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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XE435

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Site Characterization Surveys off the Coast of Massachusetts

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

ACTION: Notice; issuance of an incidental harassment authorization.

SUMMARY: In accordance with regulations implementing the Marine Mammal Protection Act (MMPA), notification is hereby given that NMFS has issued an Incidental Harassment Authorization (IHA) to Bay State Wind LLC (Bay State Wind) to take marine mammals, by harassment, incidental to high-resolution geophysical (HRG) and geotechnical survey investigations associated with marine site characterization activities off the coast of Massachusetts in the area of the Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf (OCS-A 0500) (the Lease Area).

DATES: Effective August 13, 2016, through August 12, 2017.

FOR FURTHER INFORMATION CONTACT: John Fiorentino, Office of Protected Resources, NMFS, (301) 427-8401.

SUPPLEMENTARY INFORMATION:

Availability

An electronic copy of Bay State Wind's IHA application (the application) and supporting documents, as well as a list of the references cited in this document, may be obtained by visiting the internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental/*. In case of problems accessing these documents, please call the contact listed above (see **FOR FURTHER INFORMATION CONTACT**).

Background

Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq*.) direct the Secretary of Commerce 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 authorization is provided to the public for review.

An authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s), will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant), and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth. NMFS has defined "negligible impact" in 50 CFR 216.103 as "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival."

Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has

the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) 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 (Level B harassment).

Summary of Request

On December 4, 2015, NMFS received an application from Bay State Wind for the taking of marine mammals incidental to spring 2016 geophysical survey investigations off the coast of Massachusetts in the OCS-A 0500 Lease Area, designated and offered by the U.S. Bureau of Ocean Energy Management (BOEM), to support the development of an offshore wind project. NMFS determined that the application was adequate and complete on January 27, 2016. On January 20, 2016, Bay State Wind submitted a separate request for the taking of marine mammals incidental to proposed geotechnical survey activities within the Lease Area scheduled for fall 2016. On February 26, 2016, Bay State Wind submitted a revision to the take request for the geotechnical activities and an addendum requesting that the two IHA requests be processed as a single application and IHA. NMFS determined that the combined application was adequate and complete on February 26, 2016. NMFS published a notice making preliminary determinations and proposing to issue an IHA on April 5, 2016 (81 FR 19557). The notice initiated a 30-day comment period.

The proposed geophysical survey activities would occur for four weeks beginning in August 2016, and geotechnical survey activities would take place in September 2016 and last for approximately 6 days. The following specific aspects of the proposed activities are likely to result in the take of marine mammals: shallow and medium-

penetration sub-bottom profiler (chirper and sparker) and equipment positioning system (also referred to as acoustic positioning system, or pinger) use during the HRG survey, and dynamically positioned (DP) vessel thruster use in support of geotechnical survey activities. Take, by Level B Harassment only, of individuals of nine species of marine mammals is anticipated to result from the specified activities.

Description of the Specified Activity

Overview

Bay State Wind's proposed activities discussed here are based on its February 26, 2016, final IHA application. Bay State Wind proposes to conduct a geophysical and geotechnical survey in the Lease Area to support the characterization of the existing seabed and subsurface geological conditions in the Lease Area. This information is necessary to support the siting and design of up to two floating light and detection ranging buoys (FLIDARs) and up to two metocean monitoring buoys, as well as to obtain a baseline assessment of seabed/sub-surface soil conditions in the Bay State Wind Massachusetts Lease Area to support the siting of the proposed wind farm.

Dates and Duration

HRG surveys are anticipated to commence in August 2016 and will last for approximately 30 days. Geotechnical surveys requiring the use of the DP drill ship will take place in September 2016, at the earliest, and will last for approximately 6 days.

Specified Geographic Region

Bay State Wind's survey activities will occur in the approximately 187,532-acre Lease Area designated and offered by BOEM, located approximately 14 miles (mi) south of Martha's Vineyard, Massachusetts, at its closest point (see Figure 1-1 of the

application). The Lease Area falls within the Massachusetts Wind Energy Area (MA WEA; Figure 1-1 of the application). An evaluation of site assessment activities within the MA WEA was fully assessed in the BOEM Environmental Assessment (EA) and associated Finding of No Significant Impact (BOEM 2014). A Biological Opinion on site assessment activities within the MA WEA was issued by NMFS' Greater Atlantic Regional Fisheries Office (formerly Northeast Regional Office) to BOEM in April 2013.

Detailed Description of Activities

The **Federal Register** notice for the proposed IHA (81 FR 19557; April 5, 2016; pages 19558-19560) contains a full detailed description of the geotechnical and geophysical survey activities, including the sources proposed to be used and vessel details. That information has not changed and is therefore not repeated here.

Comments and Responses

A notice of NMFS' proposal to issue an IHA to Bay State Wind was published in the **Federal Register** on April 5, 2016 (81 FR 19557). That notice described, in detail, Bay State Wind's proposed activities, the marine mammal species that may be affected by the proposed activities, and the anticipated effects on marine mammals and their habitat. During the 30-day public comment period, NMFS only received comments from the Marine Mammal Commission (Commission). Specific comments and responses are provided below. Comments are also posted at *http://www.nmfs.noaa.gov/pr/permits/incidental/*.

Comment 1: The Commission recommended a 24-hour "reset" for enumerating takes by applying standard rounding rules *before* summing the numbers of estimated

takes across days. The Commission has made similar rounding recommendations for other recent proposed incidental harassment authorizations.

Response: NMFS generally does not round take calculations to derive a daily take estimate prior to summing values across total project days. Rather, we apply standard rounding rules at the end of our calculations, which we feel results in a more accurate estimation of takes over the duration of the project and authorization. NMFS appreciates the Commission's recommendation and concurs that a consistent approach to estimating potential takes, where appropriate, is important. We will consider the Commission's recommended methodology on an action-specific basis.

Comment 2: The Commission recommended that NMFS revise its take estimates for harbor and gray seals by removing the 80 percent reduction factor that was used to calculate takes in Bay State Wind's application and in the proposed IHA (81 FR 19557; "Estimated Take by Incidental Harassment," pages 19573-19575).

Response: NMFS agrees with the Commission's recommendation to no longer use a reduction factor to estimate harbor and gray seal densities in the project area. In the proposed IHA, NMFS had applied an 80 percent reduction factor for harbor and gray seal densities based on the presumption that original density estimates for the project area were an overestimation because they included breeding populations of Cape Cod (Schroeder 2000; Ronald and Gots 2003). NMFS has since determined that the findings used to inform that reduction factor are outdated and do not accurately reflect the average annual rate of population increase (especially for gray seal) (refer to Waring *et al*., 2015 for information on population size and current population trend), and this reduction factor is no longer appropriate for calculating takes for harbor and gray seals. NMFS has

revised the take estimates accordingly for harbor and gray seals in this final IHA, using the densities reported in the Northeast Navy Operations Area (OPAREA) Density Estimates (see Table 3). Despite the resulting increase in take numbers for harbor and gray seals, estimated takes continue to represent extremely small numbers (less than 1 percent) relative to the affected species or stock sizes. NMFS will continue to advise future applicants to use up to date density estimates that reflect best available information for harbor and gray seals (and other marine mammals) as these data become available.

Comment 3: The Commission recommended that until behavior thresholds are updated, that NMFS require applicants to use the 120-dB rather than 160-dB Level B harassment threshold for sub-bottom profilers. The Commission has made similar comments on other NMFS authorizations (*e.g.*, ExxonMobil Alaska liquefied natural gas geophysical surveys; NMFS Fisheries Science Center fisheries research) proposed for activities using acoustic non-impulsive sources, including sub-bottom profilers, echosounders, and other sonars (*e.g.*, side scan and fish-finding).

