	0	0	0	0	0	0	0	0	0
Gray seal	0	0	0	0	0	0	0	0	0	0	0
Guadalupe fur seal	0	0	0	0	0	0	0	0	0	0	0
Hawaiian monk seal	0	0	0	0	0	0	0	0	0	0	0
Harbor seal	0	0	0	0	0	0	0	0	0	0	0
Harp seal	0	0	0	0	0	0	0	0	0	0	0
Hooded seal	0	0	0	0	0	0	0	0	0	0	0
Northern fur seal	0	0	0	0	0	0	0	0	0	0	0
Ribbon seal	0	0	0	0	0	0	0	0	0	0	0
Ringed seal	0	0	0	0	0	0	0	0	0	0	0
Spotted seal	0	0	0	0	0	0	0	0	0	0	0

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Manatee	0	0	0	0	0	0	0	0	0	0	0
Sea otter	0	0	0	0	0	0	0	0	0	0	0
Walrus	0	0	0	0	0	0	0	0	0	0	0
Northern elephant seal	0	0	0	0	0	0	0	0	0	0	0
Polar bear	0	0	0	0	0	0	0	0	0	0	0
California sea lion	0	0	0	0	0	0	0	0	0	0	0
Steller sea lion	0	0	0	0	0	0	0	0	0	0	0
Northern bottlenose whale	0	0	0	0	0	0	0	0	0	0	0

Table E-2. Injurious exposures for each year broken down into two categories of active acoustic surveys for activities associated with proposed Alternative B summed over all simulated regions.

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Blue whale	0	0	0	0	0	0	0	0	0	0	0
Bowhead whale	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0
Common minke whale	0	0	0	0	0	0	0	0	0	0	0
Fin whale	0	0	0	0	0	0	0	0	0	0	0
Gray whale	0	0	0	0	0	0	0	0	0	0	0

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Humpback whale	0	0	0	0	0	0	0	0	0	0	0
North Atlantic right whale	0	0	0	0	0	0	0	0	0	0	0
North Pacific right whale	0	0	0	0	0	0	0	0	0	0	0
Rice's whale	0	0	0	0	0	0	0	0	0	0	0
Sei whale	0	0	0	0	0	0	0	0	0	0	0
Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0
Baird's beaked whale	0	0	0	0	0	0	0	0	0	0	0
Beluga whale	0	0	0	0	0	0	0	0	0	0	0
Gervais' beaked whale	0	0	0	0	0	0	0	0	0	0	0
Blainville's beaked whale	0	0	0	0	0	0	0	0	0	0	0
Mesoplodont beaked whales (all)	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	0	0	0	0	0	0	0	0	0	0	0
Common bottlenose dolphin	0	0	0	0	0	0	0	0	0	0	0

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Cuvier's beaked whale	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0
Resident killer whale	0	0	0	0	0	0	0	0	0	0	0
Transient killer whale	0	0	0	0	0	0	0	0	0	0	0
Offshore killer whale	0	0	0	0	0	0	0	0	0	0	0
Long-beaked common dolphin	0	0	0	0	0	0	0	0	0	0	0
Longman's (Indo-Pacific) beaked whale	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0
Northern right whale dolphin	0	0	0	0	0	0	0	0	0	0	0
Pacific white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0
Pantropical spotted dolphin	0	0	0	0	0	0	0	0	0	0	0
Pilot whale, long finned	0	0	0	0	0	0	0	0	0	0	0

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Pilot whale, short finned	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	0	0	0
Short-beaked common dolphin	0	0	0	0	0	0	0	0	0	0	0
Sperm whale	0	0	0	0	0	0	0	0	0	0	0
Sowerby's beaked whale	0	0	0	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0
Striped dolphin	0	0	0	0	0	0	0	0	0	0	0
White-beaked dolphin	0	0	0	0	0	0	0	0	0	0	0
True's beaked whale	0	0	0	0	0	0	0	0	0	0	0
Dwarf sperm whale	0.55	0.29	0.67	0.32	0.55	0.29	0.67	0.17	0.67	0.17	4.35
Pygmy sperm whale	0.31	0.06	0.53	0.07	0.31	0.04	0.53	0.07	0.53	0.07	2.52
Dall's porpoise	0.67	0.72	0.67	0.69	0.67	0.69	0.66	0.65	0.67	0.69	6.78
Harbor porpoise	1.80	4.06	1.26	4.63	1.81	4.08	1.12	0.85	1.26	3.79	24.66
Bearded seal	0	0	0	0	0	0	0	0	0	0	0
Gray seal	0	0	0	0	0	0	0	0	0	0	0
Guadalupe fur seal	0	0	0	0	0	0	0	0	0	0	0

