

**DEPARTMENT OF COMMERCE****National Oceanic and Atmospheric Administration**

[RTID 0648–XD935]

**Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Phase 2 Construction of the Vineyard Wind 1 Offshore Wind Project off 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 the regulations implementing the Marine Mammal Protection Act (MMPA) as amended, notification is hereby given that NMFS has issued an incidental harassment authorization (IHA) to Vineyard Wind 1 LLC (Vineyard Wind 1) to incidentally harass marine mammals during the completion of construction activities associated with the Vineyard Wind 1 Offshore Wind Project in the northern portion of Lease Area OCS–A 0501 offshore of Massachusetts.

**DATES:** This authorization is effective from October 1, 2024 through September 30, 2025.

**ADDRESSES:** 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/national/marine-mammal-protection/incidental-take-authorizations-other-energy-activities-renewable>. In case of problems accessing these documents, please call the contact listed below.

**FOR FURTHER INFORMATION CONTACT:** Jessica Taylor, Office of Protected Resources, NMFS, (301) 427–8401.

**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 an authorized is proposed or, if the taking is limited to

harassment, a notice of a proposed IHA is 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 monitoring and reporting of the takings. The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

**Summary of Request**

On December 15, 2023, NMFS received a request from Vineyard Wind 1 for an IHA to take marine mammals incidental to Phase 2 construction of the Vineyard Wind 1 Offshore Wind Project off Massachusetts, specifically wind turbine generator (WTG) monopile foundation installation, in the northern portion of Lease Area OCS–A 0501. Vineyard Wind 1 completed installation of 47 WTG monopiles and one electrical service platform (ESP) jacket foundation in 2023 under an IHA issued by NMFS on June 25, 2021 (86 FR 33810) with effective dates from May 1, 2023 through April 30, 2024. Due to unexpected delays, Vineyard Wind 1 was not able to complete pile driving activities before the expiration date of the current IHA (April 30, 2024); thus, Vineyard Wind 1 requested take of marine mammals incidental to installing the remaining 15 monopiles to complete foundation installation for the Project. In total, the Project will consist of 62 WTG monopiles and 1 offshore substation.

Following NMFS’ review of the December 2023 application, Vineyard Wind 1 submitted multiple revised versions of the application, and it was deemed adequate and complete on March 13, 2024. The Vineyard Wind 1 request was for take of 14 species of marine mammals, by Level B harassment and, for 6 of these species, Level A harassment. Neither Vineyard Wind 1 nor NMFS expect serious injury or mortality to result from this activity and, therefore, an IHA is appropriate.

Vineyard Wind 1 previously conducted high resolution geophysical (HRG) site characterization surveys within the Lease Area and associated export cable corridor in 2016, 2018–2021, and during the 2023 construction season from June–December (ESS Group Inc., 2016; Vineyard Wind, 2018, 2019; EPI Group, 2021; RPS, 2022; Vineyard Wind, 2023a–f). During the 2023 construction season, NMFS coordinated closely with Vineyard Wind 1 to ensure compliance with their IHA. In a few instances, NMFS raised concerns with Vineyard Wind 1 regarding their implementation of certain required measures. NMFS worked closely with Vineyard Wind 1 throughout the construction season to course correct, where needed, and ensure compliance with the requirements (*e.g.*, mitigation, monitoring, and reporting) of the previous IHA. Information regarding their monitoring results may be found in the Estimated Take of Marine Mammals section.

**Description of the Specified Activity***Overview*

Vineyard Wind 1 plans to construct and operate an 800-megawatt (MW) wind energy facility, the Project, in the Atlantic Ocean in Lease area OCS–A 0501, offshore of Massachusetts. Altogether, the project will consist of up to 62 offshore WTGs, 1 ESP, an onshore substation, offshore and onshore cabling, and onshore operations and maintenance facilities. The onshore substation and ESP are now complete. Installation of 47 monopile foundations was completed under the previous IHA (86 FR 33810, June 25, 2021), effective from May 1, 2023 through April 30, 2024. However, due to unexpected delays, Vineyard Wind 1 was not able to complete pile driving activities before the expiration date of the IHA (April 30, 2024). Take of marine mammals, in the form of behavioral harassment and limited instances of auditory injury, may occur incidental to the installation of the remaining 15 WTG monopile foundations due to in-water noise exposure resulting from impact pile driving. The remaining 15 monopile foundations will be installed within a Limited Installation Area (LIA) (64.3 square kilometers (km<sup>2</sup>; 15,888.9 acres)) within the Lease Area (264.4 km<sup>2</sup> (65,322.4 acres)). Installation of the remaining 15 monopile foundations is expected to occur in 2024, but could also occur in 2025.