Response: The 120-dB threshold is typically associated with continuous sources. Continuous sounds are those whose sound pressure level remains above that of the ambient sound, with negligibly small fluctuations in level (NIOSH 1998; ANSI 2005). Intermittent sounds are defined as sounds with interrupted levels of low or no sound (NIOSH 1998). Sub-bottom profiler signals are intermittent sounds. Intermittent sounds can further be defined as either impulsive or non-impulsive. Impulsive sounds have been defined as sounds which are typically transient, brief (< 1 second), broadband, and consist of a high peak pressure with rapid rise time and rapid decay (ANSI 1986; NIOSH 1998). Non-impulsive sounds typically have more gradual rise times and longer decays

(ANSI 1995; NIOSH 1998). Sub-bottom profiler signals have durations that are typically very brief (< 1 second), with temporal characteristics that more closely resemble those of impulsive sounds than non-impulsive sounds. With regard to behavioral thresholds, we therefore consider the temporal and spectral characteristics of sub-bottom profiler signals to more closely resemble those of an impulse sound rather than a continuous sound. The 160-dB threshold is typically associated with impulsive sources.

The Commission has suggested that, for certain sources considered here, the interval between pulses is so small it should be considered continuous. However, a sub-bottom profiler chirp's pulse train is emitted in a similar fashion as odontocete echolocation click trains. Research indicates that marine mammals, in general, have extremely fine auditory temporal resolution and can detect each signal separately (*e.g.*, Au *et al*., 1988; Dolphin *et al*., 1995; Supin and Popov 1995; Mooney *et al*., 2009), especially for species with echolocation capabilities. Therefore, it is highly unlikely that marine mammals would perceive sub-bottom profiler signals as being continuous.

In conclusion, sub-bottom profiler signals are intermittent rather than continuous signals, and the fine temporal resolution of the marine mammal auditory system allows them to perceive these sounds as such. Further, the physical characteristics of these signals indicate a greater similarity to the way that intermittent, impulsive sounds are received. Therefore, the 160-dB threshold (typically associated with impulsive sources) is more appropriate than the 120-dB threshold (typically associated with continuous sources) for estimating takes by behavioral harassment incidental to use of such sources.

NMFS agrees with the Commission's recommendation to update existing acoustic criteria and thresholds as necessary to specify threshold levels that would be more

appropriate for a wider range of sound sources, and is currently in the process of producing such revisions. In particular, NMFS recognizes the importance of context (*e.g.*, behavioral state of the animals, distance) in behavioral responses. The current behavioral categorization (*i.e.*, impulse vs. continuous) does not account for context and is not appropriate for all sound sources. Thus, updated NMFS Acoustic Guidance (*http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm*), once finalized, will more appropriately categorize behavioral harassment criteria by activity type. NMFS recognizes, as new science becomes available, that our current categorizations (*i.e.*, impulse vs. continuous) may not fully encompass the complexity associated with behavioral responses (*i.e.*, context, etc.) and are working toward addressing these issues in future acoustic guidance. However, in the meanwhile, while our current behavioral acoustic thresholds may not fully account for some of the differences observed across taxa and contexts, they still serve as somewhat conservative generalized indicators of received levels at which we anticipate behavioral harassment, and are not undermined by newer information.

Comment 4: The Commission commented that the number of days used to estimate takes for the planned HRG and geotechnical surveys was determined in an inconsistent manner. The Commission recommended that if NMFS plans to include weather contingency days in its calculation of takes for HRG surveys it should also include weather contingency days for the geotechnical surveys as well.

Response 4: The notice of the proposed IHA was not clear regarding NMFS' consideration of weather contingency days in the calculating of takes. To clarify, additional days for weather downtime were not factored into the calculation of takes for

either the HRG or geotechnical surveys. Takes for the HRG survey were calculated based on the 30 days estimated for completion of that survey effort, and takes for the geotechnical survey were based on a total of 6 days of survey work. There was no difference in NMFS' approach to calculating takes for these two survey activities.

Comment 5: The Commission recommended that NMFS work with the BOEM Office of Renewable Energy to develop clear and consistent guidance for applicants regarding appropriate mitigation measures and the circumstances under which adoption of such measures would avoid the potential for taking marine mammals and the need for an incidental harassment authorization. The Commission further recommended that NMFS use a consistent approach for reducing (or not reducing) the numbers of estimated takes based on the requirement to implement mitigation measures to preclude taking in the respective Level B harassment zones.

Response 5: NMFS agrees with the Commission that close coordination with BOEM is needed to maintain appropriate and consistent guidance for potential applicants, including with regards to mitigation and monitoring strategies that might potentially reduce the potential for taking marine mammals or preclude the need for a MMPA authorization. NMFS has been working closely with BOEM to develop a stage-based approach to mitigation, monitoring, and reporting for each stage of offshore wind farm development. This is especially important in light of the growing potential for OCS wind farm development in the Atlantic, where there is uncertainty regarding impacts and in which an applicant may need to engage in multi-regulatory and compliance efforts and processes that involve other agencies (*e.g.*, BOEM, Federal Energy Regulatory Commission, U.S. Army Corps of Engineers) who may include standard mitigation

measures for protected species as part of their compliance requirements. Often these compliance efforts occur well before an applicant considers an MMPA authorization (as an example, the mitigation requirements and other standard operating conditions for the geophysical and geotechnical activities covered by the BOEM Lease OCS-A 0500 were developed over a year ago).

NMFS appreciates the Commission's recommendation and concurs that a consistent approach to estimating potential takes, where appropriate, is important. With few exceptions (*e.g.*, pile-driving activities in Cook Inlet--as referenced in the Commission's comment letter), NMFS generally does not factor in the implementation of mitigation measures to reduce Level B harassment takes in its MMPA authorizations. Rather, we base our analysis and negligible impact determinations on the actual number of takes that are authorized and without accounting for any potential post-mitigation reductions in take numbers. In the case of this IHA, and despite the fact that the total number of takes authorized is unlikely to actually occur due to the very restrictive mitigation measures (*e.g.*, shutdown/powerdown if an animal enters the Level B harassment isopleths), it was NMFS' opinion that some Level B takes would still occur due to the nature and duration of the survey activities within these harassment zones (*e.g.*, night time operations; large [up to 3.4 km] Level B harassment zones in some cases) and the potential to take listed species (as corroborated by the 2013 Biological Opinion), thus, warranting the issuance of an MMPA authorization.

Description of Marine Mammals in the Area of the Specified Activity

The "Description of Marine Mammals in the Area of the Specified Activities" section has not changed from what was in the proposed IHA (81 FR 19557; April 5,

2016; pages 19560-19561). The following species are both common in the waters of the Northwest Atlantic Outer Continental Shelf (OCS) region south of Massachusetts and have the highest likelihood of occurring, at least seasonally, in the Lease Area: North Atlantic right whale (*Eubalaena glacialis*), humpback whale (*Megaptera novaeangliae*), fin whale (*Balaenoptera physalus*), minke whale (*Balaenoptera acutorostrata*), harbor porpoise (*Phocoena phocoena*), Atlantic white-sided dolphin (*Lagenorhynchus acutus*), short-beaked common dolphin (*Delphinus delphis*), harbor seal (*Phoca vitulina*), and gray seal (*Halichorus grypus*). Three of these species are listed under the Endangered Species Act (ESA): North Atlantic right whale, humpback whale, and fin whale.

Further information on the biology, ecology, abundance, and distribution of those species likely to occur in the Lease Area can be found in Bay State Wind's application and in the NMFS Marine Mammal Stock Assessment Reports (see Waring *et al*., 2015), which are available online at: *http://www.nmfs.noaa.gov/pr/species/mammals*.