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Hawaiian monk seal	0	0	0	0	0	0	0	0	0	0	0
Harbor seal	0	0	0	0	0	0	0	0	0	0	0
Harp seal	0	0	0	0	0	0	0	0	0	0	0
Hooded seal	0	0	0	0	0	0	0	0	0	0	0
Northern fur seal	0	0	0	0	0	0	0	0	0	0	0
Ribbon seal	0	0	0	0	0	0	0	0	0	0	0
Ringed seal	0	0	0	0	0	0	0	0	0	0	0
Spotted seal	0	0	0	0	0	0	0	0	0	0	0
Manatee	0	0	0	0	0	0	0	0	0	0	0
Sea otter	0	0	0	0	0	0	0	0	0	0	0
Walrus	0	0	0	0	0	0	0	0	0	0	0
Northern elephant seal	0	0	0	0	0	0	0	0	0	0	0
Polar bear	0	0	0	0	0	0	0	0	0	0	0
California sea lion	0	0	0	0	0	0	0	0	0	0	0
Steller sea lion	0	0	0	0	0	0	0	0	0	0	0
Northern bottlenose whale	0	0	0	0	0	0	0	0	0	0	0

Table E-3. Injurious exposures for each year broken down into two categories of active acoustic surveys for activities associated with proposed Alternative C summed over all simulated regions.

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Blue whale	0	0	0	0	0	0	0	0	0	0	0
Bowhead whale	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0
Common minke whale	0	0	0	0	0	0	0	0	0	0	0
Fin whale	0	0	0	0	0	0	0	0	0	0	0
Gray whale	0	0	0	0	0	0	0	0	0	0	0
Humpback whale	0	0	0	0	0	0	0	0	0	0	0
North Atlantic right whale	0	0	0	0	0	0	0	0	0	0	0
North Pacific right whale	0	0	0	0	0	0	0	0	0	0	0
Rice’s whale	0	0	0	0	0	0	0	0	0	0	0
Sei whale	0	0	0	0	0	0	0	0	0	0	0
Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0
Baird's beaked whale	0	0	0	0	0	0	0	0	0	0	0
Beluga whale	0	0	0	0	0	0	0	0	0	0	0

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Gervais' beaked whale	0	0	0	0	0	0	0	0	0	0	0
Blainville's beaked whale	0	0	0	0	0	0	0	0	0	0	0
Mesoplodont beaked whales (all)	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	0	0	0	0	0	0	0	0	0	0	0
Common bottlenose dolphin	0	0	0	0	0	0	0	0	0	0	0
Cuvier's beaked whale	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0
Resident killer whale	0	0	0	0	0	0	0	0	0	0	0
Transient killer whale	0	0	0	0	0	0	0	0	0	0	0
Offshore killer whale	0	0	0	0	0	0	0	0	0	0	0
Long-beaked common dolphin	0	0	0	0	0	0	0	0	0	0	0
Longman's (Indo-Pacific) beaked whale	0	0	0	0	0	0	0	0	0	0	0

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0
Northern right whale dolphin	0	0	0	0	0	0	0	0	0	0	0
Pacific white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0
Pantropical spotted dolphin	0	0	0	0	0	0	0	0	0	0	0
Pilot whale, long finned	0	0	0	0	0	0	0	0	0	0	0
Pilot whale, short finned	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	0	0	0
Short-beaked common dolphin	0	0	0	0	0	0	0	0	0	0	0
Sperm whale	0	0	0	0	0	0	0	0	0	0	0
Sowerby's beaked whale	0	0	0	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0
Striped dolphin	0	0	0	0	0	0	0	0	0	0	0

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
White-beaked dolphin	0	0	0	0	0	0	0	0	0	0	0
True's beaked whale	0	0	0	0	0	0	0	0	0	0	0
Dwarf sperm whale	0.67	0.36	0.80	0.40	0.67	0.36	0.80	0.22	0.80	0.22	5.30
Pygmy sperm whale	0.37	0.06	0.63	0.08	0.37	0.05	0.63	0.07	0.63	0.07	2.96
Dall's porpoise	0.81	0.82	0.81	0.82	0.81	0.82	0.80	0.79	0.81	0.82	8.11
Harbor porpoise	2.14	1.32	1.49	5.09	2.15	4.49	1.50	1.04	1.49	4.14	24.85
Bearded seal	0	0	0	0	0	0	0	0	0	0	0
Gray seal	0	0	0	0	0	0	0	0	0	0	0
Guadalupe fur seal	0	0	0	0	0	0	0	0	0	0	0
Hawaiian monk seal	0	0	0	0	0	0	0	0	0	0	0
Harbor seal	0	0	0	0	0	0	0	0	0	0	0
Harp seal	0	0	0	0	0	0	0	0	0	0	0
Hooded seal	0	0	0	0	0	0	0	0	0	0	0
Northern fur seal	0	0	0	0	0	0	0	0	0	0	0
Ribbon seal	0	0	0	0	0	0	0	0	0	0	0
Ringed seal	0	0	0	0	0	0	0	0	0	0	0
Spotted seal	0	0	0	0	0	0	0	0	0	0	0
Manatee	0	0	0	0	0	0	0	0	0	0	0
Sea otter	0	0	0	0	0	0	0	0	0	0	0
Walrus	0	0	0	0	0	0	0	0	0	0	0

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Northern elephant seal	0	0	0	0	0	0	0	0	0	0	0
Polar bear	0	0	0	0	0	0	0	0	0	0	0
California sea lion	0	0	0	0	0	0	0	0	0	0	0
Steller sea lion	0	0	0	0	0	0	0	0	0	0	0
Northern bottlenose whale	0	0	0	0	0	0	0	0	0	0	0

Behavioral Disruption Exposures

Table E-4. Behavioral disruption exposures for each year broken down into two categories of active acoustic surveys for activities associated with proposed Alternative A summed over all simulated regions.