*Specific Geographic Region*

The 15 remaining piles will be installed within a Limited Installation

Area (LIA) occupying a portion of the Wind Development Area (WDA) within the Bureau of Ocean Energy Management (BOEM) lease area located in Federal waters off Massachusetts (figure 1). At its nearest point, the LIA is approximately 29 kilometers (km; 18.1 miles (mi)) from the southeast corner of Martha's Vineyard and a similar distance from Nantucket. Water

depths in the WDA range from approximately 37–49.5 meters (m; 121–162 feet (ft)). Water depth and bottom habitat are similar throughout the Lease Area (Pyc *et al.*, 2018). Figure 1 shows the LIA and planned locations for the remaining 15 monopiles to be installed.

A detailed description of the specific geographic region and planned construction activities is provided in the

**Federal Register** notice for the proposed IHA (89 FR 31008, April 23, 2024).

Since that time, no changes have been made to the planned activities.

Therefore, a detailed description is not provided here. Please refer to that

**Federal Register** notice for the description of the specific activities.

**BILLING CODE 3510-22-P**

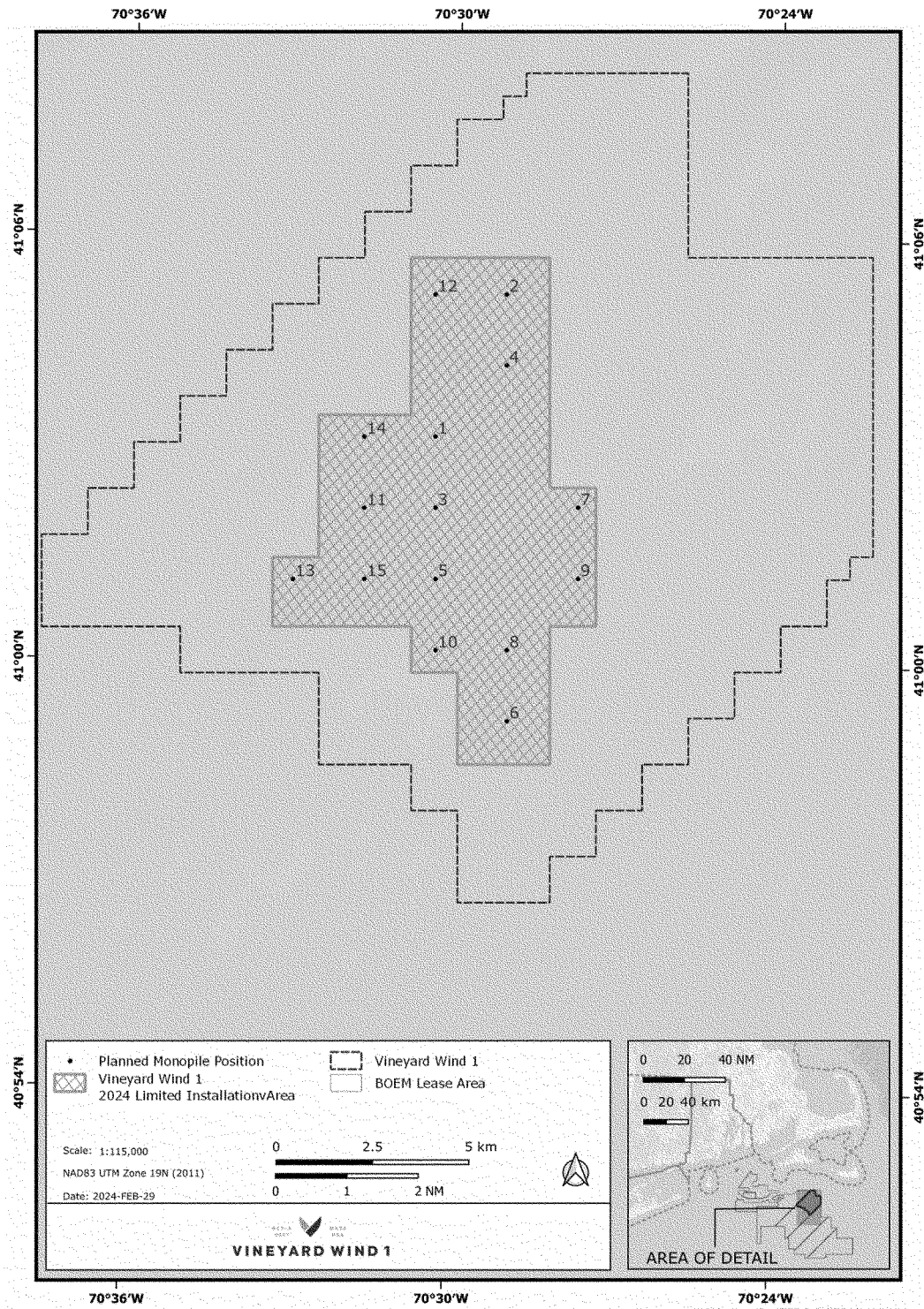


Figure 1 – Vineyard Wind 1 Limited Installation Area

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**Comments and Responses**

A notice of NMFS’ proposal to issue an IHA to Vineyard Wind 1 was

published in the **Federal Register** on April 23, 2024 (89 FR 31008). That notice described, in detail, Vineyard Wind’s activities, the marine mammal species that may be affected by the

activities, and the anticipated effects on marine mammals. In that notice, we requested public input on the request for authorization described therein, our analyses, the proposed authorization,

and any other aspect of the notice of the proposed IHA, and requested that interested persons submit relevant information, suggestions, and comments.