Potential Effects of the Specified Activity on Marine Mammals and Their Habitat

We provided a detailed discussion of the potential effects of the specified activity on marine mammals and their habitat in the notice of the proposed IHA (81 FR 19557; April 5, 2016; pages 19561-19567). That information has not changed and is not repeated here.

Mitigation

In order to issue an incidental take authorization under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable adverse impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and

areas of similar significance, and on the availability of such species or stock for taking for certain subsistence uses (where relevant).

Mitigation Measures

With NMFS' input during the application process, and as per the BOEM Lease, Bay State Wind shall implement the following mitigation measures during site characterization surveys utilizing HRG survey equipment and use of the DP thruster. The mitigation measures outlined in this section are based on protocols and procedures that have been successfully implemented for similar offshore projects and previously approved by NMFS (ESS 2013; Dominion 2013 and 2014).

Marine Mammal Exclusion Zones

Protected species observers (PSOs) shall monitor the following exclusion/monitoring zones for the presence of marine mammals:

- A 400-m exclusion zone during HRG surveys when the sub-bottom profiler is in operation.
- A 200-m exclusion zone during HRG surveys when all other equipment (*i.e.*, equipment positioning systems) is in operation.
- A 3,500-m monitoring zone during the use of DP thrusters during geotechnical survey activities.

The radial distances from the sound sources for these exclusion/monitoring zones were derived from acoustic modeling (see Appendix A of the application) and cover the area for both the Level A and Level B harassment zones (*i.e.*, the 190/180 dB and 160 dB isopleths, respectively) when HRG survey equipment is in use, and the Level B harassment zone (the 120 dB isopleth) when DP thrusters are in use; DP thrusters will not

produce sound levels at 180 dB re 1 μPa (rms). Acoustic modeling of the HRG survey equipment and DP thrusters was completed based on a version of the U.S. Naval Research Laboratory's Range-dependent Acoustic Model (RAM) and BELLHOP Gaussian beam ray-trace propagation model (Porter and Liu, 1994). The representative area ensonified to the Level B harassment threshold for each of the pieces of HRG survey equipment and for the DP thruster use represents the zone within which take of a marine mammal could occur. The distances to the Level A and Level B harassment thresholds were used to support the estimate of take as well as the development of the monitoring and/or mitigation measures. The complete acoustic modeling assessment can be found in Appendix A of the application, and is also summarized in the notice of the proposed IHA (81 FR 19557; April 5, 2016; pages 19567-19568). Radial distance to NMFS' Level A and Level B harassment thresholds are summarized in Tables 1 and 2.

Table 1. Modeled Distances to MMPA Thresholds for Marine Mammals during HRG Survey.

HRG Equipment	Marine Mammal Level A Harassment 180 dB_{RMS} re 1 μPa (m)*	Marine Mammal Level B Harassment 160 dB_{RMS} re 1 μPa (m)
ixBlue GAPS (pinger)	< 10	25
Sonardyne Scout USBL (pinger)	0	25
GeoPulse Sub-bottom Profiler (chirper)	30	75
Geo-Source 800 (sparker)	80	250
Geo-Source 200 (sparker)	90	380

*distances to NMFS' 190 dB Level A harassment threshold for pinnipeds are smaller

Table 2. Modeled Distances to MMPA Thresholds for Marine Mammals during Geotechnical Survey using DP Thrusters.

Survey Equipment	Marine Mammal Level A Harassment 180 dB_{RMS} re 1 μPa (m)	Marine Mammal Level B Harassment 120 dB_{RMS} re 1 μPa (m)
DP Thrusters – at 38 m depth	N/A	2,875
DP Thrusters – at 44 m depth	N/A	3,225
DP Thrusters – at 54 m depth	N/A	3,400

Visual monitoring of the established exclusion zone(s) for the HRG and geotechnical surveys will be performed by qualified and NMFS-approved PSOs, the resumes of whom will be provided to NMFS for review and approval prior to the start of survey activities. Observer qualifications will include direct field experience on a marine mammal observation vessel and/or aerial surveys in the Atlantic Ocean/Gulf of Mexico. An observer team comprising a minimum of four NMFS-approved PSOs and two certified Passive Acoustic Monitoring (PAM) operators (PAM operators will not function as PSOs), operating in shifts, will be stationed aboard either the survey vessel or a dedicated PSO-vessel. PSOs and PAM operators will work in shifts such that no one monitor will work more than four consecutive hours without a two-hour break or longer than 12 hours during any 24-hour period. During daylight hours the PSOs will rotate in shifts of one on and three off, while during nighttime operations PSOs will work in pairs. The PAM operators will also be on call as necessary during daytime operations should visual observations become impaired. Each PSO will monitor 360 degrees of the field of vision.

PSOs will be responsible for visually monitoring and identifying marine mammals approaching or within the established exclusion zone(s) during survey activities. It will be the responsibility of the Lead PSO on duty to communicate the presence of marine mammals as well as to communicate and enforce the action(s) that are necessary to ensure mitigation and monitoring requirements are implemented as appropriate. PAM operators will communicate detections/vocalizations to the Lead PSO on duty, who will then be responsible for implementing the necessary mitigation

procedures. A mitigation and monitoring communications flow diagram has been included as Appendix B in the IHA application.

PSOs will be equipped with binoculars and have the ability to estimate distances to marine mammals located in proximity to the vessel and/or exclusion zone using range finders. Reticulated binoculars will also be available to PSOs for use as appropriate based on conditions and visibility to support the siting and monitoring of marine species. Digital single-lens reflex camera equipment will be used to record sightings and verify species identification. During night operations or when visual observation is otherwise impaired (*e.g.*, during bad weather, rough sea conditions, poor lighting conditions), PAM (see *Passive Acoustic Monitoring* requirements below) and night-vision devices with infrared light-emitting diodes spotlights, in combination with infrared video monitoring, will be used (for additional details regarding proposed PAM, night-vision, and infrared technologies, refer to Section 2.5 Alternative Monitoring Plan in the Bay State Wind Offshore Wind Farm Site Assessment Plan [SAP] Survey Plan [BOEM 2016], which was submitted pursuant to Addendum C, Lease Stipulation 2.1.1.1 of the BOEM Lease). Position data will be recorded using hand-held or vessel global positioning system (GPS) units for each sighting.

The PSOs will begin observation of the exclusion zone(s) at least 60 minutes prior to ramp-up of HRG survey equipment. Use of noise-producing equipment will not begin until the exclusion zone is clear of all marine mammals for at least 60 minutes, as per the requirements of the BOEM Lease.

If a marine mammal is detected approaching or entering the 200-m or 400-m exclusion zones during the HRG survey, or the 3,500-m monitoring zone during DP

thrusters use, the vessel operator would adhere to the shutdown (during HRG survey) or powerdown (during DP thruster use) procedures described below to minimize noise impacts on the animals.

At all times, the vessel operator will maintain a separation distance of 500 m from any sighted North Atlantic right whale as stipulated in the *Vessel Strike Avoidance* procedures described below. These stated requirements will be included in the site-specific training to be provided to the survey team.

Vessel Strike Avoidance

Bay State Wind will ensure that vessel operators and crew maintain a vigilant watch for cetaceans and pinnipeds and slow down or stop their vessels to avoid striking these species. Survey vessel crew members responsible for navigation duties will receive site-specific training on marine mammal and sea turtle sighting/reporting and vessel strike avoidance measures. Vessel strike avoidance measures will include the following, except under extraordinary circumstances when complying with these requirements would put the safety of the vessel or crew at risk:

- All vessel operators will comply with 10 knot (<18.5 km per hour [km/h]) speed restrictions in any Dynamic Management Area (DMA). In addition, all vessels operating from November 1 through July 31 will operate at speeds of 10 knots (<18.5 km/h) or less.
- All survey vessels will maintain a separation distance of 500 m or greater from any sighted North Atlantic right whale.
- If underway, vessels must steer a course away from any sited North Atlantic right whale at 10 knots (<18.5 km/h) or less until the 500 m minimum separation

distance has been established. If a North Atlantic right whale is sited in a vessel's path, or within 100 m to an underway vessel, the underway vessel must reduce speed and shift the engine to neutral. Engines will not be engaged until the North Atlantic right whale has moved outside of the vessel's path and beyond 100 m. If stationary, the vessel must not engage engines until the North Atlantic right whale has moved beyond 100 m.