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Atlantic spotted dolphin	60.18	298.66	92.47	366.77	60.51	207.35	91.33	318.06	91.33	316.53	1903.19
Atlantic white-sided dolphin	21.69	444.97	12.09	485.45	21.69	428.30	12.01	442.16	12.01	442.16	2322.53
Baird's beaked whale	2.41	3.58	2.40	3.58	2.40	3.58	2.40	3.58	2.40	3.58	29.91
Bearded seal	0.00	319.01	0.00	438.48	0.00	472.75	0.00	110.40	0.00	110.40	1451.04
Beluga whale	0.00	13.27	0.00	18.24	0.00	215.36	0.00	4.59	0.00	4.59	256.05
Beluga whale, Cook Inlet	0.39	1.79	0.39	2.99	0.39	2.21	0.39	1.45	0.39	1.45	11.84
Blainville's beaked whale	1.72	7.40	1.72	9.38	1.72	7.40	1.43	5.88	1.43	5.88	43.96
Blue whale	4.87	7.78	4.83	7.77	4.84	7.78	4.83	7.76	4.83	7.76	63.05
Bowhead whale	0.00	3.50	0.00	0.23	0.00	55.08	0.00	0.04	0.00	0.04	58.89
Bryde's whale	0.38	0.77	0.21	0.45	0.39	0.78	0.21	0.45	0.21	0.45	4.30
California sea lion	3447.91	3606.11	3447.91	2414.72	3447.91	2102.11	3447.91	2102.11	3447.91	2102.11	29566.71
Clymene dolphin	2.84	25.41	5.07	24.48	2.84	11.35	5.07	18.12	5.07	18.12	118.37
Common bottlenose dolphin	59.26	371.72	97.30	324.95	60.35	252.98	97.30	240.67	97.30	238.75	1840.58
Common minke whale	17.21	51.21	17.48	58.49	17.41	52.92	17.48	47.19	17.48	47.17	344.04
Cuvier's beaked whale	4.90	13.07	4.79	13.28	4.87	13.07	4.43	8.90	4.43	8.90	80.64

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Dall's porpoise	7.90	15.77	7.88	14.98	7.88	14.99	7.88	14.97	7.88	14.97	115.10
Dwarf sperm whale	2.78	9.22	2.96	11.24	2.78	9.22	2.57	6.56	2.57	6.56	56.46
False killer whale	34.02	67.59	19.45	42.55	34.03	63.52	19.45	40.71	19.45	40.71	381.48
Fin whale	14.05	55.22	13.84	65.00	14.03	54.73	13.83	50.85	13.83	50.85	346.23
Fraser's dolphin	227.24	593.33	123.62	257.89	227.24	593.33	123.62	257.85	123.62	257.85	2785.59
Gervais' beaked whale	1.63	7.15	1.67	9.27	1.63	7.15	1.38	5.77	1.38	5.77	42.80
Gray whale	172.55	276.28	172.12	269.29	172.12	269.24	172.12	268.42	172.12	268.42	2212.68
Gray seal	13.86	112.83	3.15	126.58	13.86	105.53	3.15	88.62	3.15	88.62	559.35
Guadalupe fur seal	19.49	26.58	19.44	25.90	19.44	25.85	19.44	25.83	19.44	25.83	227.24
Harbor porpoise	14.93	179.86	11.83	200.10	15.02	176.51	11.83	172.83	11.83	172.83	967.57
Harbor seal	684.49	1285.22	678.54	1462.03	685.22	1243.74	678.54	971.14	678.54	971.14	9338.60
Harp seal	17.16	139.39	3.90	156.37	17.16	130.36	3.90	109.46	3.90	109.46	691.06
Hawaiian monk seal	63.01	77.05	34.15	55.20	63.01	77.05	34.15	55.20	34.15	55.20	548.17
Hooded seal	6.45	63.28	1.35	76.36	6.45	58.77	1.35	52.92	1.35	52.92	321.20
Humpback whale	1.17	17.62	1.22	20.68	1.17	16.88	1.22	17.83	1.22	17.83	96.84
Humpback whale, CA	15.78	26.27	15.74	25.45	15.74	25.17	15.74	25.38	15.74	25.38	206.39
Humpback whale, CNP	2.91	6.78	2.04	7.12	2.91	8.00	2.04	3.50	2.04	3.50	40.84
Humpback whale, WNP	0.32	0.74	0.22	0.78	0.32	0.88	0.22	0.38	0.22	0.38	4.46
Long-beaked common dolphin	1090.42	2166.85	1093.12	2077.98	1093.12	2047.94	1093.12	2070.34	1093.12	2070.34	15896.35