During the 30-day public comment period, NMFS received 87 total comment letters, including letters from various non-governmental organizations (Seafreeze, Ltd., Rand Acoustics, LLC., Long Island Commercial Fishing Association (LICFA), Save Right Whales Coalition (SRWC), Rand Acoustics, Inc., ACK Residents Against Turbines) and members of the general public. We note that approximately 11 comment letters followed one of 2 different generic template formats, in which respondents provided comments that were identical or substantively the same. NMFS has reviewed all public comments received on the proposed issuance of the Vineyard Wind 1 Phase 2 IHA. All relevant substantive comments and NMFS' responses are provided below. Comments that are out of scope to NMFS' action of issuing the requested IHA (e.g., comments regarding how unusual mortality events (UMEs) are determined to be closed or requests for necropsy reports; declarations on the adequacy of the previously issued IHA to Vineyard Wind) and comments indicating general support for or opposition to offshore wind construction are not relevant to the proposed action and therefore were not considered or addressed here. We also provide no response to species or statutes not relevant to our proposed action under section 101(a)(5)(D) of the MMPA. The public comments and recommendations are available online at: <https://www.fisheries.noaa.gov/action/incidental-take-authorization-vineyard-wind-1-llc-construction-vineyard-wind-offshore-wind>. Please see the comment submissions for full details regarding the recommendations and supporting rationale.

#### *Modeling and Take Estimates*

*Comment 1:* A commenter suggested that NMFS and Vineyard Wind 1 should not operate under the assumption that Level B takes do not result in injury or death. The commenter suggests that the IHA analysis is deficient as behavioral disturbance resulting from the proposed activities could result in auditory masking, disruption to navigational ability and spatial orientation, splitting of mother calf pairs, and increased stress and cortisol responses could lead to secondary deaths due to entanglements, vessel strikes, and strandings. Another commenter suggested that NMFS was authorizing take in the form of mortality and,

further, stated that North Atlantic right whales are on the brink of extinction and a single additional death from construction activities could be catastrophic.