- All vessels will maintain a separation distance of 100 m or greater from any sighted non-delphinoid (*i.e.*, mysticetes and sperm whales) cetaceans. If sighted within 100 m, the vessel underway must reduce speed and shift the engine to neutral, and must not engage the engines until the non-delphinoid cetacean has moved outside of the vessel's path and beyond 100 m. If a survey vessel is stationary, the vessel will not engage engines until the non-delphinoid cetacean has moved out of the vessel's path and beyond 100 m.
- All vessels will maintain a separation distance of 50 m or greater from any sighted delphinoid cetacean. Any vessel underway will remain parallel to a sighted delphinoid cetacean's course whenever possible, and avoid excessive speed or abrupt changes in direction. Any vessel underway will reduce vessel speed to 10 knots or less when pods (including mother/calf pairs) or large assemblages of delphinoid cetaceans are observed. Vessels may not adjust course and speed until the delphinoid cetaceans have moved beyond 50 m and/or abeam (*i.e.*, moving away and at a right angle to the centerline of the vessel) of the underway vessel.
- All vessels will maintain a separation distance of 50 m (164 ft) or greater from any sighted pinniped.

The training program will be provided to NMFS for review and approval prior to the start of surveys. Confirmation of the training and understanding of the requirements will be documented on a training course log sheet. Signing the log sheet will certify that the crew members understand and will comply with the necessary requirements throughout the survey event.

Seasonal Operating Requirements

Between watch shifts, members of the monitoring team will consult the NMFS North Atlantic right whale reporting systems for the presence of North Atlantic right whales throughout survey operations. The proposed survey activities will, however, occur outside of the seasonal management area (SMA) located off the coast of Massachusetts and Rhode Island. The proposed survey activities will also occur in August and September, which is outside of the seasonal mandatory speed restriction period for this SMA (November 1 through April 30).

Throughout all survey operations, Bay State Wind will monitor the NMFS North Atlantic right whale reporting systems for the establishment of a DMA. If NMFS should establish a DMA in the Lease Area under survey, within 24 hours of the establishment of the DMA Bay State Wind will work with NMFS to shut down and/or alter the survey activities to avoid the DMA.

Passive Acoustic Monitoring

As per the BOEM Lease, alternative monitoring technologies (*e.g.*, active or passive acoustic monitoring) are required if a Lessee intends to conduct geophysical or geotechnical surveys at night or when visual observation is otherwise impaired (*e.g.*, during bad weather, rough sea conditions, poor lighting conditions). To support 24-hour

survey operations, Bay State Wind will use certified PAM operators with experience reviewing and identifying recorded marine mammal vocalizations, as part of the project monitoring during nighttime operations to provide for optimal acquisition of species detections at night, or as needed during periods when visual observations may be impaired. In addition, PAM systems shall be employed during daylight hours to support system calibration and PSO and PAM team coordination, as well as in support of efforts to evaluate the effectiveness of the various mitigation techniques (*i.e.*, visual observations during day and night, compared to the PAM detections/operations).

Given the range of species that could occur in the Lease Area, and that these species vary with regard to their vocalization frequencies (high vs. low), the PAM system will consist of an array of hydrophones with both broadband (sampling frequencies of 2 kHz to 200 kHz) and at least one low-frequency hydrophone (sampling range frequencies of 10 Hz to 30 kHz). Monitoring of the PAM system will be conducted from a customized processing station aboard the survey vessel. The on-board processing station provides the interface between the PAM system and the operator. The PAM operator(s) will monitor the hydrophone signals in real time both aurally (using headphones) and visually (via the monitor screen displays). Bay State Wind proposes the use of PAMGuard software for 'target motion analysis' to support localization in relation to the identified exclusion zone. PAMGuard is an open source and versatile software/hardware interface to enable flexibility in the configuration of in-sea equipment (number of hydrophones, sensitivities, spacing, and geometry). PAM operators will immediately communicate detections/vocalizations to the Lead PSO on duty who will ensure the

implementation of the appropriate mitigation measure (*e.g.*, shutdown) even if visual observations by PSOs have not been made.

Additional details regarding the proposed PAM system can be found in Section 2.5 Alternative Monitoring Plan in the Bay State Wind Offshore Wind Farm SAP Survey Plan (BOEM, 2016).

Ramp-Up

As per the BOEM Lease, a ramp-up procedure will be used for HRG survey equipment capable of adjusting energy levels at the start or re-start of HRG survey activities. A ramp-up procedure will be used at the beginning of HRG survey activities in order to provide additional protection to marine mammals near the Lease Area by allowing them to vacate the area prior to the commencement of survey equipment use. The ramp-up procedure will not be initiated during daytime, night time, or periods of inclement weather if the exclusion zone cannot be adequately monitored by the PSOs using the appropriate visual technology (*e.g.*, reticulated binoculars, night vision equipment) and/or PAM for a 60-minute period. A ramp-up would begin with the power of the smallest acoustic HRG equipment at its lowest practical power output appropriate for the survey. The power would then be gradually turned up and other acoustic sources added such that the source level would increase in steps not exceeding 6 dB per 5-minute period. If marine mammals are detected within the HRG survey exclusion zone prior to or during the ramp-up, activities will be delayed until the animal(s) has moved outside the monitoring zone and no marine mammals are detected for a period of 60 minutes.

Shutdown and Powerdown

HRG Survey - The exclusion zone(s) around the noise-producing activities HRG survey equipment will be monitored, as previously described, by PSOs and at night by PAM operators for the presence of marine mammals before, during, and after any noise-producing activity. The vessel operator must comply immediately with any call for shutdown by the Lead PSO. Any disagreement should be discussed only after shutdown.

As per the BOEM Lease, if a non-delphinoid (*i.e.*, mysticetes and sperm whales) cetacean is detected at or within the established exclusion zone (200-m exclusion zone during equipment positioning systems use; 400-m exclusion zone during the operation of the sub-bottom profiler), an immediate shutdown of the HRG survey equipment is required. Subsequent restart of the electromechanical survey equipment must use the ramp-up procedures described above and may only occur following clearance of the exclusion zone for 60 minutes. These are conservative shutdown zones, as the 200 and 400-m exclusion radii exceed the distances to the estimated Level B harassment isopleths (Table 1).

As per the BOEM Lease, if a delphinoid cetacean or pinniped is detected at or within the exclusion zone, the HRG survey equipment (including the sub-bottom profiler) must be powered down to the lowest power output that is technically feasible. Subsequent power up of the survey equipment must use the ramp-up procedures described above and may occur after (1) the exclusion zone is clear of a delphinoid cetacean and/or pinniped for 60 minutes or (2) a determination by the PSO after a minimum of 10 minutes of observation that the delphinoid cetacean or pinniped is approaching the vessel or towed equipment at a speed and vector that indicates voluntary approach to bow-ride or chase towed equipment.