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Longman's (Indo-Pacific) beaked whale	0.18	0.51	0.10	0.22	0.18	0.51	0.10	0.22	0.10	0.22	2.34
Manatee	5.41	38.15	11.31	32.68	12.97	38.15	11.31	32.68	11.31	32.68	226.65
Melon-headed whale	4.19	8.19	2.96	6.14	4.19	8.19	2.88	5.22	2.88	5.22	50.06
Mesoplodont beaked whales (all)	7.02	15.15	7.03	17.27	6.99	15.15	6.74	13.77	6.74	13.77	109.63
North Atlantic right whale	0.32	2.76	0.18	3.66	0.32	2.51	0.18	2.16	0.18	2.16	14.43
North Pacific right whale	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.03
Northern elephant seal	453.95	709.43	454.70	769.43	454.70	685.12	454.70	613.00	454.70	613.00	5662.73
Northern fur seal	425.01	4175.57	425.01	5915.73	425.01	5384.32	425.01	1687.83	425.01	1687.83	20976.33
Northern bottlenose whale	0.03	0.08	0.03	0.08	0.03	0.08	0.02	0.06	0.02	0.06	0.49
Northern right whale dolphin	191.64	350.60	192.99	313.75	192.99	301.27	192.99	310.62	192.99	310.62	2550.46
Offshore killer whale	1.58	2.63	1.58	2.56	1.58	2.56	1.58	2.55	1.58	2.55	20.75
Pacific white-sided dolphin	408.17	875.96	409.07	878.16	409.07	834.15	409.07	809.21	409.07	809.21	6251.14
Pantropical spotted dolphin	300.12	687.50	179.03	365.43	300.12	687.50	179.03	363.62	179.03	363.62	3605.00
Pilot whale, long finned	12.26	49.55	12.48	61.02	12.65	48.20	11.94	43.98	11.94	43.83	307.85

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Pilot whale, short finned	12.26	38.19	11.46	43.35	12.54	36.62	11.08	32.45	11.08	32.35	241.38
Polar bear	0.00	8.31	0.00	12.86	0.00	26.52	0.00	3.24	0.00	3.24	54.17
Pygmy killer whale	75.34	181.52	41.21	107.71	75.34	179.65	41.21	106.91	41.21	106.91	957.01
Pygmy sperm whale	960.70	1724.12	521.38	1013.85	960.70	1722.05	521.38	1013.09	521.38	1013.08	9971.73
Resident killer whale	2.33	5.14	2.30	5.93	2.33	5.69	2.30	4.24	2.30	4.24	36.80
Ribbon seal	13.77	182.34	13.77	272.54	13.77	680.72	13.77	84.03	13.77	84.03	1372.51
Rice's whale	0.02	0.13	0.03	0.13	0.02	0.06	0.03	0.10	0.03	0.10	0.65
Ringed seal	0.00	142.93	0.00	196.46	0.00	664.74	0.00	49.46	0.00	49.46	1103.05
Risso's dolphin	52.17	126.55	43.03	145.52	52.15	112.94	42.61	101.72	42.61	101.52	820.82
Rough-toothed dolphin	852.26	1840.80	464.93	1089.53	852.66	1833.37	464.93	1086.93	464.93	1086.85	10037.19
Sea otter, CA	40.88	78.31	41.61	76.50	41.61	80.57	41.61	76.50	41.61	76.50	595.70
Sea otter, SC	11.98	45.71	11.98	82.96	11.98	58.74	11.98	35.05	11.98	35.05	317.41
Sea otter, SE	60.03	53.27	60.03	19.83	60.03	19.83	60.03	19.83	60.03	19.83	432.74
Sea otter, WA	13.32	27.25	13.32	25.07	13.32	21.72	13.32	25.77	13.32	25.77	192.18
Sei whale	2.47	5.98	2.35	5.96	2.47	5.82	2.34	5.69	2.34	5.69	41.11
Short-beaked common dolphin	1821.13	3576.51	1798.95	3643.68	1825.43	3414.96	1798.95	3349.00	1798.95	3348.96	26376.52
Sowerby's beaked whale	1.63	6.87	1.67	7.03	1.63	6.87	1.38	3.58	1.38	3.58	35.62
Sperm whale	4.11	7.83	4.11	9.66	4.09	7.83	4.03	8.49	4.03	8.49	62.67
Spinner dolphin	7.20	9.17	6.53	16.27	7.20	9.17	6.53	15.95	6.53	15.95	100.50

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Spotted seal	0.00	1538.41	0.00	2380.14	0.00	4907.14	0.00	600.16	0.00	600.16	10026.01
Steller sea lion	185.99	322.31	185.99	340.30	185.99	323.63	185.99	277.93	185.99	277.93	2472.05
Striped dolphin	969.38	1833.02	658.59	1058.93	969.38	1832.78	658.59	1058.71	658.59	1058.71	10756.68
Transient killer whale	1.84	3.07	1.84	2.90	1.84	2.61	1.84	2.71	1.84	2.71	23.20
True's beaked whale	1.63	6.87	1.67	7.03	1.63	6.87	1.38	3.58	1.38	3.58	35.62
Walrus	0.00	76.86	0.00	105.65	0.00	357.48	0.00	26.60	0.00	26.60	593.19
White-beaked dolphin	0.05	0.50	0.04	0.63	0.05	0.46	0.04	0.44	0.04	0.44	2.69

Table E-5. Behavioral disruption exposures for each year broken down into two categories of active acoustic surveys for activities associated with proposed Alternative B summed over all simulated regions.