*Response:* NMFS disagrees with commenters that the planned pile driving activities would cause mortality or serious injury of marine mammals, and this final IHA does not authorize mortality or serious injury. The best scientific evidence available indicates that the anticipated impacts from the specified activities potentially include avoidance, cessation of foraging or communication, temporary threshold shift (TTS) and permanent threshold shift (PTS), stress, masking, etc. (as described in the Potential Effects of Specified Activities on Marine Mammals and Their Habitat section in the proposed IHA **Federal Register** notice (89 FR 31008, April 23, 2024). Further, as described in the NID section, there is no evidence to suggest that these authorized impacts (characterized as harassment), at the magnitude and severity anticipated to result from these activities, would lead to impacts on reproduction or survival of any individual North Atlantic right whale (NARW) or other marine mammals, much less mortality.

In addition, NMFS emphasizes that there is no evidence that noise resulting from offshore wind development-related specified activities would cause increased risk of marine vessel strikes, entanglements, or mammal strandings. NMFS acknowledges that whales may temporarily avoid the area where the specified activities occur. However, NMFS does not anticipate, based on the best available science, that whales will abandon their habitat or be displaced in a manner that would result in a higher risk of vessel strike or entanglement, as suggested by a commenter, and the commenter does not provide evidence that either of these effects should be a reasonably anticipated outcome of the specified activity. The primary activity that is anticipated to result in temporary avoidance of the otherwise used habitat is foundation installation pile driving. Not only would this activity be limited to times of year when North Atlantic right whale presence is lower, pile driving would be intermittent, and only occur for a limited time over the course of 1 year. Together, these factors further reduce the likelihood that this species would be in close enough proximity to the activity to engage in avoidance behavior to the degree it would move into an area of risk (which would be closer to shore) that it could be struck by another vessel or experience entanglement.

*Comment 2:* Multiple commenters have expressed general concern for impacts to marine mammals, specifically to North Atlantic right whales, indicating that there are too many takes proposed for authorization and the IHA should be put on hold until more is known about impacts of offshore wind construction activities to North Atlantic right whales. A commenter suggests that estimated take by Level A harassment for North Atlantic right whales should be analyzed as modeled exposure estimates were greater than zero. Another commenter indicates that every attempt must be made to protect North Atlantic right whale calves from the risk of TTS and that pile driving should shut down for the remainder of a day if a mother and calf were to enter a clearance or shutdown zone.

*Response:* NMFS appreciates the commenters' general concern for marine mammals and specifically for North Atlantic right whales and, in general, acknowledges the need for additional data regarding the impacts of offshore wind construction activities on North Atlantic right whales; but disagrees that Level A harassment of NARW will result from the activity or that the IHA should be put on hold until more is known. NMFS is required to consider the best available science when assessing potential impacts and cannot delay authorization of an IHA until additional data is available. While there was a very small amount of Level A harassment modeled, the model is conservative for both Level A harassment and Level B harassment, as it does not take into account that Vineyard Wind 1 will be required to monitor and delay or shut down pile driving activities if a North Atlantic right whale is visually sighted at any distance by the pile driving protected species observers (PSOs) or acoustically detected within the 10 km passive acoustic monitoring (PAM) clearance and shutdown zone. As described in the proposed IHA, from November 1 through December 31 (when Vineyard Wind 1 would be installing piles), if a North Atlantic right whale (not just a mother/calf pair) is detected either via real-time PAM or vessel-based surveys at any distance from the pile driving location, pile driving must be delayed until the "follow-up vessel-based survey" described in their Pile Driving Monitoring Plan has been completed. Moreover, if three or more North Atlantic right whales are observed, pile driving will be delayed until the following day. These conservative measures were included in the proposed