If the HRG sound source (including the sub-bottom profiler) shuts down for reasons other than encroachment into the exclusion zone by a marine mammal including but not limited to a mechanical or electronic failure, resulting in the cessation of sound source for a period greater than 20 minutes, a restart for the HRG survey equipment (including the sub-bottom profiler) is required using the full ramp-up procedures and clearance of the exclusion zone of all cetaceans and pinnipeds for 60 minutes. If the pause is less than 20 minutes, the equipment may be restarted as soon as practicable at its operational level as long as visual surveys were continued diligently throughout the silent period and the exclusion zone remained clear of cetaceans and pinnipeds. If the visual surveys were not continued diligently during the pause of 20 minutes or less, a restart of the HRG survey equipment (including the sub-bottom profiler) is required using the full ramp-up procedures and clearance of the exclusion zone for all cetaceans and pinnipeds for 60 minutes.

Geotechnical Survey (DP Thrusters) - During geotechnical survey activities, a constant position over the drill, coring, or deep cone penetration test site must be maintained to ensure the integrity of the survey equipment. Any stoppage of DP thruster during the proposed geotechnical activities has the potential to result in significant damage to survey equipment. Therefore, during geotechnical survey activities if marine mammals enter or approach the established 3,500-m 120 dB isopleth monitoring zone, Bay State Wind shall reduce DP thruster to the maximum extent possible, except under circumstances when reducing DP thruster use would compromise safety (both human health and environmental) and/or the integrity of the equipment. Reducing thruster energy will effectively reduce the potential for exposure of marine mammals to sound

energy. After decreasing thruster energy, PSOs will continue to monitor marine mammal behavior and determine if the animal(s) is moving towards or away from the established monitoring zone. If the animal(s) continues to move towards the sound source then DP thruster use would remain at the reduced level. Normal use will resume when PSOs report that the marine mammals have moved away from and remained clear of the monitoring zone for a minimum of 60 minutes since the last sighting.

Mitigation Conclusions

NMFS has carefully evaluated Bay State Wind's mitigation measures in the context of ensuring that we prescribe the means of effecting the least practicable impact on the affected marine mammal species and stocks and their habitat. Our evaluation of potential measures included consideration of the following factors in relation to one another:

- The manner in which, and the degree to which, the successful implementation of the measure is expected to minimize adverse impacts to marine mammals;
- The proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and
- The practicability of the measure for applicant implementation.

Any mitigation measure(s) prescribed by NMFS should be able to accomplish, have a reasonable likelihood of accomplishing (based on current science), or contribute to the accomplishment of one or more of the general goals listed here:

1. Avoidance or minimization of injury or death of marine mammals wherever possible (goals 2, 3, and 4 may contribute to this goal).
2. A reduction in the numbers of marine mammals (total number or number at biologically important time or location) exposed to received levels of activities

that we expect to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).

3. A reduction in the number of times (total number or number at biologically important time or location) individuals would be exposed to received levels of activities that we expect to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).
4. A reduction in the intensity of exposures (either total number or number at biologically important time or location) to received levels of activities that we expect to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing the severity of harassment takes only).
5. Avoidance or minimization of adverse effects to marine mammal habitat, paying special attention to the food base, activities that block or limit passage to or from biologically important areas, permanent destruction of habitat, or temporary destruction/disturbance of habitat during a biologically important time.
6. For monitoring directly related to mitigation—an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

Based on our evaluation of the proposed measures, as well as other measures considered by NMFS, NMFS has determined that the proposed mitigation measures provide the means of effecting the least practicable impact on marine mammals species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Monitoring and Reporting

In order to issue an IHA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth, "requirements pertaining to the monitoring and reporting of such taking." The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for incidental take authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the proposed action area.

Monitoring measures prescribed by NMFS should accomplish one or more of the following general goals:

1. An increase in our understanding of the likely occurrence of marine mammal species in the vicinity of the action, *i.e.*, presence, abundance, distribution, and/or density of species.
2. An increase in our understanding of the nature, scope, or context of the likely exposure of marine mammal species to any of the potential stressor(s) associated with the action (*e.g.* sound or visual stimuli), through better understanding of one or more of the following: the action itself and its environment (*e.g.* sound source characterization, propagation, and ambient noise levels); the affected species (*e.g.* life history or dive pattern); the likely co-occurrence of marine mammal species with the action (in whole or part) associated with specific adverse effects; and/or the likely biological or behavioral context of exposure to the stressor for the marine mammal (*e.g.* age class of exposed animals or known pupping, calving, or feeding areas).
3. An increase in our understanding of how individual marine mammals respond

(behaviorally or physiologically) to the specific stressors associated with the action (in specific contexts, where possible, *e.g.*, at what distance or received level).

4. An increase in our understanding of how anticipated individual responses, to individual stressors or anticipated combinations of stressors, may impact either: the long-term fitness and survival of an individual; or the population, species, or stock (*e.g.* through effects on annual rates of recruitment or survival).
5. An increase in our understanding of how the activity affects marine mammal habitat, such as through effects on prey sources or acoustic habitat (*e.g.*, through characterization of longer-term contributions of multiple sound sources to rising ambient noise levels and assessment of the potential chronic effects on marine mammals).
6. An increase in understanding of the impacts of the activity on marine mammals in combination with the impacts of other anthropogenic activities or natural factors occurring in the region.
7. An increase in our understanding of the effectiveness of mitigation and monitoring measures.
8. An increase in the probability of detecting marine mammals (through improved technology or methodology), both specifically within the safety zone (thus allowing for more effective implementation of the mitigation) and in general, to better achieve the above goals.

Monitoring Measures

Bay State Wind submitted a marine mammal monitoring and reporting plan as part of the IHA application.

Visual Monitoring - Visual monitoring of the established Level B harassment zones (400-m radius for sub-bottom profiler and 200-m radius for equipment positioning system use during HRG surveys [note that these are the same as the mitigation exclusion/shutdown zones established for HRG survey sound sources]; 3,500-m radius during DP thruster use [note that this is the same as the mitigation powerdown zone established for DP thruster sound sources]) will be performed by qualified and NMFS-approved PSOs (see discussion of PSO qualifications and requirements in *Marine Mammal Exclusion Zones* above).

The PSOs will begin observation of the monitoring zone during all HRG survey activities and all geotechnical operations where DP thrusters are employed. Observations of the monitoring zone will continue throughout the survey activity and/or while DP thrusters are in use. PSOs will be responsible for visually monitoring and identifying marine mammals approaching or entering the established monitoring zone during survey activities.

Observations will take place from the highest available vantage point on the survey vessel. General 360 degree scanning will occur during the monitoring periods, and target scanning by the PSO will occur when alerted of a marine mammal presence.

Data on all PSO observations will be recorded based on standard PSO collection requirements. This will include dates and locations of survey operations; vessel activity during sighting, time and location (*i.e.*, distance from sound source) of observation; weather conditions (*i.e.*, percent cloud cover, visibility, percent glare); water conditions

(*i.e.*, Beaufort sea-state, tidal state, swell); details of the sightings (species, description of observed animal, sex, age classification [if known], numbers); and reaction of the animal(s) to relevant sound source (if any) and observed animal behavior (*e.g.*, avoidance, approach), including bearing and direction of travel. The data sheet will be provided to both NMFS and BOEM for review and approval prior to the start of survey activities. In addition, prior to initiation of survey work, all crew members will undergo environmental training, a component of which will focus on the procedures for sighting and protection of marine mammals. A briefing will also be conducted between the survey supervisors and crews, the PSOs, and Bay State Wind. The purpose of the briefing will be to establish responsibilities of each party, define the chains of command, discuss communication procedures, provide an overview of monitoring purposes, and review operational procedures.

Acoustic Field Verification – As per the requirements of the BOEM Lease, field verification of the exclusion/monitoring zones will be conducted to determine whether the proposed zones correspond accurately to the relevant isopleths and are adequate to minimize impacts to marine mammals. The details of the field verification strategy will be provided in a Field Verification Plan no later than 45 days prior to the commencement of field verification activities.