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Atlantic spotted dolphin	75.24	348.24	115.54	443.75	75.59	247.78	113.76	368.16	114.11	386.42	2288.59
Atlantic white-sided dolphin	26.92	495.51	14.92	537.27	26.92	477.17	14.83	91.45	14.83	489.50	2189.32
Baird's beaked whale	3.00	4.39	2.98	4.39	2.98	4.39	2.85	3.75	2.98	4.39	36.10
Bearded seal	0.00	350.91	0.00	482.33	0.00	520.02	0.00	121.44	0.00	121.44	1596.14
Beluga whale	0.00	14.60	0.00	20.06	0.00	236.90	0.00	5.05	0.00	5.05	281.66
Beluga whale, Cook Inlet	0.48	2.12	0.48	3.44	0.48	2.58	0.48	1.74	0.48	1.74	14.02
Blainville's beaked whale	2.16	9.26	2.15	11.70	2.16	9.26	1.79	7.34	1.79	7.34	54.95

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Blue whale	6.05	9.53	6.01	9.51	6.02	9.53	5.74	8.11	6.01	9.50	76.01
Bowhead whale	0.00	3.85	0.00	0.25	0.00	60.59	0.00	0.05	0.00	0.05	64.79
Bryde's whale	0.47	0.96	0.27	0.56	0.48	0.96	0.27	0.55	0.27	0.56	5.35
California sea lion	4309.88	4282.04	4309.88	2971.51	4309.88	2627.64	4309.88	2627.64	4309.88	2627.64	36685.87
Clymene dolphin	3.55	28.92	6.34	29.27	3.55	13.46	6.34	22.07	6.34	22.28	142.12
Common bottlenose dolphin	73.71	422.91	121.10	375.43	74.91	292.26	117.20	217.65	121.10	280.60	2096.87
Common minke whale	21.31	58.92	21.62	67.00	21.53	60.82	19.87	30.43	21.62	54.55	377.67
Cuvier's beaked whale	6.13	16.34	5.99	16.59	6.09	16.34	5.53	11.11	5.53	11.11	100.76
Dall's porpoise	9.85	19.45	9.83	18.58	9.83	18.59	9.65	17.60	9.83	18.57	141.78
Dwarf sperm whale	3.46	11.52	3.69	14.04	3.46	11.52	3.20	8.19	3.20	8.19	70.47
False killer whale	42.53	83.66	24.30	52.77	42.55	79.18	24.29	50.53	24.30	50.76	474.87
Fin whale	17.44	63.29	17.19	74.05	17.42	62.76	16.37	29.88	17.18	58.45	374.03
Fraser's dolphin	284.06	741.66	154.52	322.36	284.06	741.66	154.52	322.31	154.52	322.31	3481.98
Gervais' beaked whale	2.05	8.94	2.09	11.56	2.05	8.94	1.73	7.20	1.73	7.20	53.49
Gray whale	213.81	331.37	213.34	323.67	213.34	323.62	199.99	236.26	213.34	322.72	2591.46
Gray seal	17.29	127.18	3.90	139.88	17.29	119.15	3.90	11.05	3.90	98.11	541.65
Guadalupe fur seal	24.14	31.88	24.09	31.13	24.09	31.08	22.58	22.73	24.09	31.05	266.86
Harbor porpoise	18.41	199.76	14.52	221.39	18.51	196.07	12.70	30.77	14.52	191.40	918.05
Harbor seal	851.30	1509.34	843.75	1702.33	852.10	1463.70	811.56	952.19	843.75	1162.35	10992.37
Harp seal	21.39	157.11	4.82	172.79	21.39	147.18	4.82	13.65	4.82	121.20	669.17

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Hawaiian monk seal	78.77	96.32	42.69	69.00	78.77	96.32	42.69	69.00	42.69	69.00	685.25
Hooded seal	8.06	70.64	1.68	84.23	8.06	65.67	1.68	4.65	1.68	58.42	304.77
Humpback whale	1.47	19.67	1.52	23.04	1.47	18.84	1.51	5.60	1.51	19.90	94.53
Humpback whale, CA	19.55	31.47	19.51	30.56	19.51	30.26	18.29	22.62	19.51	30.49	241.77
Humpback whale, CNP	3.64	7.97	2.55	8.17	3.64	9.31	2.55	4.19	2.55	4.19	48.76
Humpback whale, WNP	0.40	0.87	0.28	0.90	0.40	1.02	0.28	0.46	0.28	0.46	5.35
Long-beaked common dolphin	1347.27	2560.34	1350.23	2462.58	1350.23	2429.54	1231.72	1601.68	1350.23	2454.18	18138.00
Longman's (Indo-Pacific) beaked whale	0.23	0.64	0.12	0.27	0.23	0.64	0.12	0.27	0.12	0.27	2.91
Manatee	6.77	46.47	13.01	39.64	15.08	46.47	4.69	30.78	13.01	39.64	255.56
Melon-headed whale	5.24	10.25	3.71	7.68	5.24	10.25	3.61	6.53	3.61	6.53	62.65
Mesoplodont beaked whales (all)	8.74	18.74	8.75	21.36	8.71	18.74	8.10	15.56	8.39	17.00	134.09
North Atlantic right whale	0.39	3.10	0.22	4.06	0.39	2.82	0.22	0.53	0.22	2.42	14.37
North Pacific right whale	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.03
Northern elephant seal	563.08	838.44	563.90	904.43	563.90	811.69	531.07	562.72	563.90	732.36	6635.49
Northern fur seal	531.27	4660.75	531.27	6574.94	531.27	5990.38	531.27	1924.25	531.27	1924.25	23730.92
Northern bottlenose whale	0.03	0.10	0.03	0.11	0.03	0.10	0.03	0.09	0.03	0.09	0.64

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Northern right whale dolphin	235.92	396.91	237.40	356.38	237.40	342.65	209.30	147.31	237.40	352.93	2753.60
Offshore killer whale	1.96	3.15	1.95	3.08	1.95	3.07	1.83	2.25	1.95	3.07	24.26
Pacific white-sided dolphin	504.96	1035.12	505.94	1037.52	505.94	989.11	466.41	663.89	505.94	961.68	7176.51
Pantropical spotted dolphin	375.14	859.37	223.79	456.52	375.14	859.37	223.79	454.54	223.79	454.54	4505.99
Pilot whale, long finned	15.34	58.99	15.53	72.26	15.77	57.52	14.43	43.64	14.86	52.45	360.79
Pilot whale, short finned	15.32	45.70	14.28	51.52	15.62	43.95	13.42	32.74	13.81	38.86	285.22
Polar bear	0.00	9.14	0.00	14.15	0.00	29.17	0.00	3.57	0.00	3.57	59.60
Pygmy killer whale	94.18	226.53	51.51	134.47	94.18	224.48	51.51	133.58	51.51	133.58	1195.53
Pygmy sperm whale	1200.87	2154.70	651.73	1267.12	1200.87	2152.42	651.73	1266.18	651.73	1266.25	12463.60
Resident killer whale	2.92	6.14	2.88	6.99	2.92	6.74	2.85	4.94	2.88	5.14	44.40
Ribbon seal	17.22	204.00	17.22	303.22	17.22	752.21	17.22	95.86	17.22	95.86	1537.25
Rice's whale	0.03	0.14	0.04	0.16	0.03	0.07	0.04	0.13	0.04	0.13	0.81
Ringed seal	0.00	157.22	0.00	216.10	0.00	731.22	0.00	54.41	0.00	54.41	1213.36
Risso's dolphin	64.99	151.37	53.56	170.95	64.96	136.38	51.44	102.82	53.03	121.89	971.39
Rough-toothed dolphin	1065.32	2299.08	581.10	1360.87	1065.76	2290.87	580.66	1356.44	581.10	1357.93	12539.13
Sea otter, CA	49.11	87.36	49.92	85.37	49.92	89.85	34.57	10.17	49.92	85.37	591.56
Sea otter, SC	14.98	53.42	14.98	94.40	14.98	67.77	14.98	41.70	14.98	41.70	373.89
Sea otter, SE	75.04	61.18	75.04	24.40	75.04	24.40	75.04	24.40	75.04	24.40	533.98

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Sea otter, WA	16.65	30.55	16.65	28.15	16.65	24.46	16.65	17.06	16.65	28.93	212.40
Sei whale	3.07	7.01	2.91	6.98	3.08	6.86	2.73	3.79	2.90	6.67	46.00
Short-beaked common dolphin	2251.32	4224.88	2222.95	4290.14	2256.05	4047.15	2034.47	2565.01	2222.95	3965.93	30080.85
Sowerby's beaked whale	2.05	8.59	2.09	8.77	2.05	8.59	1.73	4.46	1.73	4.46	44.52
Sperm whale	5.09	9.70	5.12	11.96	5.08	9.69	4.89	9.74	5.02	10.50	76.79
Spinner dolphin	9.01	11.47	8.16	20.29	9.01	11.47	8.16	19.93	8.16	19.93	125.59
Spotted seal	0.00	1692.25	0.00	2618.16	0.00	5397.85	0.00	660.18	0.00	660.18	11028.62
Steller sea lion	232.47	380.73	232.47	400.53	232.47	382.18	232.47	287.68	232.47	331.92	2945.39
Striped dolphin	1208.28	2274.27	819.80	1306.66	1208.28	2274.00	794.49	1181.92	819.80	1306.41	13193.91
Transient killer whale	2.30	3.69	2.30	3.52	2.30	3.18	2.30	3.07	2.30	3.32	28.28
True's beaked whale	2.05	8.59	2.09	8.77	2.05	8.59	1.73	4.46	1.73	4.46	44.52
Walrus	0.00	84.55	0.00	116.22	0.00	393.23	0.00	29.26	0.00	29.26	652.52
White-beaked dolphin	0.06	0.55	0.06	0.70	0.06	0.52	0.06	0.18	0.06	0.50	2.75

Table E-6. Behavioral disruption exposures for each year broken down into two categories of active acoustic surveys for activities associated with proposed Alternative C summed over all simulated regions.