Bay State Wind must conduct field verification of the exclusion zone (the 160 dB isopleth) for HRG survey equipment and the powerdown zone (the 120 dB isopleth) for DP thruster use for all equipment operating below 200 kHz. Bay State Wind must take acoustic measurements at a minimum of two reference locations and in a manner that is sufficient to establish source level (peak at 1 meter) and distance to the 180 dB and 160

dB isopleths (the Level A and B harassment zones for HRG surveys) and 120 dB isopleth (the Level B harassment zone) for DP thruster use. Sound measurements must be taken at the reference locations at two depths *(i.e.,* a depth at mid-water and a depth at approximately 1 meter [3.28 ft] above the seafloor).

Bay State Wind may use the results from its field-verification efforts to request modification of the exclusion/monitoring zones for the HRG or geotechnical surveys. Any new exclusion/monitoring zone radius proposed by Bay State Wind must be based on the most conservative measurements (*i.e.,* the largest safety zone configuration) of the target Level A or Level B harassment acoustic threshold zones. The modified zone must be used for all subsequent use of field-verified equipment. Bay State Wind must obtain approval from NMFS and BOEM of any new exclusion/monitoring zone before it may be implemented.

Reporting Measures

Bay State Wind will provide the following reports as necessary during survey activities:

- Bay State Wind will contact NMFS and BOEM within 24 hours of the commencement of survey activities and again within 24 hours of the completion of the activity.
- As per the BOEM Lease: Any observed significant behavioral reactions (*e.g.,* animals departing the area) or injury or mortality to any marine mammals must be reported to NMFS and BOEM within 24 hours of observation. Dead or injured protected species are reported to the NMFS Greater Atlantic Regional Fisheries Office Stranding Hotline (800-900-3622) within 24 hours of sighting, regardless

of whether the injury is caused by a vessel. In addition, if the injury or death was caused by a collision with a project related vessel, Bay State Wind must ensure that NMFS and BOEM are notified of the strike within 24 hours. Bay State Wind must use the form included as Appendix A to Addendum C of the Lease to report the sighting or incident. If Bay State Wind is responsible for the injury or death, the vessel must assist with any salvage effort as requested by NMFS. Additional reporting requirements for injured or dead animals are described below (*Notification of Injured or Dead Marine Mammals*).

- *Notification of Injured or Dead Marine Mammals* - In the unanticipated event that the specified HRG and geotechnical activities lead to an injury of a marine mammal (Level A harassment) or mortality (*e.g.*, ship-strike, gear interaction, and/or entanglement), Bay State Wind would immediately cease the specified activities and report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources and the NOAA Greater Atlantic Regional Fisheries Office (GARFO) Stranding Coordinator. The report would include the following information:
    - Time, date, and location (latitude/longitude) of the incident;
    - Name and type of vessel involved;
    - Vessel's speed during and leading up to the incident;
    - Description of the incident;
    - Status of all sound source use in the 24 hours preceding the incident;
    - Water depth;

- Environmental conditions (*e.g.*, wind speed and direction, Beaufort sea state, cloud cover, and visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available).

Activities would not resume until NMFS is able to review the circumstances of the event. NMFS would work with Bay State Wind to minimize reoccurrence of such an event in the future. Bay State Wind would not resume activities until notified by NMFS.

In the event that Bay State Wind discovers an injured or dead marine mammal and determines that the cause of the injury or death is unknown and the death is relatively recent (*i.e.*, in less than a moderate state of decomposition), Bay State Wind would immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources and the GARFO Stranding Coordinator. The report would include the same information identified in the paragraph above. Activities would be able to continue while NMFS reviews the circumstances of the incident. NMFS would work with Bay State Wind to determine if modifications in the activities are appropriate.

In the event that Bay State Wind discovers an injured or dead marine mammal and determines that the injury or death is not associated with or related to the activities authorized in the IHA (*e.g.*, previously wounded animal, carcass

with moderate to advanced decomposition, or scavenger damage), Bay State Wind would report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the NMFS Greater Atlantic Regional Fisheries Office Regional Stranding Coordinator, within 24 hours of the discovery. Bay State Wind would provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS. Bay State Wind can continue its operations under such a case.

- Within 90 days after completion of the marine site characterization survey activities, a draft technical report will be provided to NMFS and BOEM that fully documents the methods and monitoring protocols, summarizes the data recorded during monitoring (as identified above in *Visual Monitoring*), estimates the number of marine mammals that may have been taken during survey activities, and provides an interpretation of the results and effectiveness of all monitoring tasks. Any recommendations made by NMFS must be addressed in the final report prior to acceptance by NMFS.
- In addition to the reporting requirements outlined above, Bay State Wind will provide an assessment report of the effectiveness of the various mitigation techniques, *i.e.* visual observations during day and night, compared to the PAM detections/operations. This will be submitted as a draft to NMFS and BOEM 30 days after the completion of the HRG and geotechnical surveys and as a final version 60 days after completion of the surveys.

Estimated Take by Incidental Harassment

Project activities that have the potential to harass marine mammals, as defined by the MMPA, include underwater noise from operation of the HRG survey sub-bottom profilers and equipment positioning systems, and noise propagation associated with the use of DP thrusters during geotechnical survey activities that require the use of a DP drill ship. Harassment could take the form of temporary threshold shift, avoidance, or other changes in marine mammal behavior. NMFS anticipates that impacts to marine mammals would be in the form of behavioral harassment and no take by injury, serious injury, or mortality is proposed. NMFS does not anticipate take resulting from the movement of vessels associated with construction because there will be a limited number of vessels moving at slow speeds over a relatively shallow, nearshore area.

The basis for the take estimate is the number of marine mammals that would be exposed to sound levels in excess of NMFS' Level B harassment criteria for impulsive noise (160 dB re 1 μPa (rms) and continuous noise (120 dB re 1 μPa (rms.)). NMFS' current acoustic exposure criteria for estimating take are shown in Table 3 below. Bay State Wind's modeled distances to these acoustic exposure criteria are shown in Tables 1 and 2. Details on the model characteristics and results are provided in the hydroacoustic modeling assessment found in Appendix A of the IHA application. As discussed in the application and in Appendix A, modeling took into consideration sound sources using the loudest potential operational parameters, bathymetry, geoacoustic properties of the Lease Area, time of year, and marine mammal hearing ranges. Results from the hydroacoustic modeling assessment showed that estimated maximum critical distance to the 160 dB re 1 μPa (rms) MMPA threshold for all water depths for the HRG survey sub-bottom profilers (the HRG survey equipment with the greatest potential for effect on marine

mammal) was approximately 380 m from the source (see Table 1), and the estimated maximum critical distance to the 120 dB re 1 µPa (rms) MMPA threshold for all water depths for the drill ship DP thruster was approximately 3,400 m from the source (see Table 2). Bay State Wind and NMFS believe that these estimates represent the worst-case scenario and that the actual distances to the Level B harassment threshold may be shorter.

Table 3. NMFS' Current Acoustic Exposure Criteria.

Non-Explosive Sound		
Criterion	Criterion Definition	Threshold
Level A Harassment (Injury)	Permanent Threshold Shift (PTS) (Any level above that which is known to cause TTS)	180 dB re 1 µPa-m (cetaceans) / 190 dB re 1 µPa-m (pinnipeds) root mean square (rms)
Level B Harassment	Behavioral Disruption (for impulse noises)	160 dB re 1 µPa-m (rms)
Level B Harassment	Behavioral Disruption (for continuous noise)	120 dB re 1 µoPa-m (rms)

Bay State Wind estimated species densities within the proposed project area in order to estimate the number of marine mammal exposures to sound levels above the 120 dB Level B harassment threshold for continuous noise (*i.e.*, DP thrusters) and the 160 dB Level B harassment threshold for intermittent, impulsive noise (*i.e.*, pingers and sub-bottom profiler). Research indicates that marine mammals generally have extremely fine auditory temporal resolution and can detect each signal separately (*e.g.*, Au *et al*., 1988; Dolphin *et al*., 1995; Supin and Popov 1995; Mooney *et al*., 2009b), especially for species with echolocation capabilities. Therefore, it is likely that marine mammals would perceive the acoustic signals associated with the HRG survey equipment as being intermittent rather than continuous, and we base our takes from these sources on exposures to the 160 dB threshold.