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Atlantic spotted dolphin	90.28	376.48	138.61	520.71	90.67	288.26	136.79	437.50	136.89	456.32	2672.51

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Atlantic white-sided dolphin	32.18	106.55	17.77	589.09	32.18	526.04	20.29	112.08	17.67	536.86	1990.71
Baird's beaked whale	3.58	4.70	3.56	5.20	3.56	5.20	3.45	4.55	3.56	5.20	42.56
Bearded seal	0.00	382.81	0.00	526.18	0.00	567.30	0.00	132.48	0.00	132.48	1741.25
Beluga whale	0.00	15.92	0.00	21.89	0.00	258.44	0.00	5.51	0.00	5.51	307.27
Beluga whale, Cook Inlet	0.58	2.45	0.58	3.88	0.58	2.95	0.58	2.03	0.58	2.03	16.24
Blainville's beaked whale	2.58	11.12	2.57	14.04	2.58	11.12	2.14	8.81	2.14	8.81	65.91
Blue whale	7.22	10.22	7.18	11.26	7.19	11.28	6.95	9.86	7.18	11.25	89.59
Bowhead whale	0.00	4.20	0.00	0.27	0.00	66.10	0.00	0.05	0.00	0.05	70.67
Bryde's whale	0.58	1.14	0.33	0.66	0.59	1.14	0.32	0.66	0.32	0.66	6.40
California sea lion	5171.86	4957.97	5171.86	3528.30	5171.86	3153.17	5171.86	3153.17	5171.86	3153.17	43805.08
Clymene dolphin	4.26	32.12	7.62	34.07	4.26	15.58	7.62	26.23	7.62	26.44	165.82
Common bottlenose dolphin	88.15	406.57	144.90	425.89	89.46	331.58	141.82	257.45	144.90	322.45	2353.17
Common minke whale	25.39	41.95	25.75	75.51	25.63	68.72	24.11	36.63	25.75	61.93	411.37
Cuvier's beaked whale	7.34	19.66	7.18	19.91	7.30	19.60	6.69	13.34	6.63	13.34	120.99
Dall's porpoise	11.80	22.41	11.78	22.20	11.78	22.21	11.63	21.22	11.78	22.19	169.00
Dwarf sperm whale	4.15	13.81	4.43	16.84	4.15	13.81	3.85	9.83	3.85	9.83	84.55
False killer whale	51.03	99.42	29.14	62.99	51.04	94.84	29.37	60.96	29.14	60.79	568.72
Fin whale	20.84	40.97	20.53	83.08	20.82	70.85	19.96	35.85	20.52	66.08	399.50

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Fraser's dolphin	340.86	889.99	185.44	386.83	340.86	889.99	185.44	386.78	185.44	386.78	4178.41
Gervais' beaked whale	2.45	10.74	2.50	13.88	2.45	10.74	2.07	8.65	2.07	8.65	64.20
Gray whale	255.07	310.98	254.55	378.06	254.55	378.00	242.30	288.49	254.55	377.02	2993.57
Gray seal	20.70	45.40	4.64	153.18	20.70	132.77	5.37	14.70	4.64	107.62	509.72
Guadalupe fur seal	28.80	29.91	28.74	36.37	28.74	36.30	27.36	27.75	28.74	36.27	308.98
Harbor porpoise	21.91	44.75	17.24	242.67	22.02	215.62	16.43	38.82	17.24	209.95	846.65
Harbor seal	1018.09	1544.14	1008.97	1942.64	1018.97	1683.64	976.82	1132.50	1008.97	1353.56	12688.30
Harp seal	25.62	56.08	5.74	189.22	25.62	164.01	6.63	18.16	5.74	132.94	629.76
Hawaiian monk seal	94.52	115.58	51.23	82.80	94.52	115.58	51.91	83.76	51.23	82.80	823.93
Hooded seal	9.67	18.62	2.02	92.08	9.67	72.58	2.48	6.55	2.02	63.94	279.63
Humpback whale	1.75	5.92	1.81	25.40	1.75	20.81	1.92	6.74	1.80	21.99	89.89
Humpback whale, CA	23.32	29.80	23.28	35.68	23.28	35.35	22.16	27.54	23.28	35.60	279.29
Humpback whale, CNP	4.37	9.16	3.05	9.23	4.37	10.62	3.06	4.90	3.05	4.88	56.69
Humpback whale, WNP	0.48	1.00	0.33	1.01	0.48	1.16	0.34	0.54	0.33	0.54	6.21
Long-beaked common dolphin	1604.12	2197.58	1607.35	2847.18	1607.35	2811.14	1488.82	1965.12	1607.35	2838.02	20574.03
Longman's (Indo-Pacific) beaked whale	0.27	0.76	0.15	0.33	0.27	0.76	0.15	0.33	0.15	0.33	3.50
Manatee	8.12	45.14	14.70	46.60	17.19	54.80	6.31	37.66	14.70	46.60	291.82
Melon-headed whale	6.28	12.30	4.44	9.21	6.28	12.30	4.33	7.83	4.33	7.83	75.13

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Mesoplodont beaked whales (all)	10.45	21.24	10.46	25.48	10.41	22.34	9.78	18.81	10.03	20.25	159.25
North Atlantic right whale	0.47	1.34	0.27	4.46	0.47	3.13	0.28	0.65	0.27	2.66	14.00
North Pacific right whale	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.03
Northern elephant seal	672.20	816.95	673.09	1039.44	673.09	938.27	640.27	678.02	673.09	851.72	7656.14
Northern fur seal	637.51	5145.94	637.51	7234.14	637.51	6596.44	637.51	2160.66	637.51	2160.66	26485.39
Northern bottlenose whale	0.03	0.13	0.03	0.13	0.03	0.13	0.03	0.10	0.03	0.10	0.74
Northern right whale dolphin	280.20	247.88	281.82	399.01	281.82	384.03	254.16	181.81	281.82	395.24	2987.79
Offshore killer whale	2.34	2.96	2.33	3.59	2.33	3.59	2.22	2.74	2.33	3.59	28.02
Pacific white-sided dolphin	601.75	930.09	602.83	1196.88	602.83	1144.08	563.29	809.23	602.83	1114.15	8167.96
Pantropical spotted dolphin	450.17	1031.24	268.55	547.61	450.17	1031.24	268.55	545.44	268.55	545.44	5406.96
Pilot whale, long finned	18.39	58.72	18.59	83.50	18.86	66.85	17.55	52.03	17.78	61.08	413.35
Pilot whale, short finned	18.37	46.53	17.08	59.72	18.69	51.26	16.30	39.12	16.52	45.41	329.00
Polar bear	0.00	9.98	0.00	15.43	0.00	31.82	0.00	3.89	0.00	3.89	65.01
Pygmy killer whale	113.02	271.53	61.81	161.23	113.02	269.30	62.35	161.49	61.81	160.27	1435.83
Pygmy sperm whale	1441.04	2585.17	782.09	1520.37	1441.04	2582.81	788.98	1531.05	782.09	1519.43	14974.07

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Resident killer whale	3.48	6.95	3.44	8.04	3.48	7.78	3.41	5.81	3.44	6.01	51.84
Ribbon seal	20.66	225.66	20.66	333.90	20.66	823.70	20.66	107.68	20.66	107.68	1701.92
Rice's whale	0.04	0.16	0.05	0.19	0.04	0.08	0.05	0.15	0.05	0.15	0.96
Ringed seal	0.00	171.51	0.00	235.75	0.00	797.69	0.00	59.36	0.00	59.36	1323.67
Risso's dolphin	77.79	157.34	64.12	196.40	77.77	159.86	62.18	122.63	63.49	142.26	1123.84
Rough-toothed dolphin	1278.39	2755.61	697.28	1632.24	1278.87	2748.41	702.97	1639.92	697.28	1629.02	15059.99
Sea otter, CA	57.35	31.60	58.23	94.24	58.23	99.12	42.72	15.53	58.23	94.24	609.49
Sea otter, SC	17.97	61.14	17.97	105.84	17.97	76.79	17.97	48.36	17.97	48.36	430.34
Sea otter, SE	90.05	69.09	90.05	28.97	90.05	28.97	90.05	28.97	90.05	28.97	635.22
Sea otter, WA	19.98	19.47	19.98	31.23	19.98	27.21	20.16	20.07	19.98	32.08	230.14
Sei whale	3.67	5.09	3.47	7.98	3.68	7.89	3.32	4.60	3.45	7.61	50.76
Short-beaked common dolphin	2681.51	3610.07	2646.96	4936.58	2686.68	4679.33	2459.49	3146.27	2646.96	4582.89	34076.74
Sowerby's beaked whale	2.45	10.31	2.50	10.54	2.45	10.31	2.07	5.36	2.07	5.36	53.42
Sperm whale	6.12	10.98	6.13	14.27	6.10	11.55	5.90	11.76	6.01	12.52	91.34
Spinner dolphin	10.82	13.76	9.81	24.31	10.82	13.76	9.81	23.91	9.81	23.91	150.72
Spotted seal	0.00	1846.09	0.00	2856.17	0.00	5888.56	0.00	720.19	0.00	720.19	12031.20
Steller sea lion	278.97	385.53	278.97	460.75	278.97	440.73	279.65	346.49	278.97	385.91	3414.94
Striped dolphin	1447.18	2615.80	980.99	1554.37	1447.18	2715.22	955.31	1429.04	980.99	1554.11	15680.19
Transient killer whale	2.76	4.02	2.77	4.14	2.76	3.77	2.77	3.71	2.77	3.93	33.40
True's beaked whale	2.45	10.31	2.50	10.54	2.45	10.31	2.07	5.36	2.07	5.36	53.42

Species	Year2 <30kHz	Year2 <200kHz	Year3 <30kHz	Year3 <200kHz	Year4 <30kHz	Year4 <200kHz	Year5 <30kHz	Year5 <200kHz	Year6 <30kHz	Year6 <200kHz	Total Exposures
Walrus	0.00	92.24	0.00	126.78	0.00	428.98	0.00	31.92	0.00	31.92	711.84
White-beaked dolphin	0.07	0.27	0.07	0.79	0.07	0.58	0.07	0.22	0.07	0.57	2.78