The data used as the basis for estimating cetacean species density for the Lease Area are sightings per unit effort (SPUE) taken from Kenney and Vigness-Raposa (2009). SPUE (or, the relative abundance of species) is derived by using a measure of survey effort and number of individual cetaceans sighted. Species density (animals per km^2) can be computed by dividing the SPUE value by the width of the marine mammal survey track, and numbers of animals can be computed by multiplying the species density by the size of the geographic area in question ($km^{2)}$. SPUE allows for comparison between discrete units of time (*i.e.* seasons) and space within a project area (Shoop and Kenney 1992). SPUE calculated by Kenney and Vigness-Raposa (2009) was derived from a number of sources including: 1) North Atlantic Right Whale Consortium (NARWC) database; 2) University of Rhode Island Cetacean and Turtle Assessment Program (CeTAP); 3) sightings data from the Coastal Research and Education Society of Long Island, Inc. and Okeanos Ocean Research Foundation; 4) the Northeast Regional Stranding network (marine mammals); and 5) the NOAA Northeast Fisheries Science Center's Fisheries Sampling Branch.

The OPAREA Density Estimates (U.S. Department of the Navy 2007) were used for estimating takes for harbor and gray seals. In the proposed IHA, NMFS had applied an 80 percent reduction factor for harbor and gray seal densities based on the presumption that original density estimates for the project area were an overestimation because they included breeding populations of Cape Cod (Schroeder 2000; Ronald and Gots 2003). NMFS has since determined that the findings used to inform that reduction factor are outdated and do not accurately reflect the average annual rate of population

increase (especially for gray seal), and this reduction factor is no longer appropriate for calculating takes for harbor and gray seals.

The methodology for calculating takes was described in the **Federal Register** notice for the proposed IHA (81 FR 19557; April 5, 2016). Estimated takes were calculated by multiplying the species density (per 100 km^2) by the zone of influence (ZOI), multiplied by the number of days of the specified activity. A detailed description of the acoustic modeling used to calculate zones of influence is provided in the acoustic modeling assessment found in Appendix A of the IHA application (also see the discussion in the "Mitigation" section above).

Bay State Wind used a ZOI of 23.6 m^2 (61 km^2) and a survey period of 30 days to estimate take from use of the HRG survey equipment during geophysical survey activities. The ZOI is based on the worst case (since it assumes the higher powered GeoSource 200 sparker will be operating all the time) ensonified area of 380 m, and a maximum survey trackline of 49 mi (79 km) per day. Based on the proposed HRG survey schedule, take calculations were based on the species density as derived from seasonal SPUE data reported in Kenney and Vigness-Raposa (2009) and seasonal OPAREA density estimates (U.S. Department of the Navy 2007). The resulting take estimates (rounded to the nearest whole number) are presented in Table 4.

Table 4. Estimated Level B Harassment Takes for HRG Survey Activities.

Species	Density[1] (No./100 km^2)	Calculated Take (No.)	Take Authorization (No.)	Percentage of Stock Potentially Affected
North Atlantic Right Whale	0.07	1.28	1	0.22
Humpback Whale	0.05	0.92	1	0.01
Fin Whale	0.14	2.56	3	0.19
Minke Whale	0.44	8.05	8	0.04
Common Dolphin	8.21	150.24	150	0.12

Atlantic White-sided Dolphin	7.46	136.52	137	0.28
Harbor Porpoise	0.23	4.21	4	0.01
Harbor Seal[2]	9.74	178.24	178	0.23
Gray Seal[2]	14.16	259.13	259	0.07

[1]Densities have been updated since the publishing of the proposed IHA to more accurately reflect the seasonality of the proposed HRG survey activities (August-September). Seasonal densities, and resulting takes, depicted in the proposed IHA were based on a projected spring HRG survey, which is no longer accurate. Despite this change in seasonal densities and take numbers there were no changes in our analysis or negligible impact determination since the publishing of the proposed IHA.

[2]An 80 percent reduction factor for harbor and gray seal densities was applied in the proposed IHA based on the presumption that original density estimates for the project area were an overestimation because they included breeding populations of Cape Cod (Schroeder, 2000; Ronald and Gots, 2003). NMFS has since determined that the findings used to inform that reduction factor are outdated and do not accurately reflect the average annual rate of population increase (especially for gray seal). Therefore, NMFS no longer considers this reduction factor appropriate for calculating takes for harbor and gray seals.

Bay State Wind used a ZOI of 9.8 m^2 (25.4 km^2) and a maximum DP thruster use period of 6 days to estimate take from use of the DP thruster during geotechnical survey activities. The ZOI represents the worst-case ensonified area across the three representative water depths within the Lease Area (125 ft, 144 ft, and 177 ft [38m, 44 m, and 54 m]). Based on the proposed geotechnical survey schedule, take calculations were based on the species density as derived from seasonal abundance data reported in Kenney and Vigness-Raposa (2009) and seasonal OPAREA density estimates (U.S. Department of the Navy 2007) (Table 5). The resulting take estimates (rounded to the nearest whole number) based upon these conservative assumptions for common and Atlantic white-sided dolphins are presented in Table 5. These numbers are based on six days and represent only 0.011 and 0.022 percent of the stock for these two species, respectively. Take calculations for North Atlantic right whale, humpback whale, fin whale, minke whale, harbor porpoise, gray seal, and harbor seal are at or near zero (refer to the IHA application); therefore, no takes for these species are requested or proposed for authorization.

Table 5. Estimated Level B Harassment Takes for Geotechnical Survey Activities.

Species	Fall Density (No./100 km^2)	Calculated Take (No.)	Take Authorization (No.)	Percentage of Stock Potentially Affected
Common Dolphin	8.21	12.5	13	0.01
Atlantic White-sided Dolphin	7.46	11	11	0.02

Bay State Wind's authorized take numbers are provided in Tables 4 and 5. Bay State Wind's calculations do not take into account whether a single animal is harassed multiple times or whether each exposure is a different animal. Therefore, the numbers in Tables 4 and 5 are the maximum number of animals that may be harassed during the HRG and geotechnical surveys (*i.e.*, Bay State Wind assumes that each exposure event is a different animal). These estimates do not account for prescribed mitigation measures that Bay State Wind would implement during the specified activities and the fact that shutdown/powerdown procedures shall be implemented if an animal enters the Level B harassment zone (160 dB and 120 dB for HRG survey equipment and DP thruster use, respectively), further reducing the potential for any takes to occur during these activities.

Analysis and Determinations

Negligible Impact

Negligible impact is "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival" (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of takes, alone, is not enough information on which to base an impact determination, as the severity of harassment may vary greatly depending on the context and duration of the

behavioral response, many of which would not be expected to have deleterious impacts on the fitness of any individuals. In determining whether the expected takes will have a negligible impact, in addition to considering estimates of the number of marine mammals that might be "taken," NMFS must consider other factors, such as the likely nature of any responses (their intensity, duration, etc.), the context of any responses (critical reproductive time or location, migration, etc.), as well as the number and nature of estimated Level A harassment takes, the number of estimated mortalities, and the status of the species.

To avoid repetition, the discussion of our analyses applies to all the species listed in Tables 4 and 5, given that the anticipated effects of this activity on these different marine mammal stocks are expected to be similar. There is no information about the nature or severity of the impacts, or the size, status, or structure of any species or stocks that would lead to a different analysis for this activity.

As discussed in the "Potential Effects" section of the notice of the proposed IHA (81 FR 19557; April 5, 2016; pages 19561-19567), permanent threshold shift, masking, non-auditory physical effects, and vessel strike are not expected to occur. There is some potential for limited TTS; however, animals in the area would likely incur no more than brief hearing impairment (*i.e.*, TTS) due to generally low SPLs—and in the case of the HRG survey equipment use, highly directional beam pattern, transient signals, and moving sound sources—and the fact that most marine mammals would more likely avoid a loud sound source rather than swim in such close proximity as to result in TTS or PTS. Further, once an area has been surveyed, it is not likely that it will be surveyed again, therefore reducing the likelihood of repeated impacts within the project area.

Potential impacts to marine mammal habitat were discussed previously in the "Anticipated Effects on Marine Mammal Habitat" section of the notice of the proposed IHA (81 FR 19557; April 5, 2016; page 19567). Marine mammal habitat may be impacted by elevated sound levels and some sediment disturbance, but these impacts would be temporary. Feeding behavior is not likely to be significantly impacted, as marine mammals appear to be less likely to exhibit behavioral reactions or avoidance responses while engaged in feeding activities (Richardson *et al*., 1995). Prey species are mobile, and are broadly distributed throughout the Lease Area; therefore, marine mammals that may be temporarily displaced during survey activities are expected to be able to resume foraging once they have moved away from areas with disturbing levels of underwater noise. Because of the temporary nature of the disturbance, the availability of similar habitat and resources in the surrounding area, and the lack of important or unique marine mammal habitat, the impacts to marine mammals and the food sources that they utilize are not expected to cause significant or long-term consequences for individual marine mammals or their populations. Furthermore, there are no feeding areas, rookeries, or mating grounds known to be biologically important to marine mammals within the proposed project area. A biologically important area (BIA) for feeding for North Atlantic right whale encompasses the Lease Area (LaBrecque, *et al*., 2015); however, there is no temporal overlap between the BIA (effective March-April; November-December) and the proposed survey activities. ESA-listed species for which takes are proposed are North Atlantic right, humpback, and fin whales. Recent estimates of abundance indicate a stable or growing humpback whale population, while examination of the minimum number alive population index calculated from the individual sightings database for the

years 1990-2010 suggests a positive and slowly accelerating trend in North Atlantic right whale population size (Waring *et al*., 2015). There are currently insufficient data to determine population trends for fin whale (Waring *et al*., 2015). There is no designated critical habitat for any ESA-listed marine mammals within the Lease Area, and none of the stocks for non-listed species proposed to be taken are considered "depleted" or "strategic" by NMFS under the MMPA.

The mitigation measures are expected to reduce the number and/or severity of takes by (1) giving animals the opportunity to move away from the sound source before HRG survey equipment reaches full energy; (2) reducing the intensity of exposure within a certain distance by reducing the DP thruster power; and (3) preventing animals from being exposed to sound levels reaching 180 dB during HRG survey activities (sound levels in excess of 180 dB are not anticipated for DP thruster use). Additional vessel strike avoidance requirements will further mitigate potential impacts to marine mammals during vessel transit to and within the Study Area.

Bay State Wind did not request, and NMFS is not proposing, take of marine mammals by injury, serious injury, or mortality. NMFS expects that most takes would be in the form of short-term Level B behavioral harassment in the form of brief startling reaction and/or temporary vacating of the area, or decreased foraging (if such activity were occurring)—reactions that are considered to be of low severity and with no lasting biological consequences (*e.g.*, Southall *et al*., 2007). This is largely due to the short time scale of the proposed activities, the low source levels and intermittent nature of many of the technologies proposed to be used, as well as the required mitigation.

Based on the best available science, NMFS concludes that exposures to marine mammal species and stocks due to Bay State Wind's HRG and geotechnical survey activities would result in only short-term (temporary and short in duration) and relatively infrequent effects to individuals exposed, and not of the type or severity that would be expected to be additive for the very small portion of the stocks and species likely to be exposed. Given the duration and intensity of the activities, and the fact that shipping contributes to the ambient sound levels in the surrounding waters (vessel traffic in this area is relatively high; some marine mammals may be habituated to this noise), NMFS does not anticipate the proposed take estimates to impact annual rates of recruitment or survival. Animals may temporarily avoid the immediate area, but are not expected to permanently abandon the area. Major shifts in habitat use, distribution, or foraging success, are not expected.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS finds that the total marine mammal take from Bay State Wind's proposed HRG survey and DP thruster use during geotechnical survey activities will have a negligible impact on the affected marine mammal species or stocks.

Small Numbers

The requested takes proposed to be authorized for the HRG and geotechnical surveys represent 0.22 percent of the Western North Atlantic (WNA) stock of North Atlantic right whale, 0.01 percent of the Gulf of Maine stock of humpback whale, 0.43 percent of the WNA stock of fin whale, 0.01 percent of the Canadian East Coast stock of

minke whale, 0.04 percent of the WNA stock of short-beaked common dolphin, 0.30 percent of the WNA stock of Atlantic white-sided dolphin, 0.01 percent of the Gulf of Maine/Bay of Fundy stock of harbor porpoise, 0.23 percent of the WNA stock of harbor seal, and 0.07 percent of the North Atlantic stock of gray seal. These take estimates represent the percentage of each species or stock that could be taken by Level B behavioral harassment and are extremely small numbers (less than 1 percent) relative to the affected species or stock sizes. Further, the proposed take numbers are the maximum numbers of animals that are expected to be harassed during the project; it is possible that some of these exposures may occur to the same individual. Therefore, NMFS finds that small numbers of marine mammals will be taken relative to the populations of the affected species or stocks.

Impact on Availability of Affected Species for Taking for Subsistence Uses

There are no relevant subsistence uses of marine mammals implicated by this action. Therefore, NMFS has determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

Endangered Species Act

Within the project area, fin, humpback, and North Atlantic right whale are listed as endangered under the ESA. Under section 7 of the ESA, BOEM consulted with NMFS on commercial wind lease issuance and site assessment activities on the Atlantic Outer Continental Shelf in Massachusetts, Rhode Island, New York and New Jersey Wind Energy Areas. NOAA's GARFO issued a Biological Opinion concluding that these activities may adversely affect but are not likely to jeopardize the continued

existence of fin whale, humpback whale, or North Atlantic right whale. NMFS also consulted internally on the issuance of an IHA under section 101(a)(5)(D) of the MMPA for this activity. Following issuance of the Bay State Wind IHA, the Biological Opinion will be amended to include an incidental take exemption for these marine mammal species, as appropriate.

National Environmental Policy Act

BOEM prepared an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA), to evaluate the issuance of wind energy leases covering the entirety of the Massachusetts Wind Energy Area (including the OCS-A 0500 Lease Area), and the approval of site assessment activities within those leases (BOEM 2014). NMFS has reviewed BOEM's EA, determined it to be sufficient, and adopted that EA and signed a Finding of No Significant Impact (FONSI). We believe that the adoption of BOEM's EA allows NMFS to meet its responsibilities under NEPA for the issuance of an IHA to Bay State Wind for HRG and geotechnical survey investigations in the Lease Area. BOEM's EA and NMFS' FONSI are available on the internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental/energy_other.htm*.

Authorization

As a result of these determinations, NMFS has issued an IHA to Bay State Wind

for HRG survey activities and use of DP vessel thrusters during geotechnical survey activities from August 2016 through August 2017, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated.

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