IHA in recognition that North Atlantic right whales are more likely to be foraging in the area during November and December and that aggregations of North Atlantic right whales are more likely to remain in an area. The commenters' suggestion to delay pile driving until the next day if a mother and calf pair is observed is not warranted in November and December given the other extensive mitigation measures in place and the fact that data do not suggest mother and calf pairs remain in the area (Quintana-Rizzo *et al.*, 2021). Delaying pile driving would extend the project later into December which could result in more impacts as whale density increases throughout the winter (*i.e.*, the later in December, the more whales are likely to be present). Moreover, delaying the project is not practicable as Vineyard Wind is installing the 15 remaining piles in 2024 but must cease pile driving after December 31. Given these mitigation measures and the extensive related monitoring efforts designed to detect North Atlantic right whales for mitigation, NMFS does not anticipate and has not authorized any take by Level A harassment for North Atlantic right whales. The required measures reduce the risk of TTS for any North Atlantic right whale. Accordingly, as described in the **Federal Register** notice for the proposed IHA (89 FR 31008, April 23, 2024), the final IHA assumes that the mitigation efforts will be effective at reducing the potential for Level A harassment calculated in the density-based models as, specifically, the small number of instances in which a North Atlantic right whale was modeled to approach pile driving at a distance associated with exposure above the Level A harassment threshold, would not be expected to occur given the anticipated effectiveness of clearance and shutdowns in preventing exposure at notably greater distances and lower levels. We also note that while the scientific literature documents marine mammals are likely to avoid loud noises such as pile driving (*e.g.*, Brandt *et al.*, 2016; Nowacek *et al.*, 2004), avoidance was not quantitatively considered in the take estimates (although NMFS reasonably predicts this natural behavior will further reduce the potential for Level A harassment). NMFS recognizes that the key to effective mitigation is effective monitoring and the ability to detect marine mammals so that mitigation measures, such as delay to commencement of pile driving and shutdown should pile driving be occurring, may be implemented.

Vineyard Wind 1 is required to undertake extensive monitoring to maximize the ability to detect marine mammals with at least 9 PSOs monitoring for marine mammals before, during, and after pile driving. The reduction to the Level A harassment density-based take estimate appropriately reflects and acknowledges the monitoring and mitigation efforts, including the placement of three PSOs on the pile driving platform and dedicated PSOs vessel(s) and PAM.

*Comment 3:* A commenter indicates that estimated take by Level B harassment for common dolphins should not be adjusted per the AMAPPS average group size (30 dolphins), but rather per the PSO data collected by Vineyard Wind 1 during HRG surveys (10 dolphins) as this PSO data is more appropriate. The commenter further notes that there is no information indicating that Vineyard Wind 1 had difficulty staying within the take limits for common dolphins for the 2023 IHA.

*Response:* NMFS disagrees that an average group size estimate of 10 for common dolphins, based upon local PSO data, is more appropriate for adjusting the estimated take by Level B harassment for common dolphins than the AMAPPS group size of 30. The commenter references PSO data collected by Vineyard Wind 1 during HRG surveys, yet does not provide detail on the PSO report(s) upon which this data is based upon. The most recent Vineyard Wind 1 PSO report describes sighting 29 groups and a total of 717 common dolphins during the 2023 construction period, with an average group size of 24.7 dolphins (RPS, 2024). This estimate closely aligns with the average group size of 30 common dolphins from the AMAPPS dataset (Palka *et al.*, 2017; 2021), which NMFS has determined to be the best available data and most robust dataset for adjusting take estimates due to the standardized consistent effort and large dataset sample size. The large sample size contained in the AMAPPS dataset accounts for any variability in group size that may occur between observed common dolphin groups. Therefore, NMFS has determined that the AMAPPS average group size of 30 is most appropriate for adjusting take by Level B harassment for common dolphins in this analysis.

*Comment 4:* Multiple commenters suggest that NMFS should consider exposure to noise from vessel propulsion, thrusters, and jet trenching with scour protection as constituting behavioral harassment or that NMFS should undertake an analysis identifying the potential for take by

Level B harassment from operating offshore wind construction vessels, including the use of dynamic positioning (DP) thrusters, and jet trenching, and scour protection.

*Response:* NMFS analyzed the potential for various sources of noise to result in take of marine mammals and concludes that take from vessel propulsion, DP thrusters and jet trenching during Vineyard Wind 1's activities is not likely. Further, as noted below in Comment 5, mitigation requirements to further lessen any potential for impacts are included. On July 29, 2024, Vineyard Wind 1 confirmed to NMFS that scour protection activities are complete for the project and therefore this activity is not discussed further.

On a typical foundation, WTG, and inter-array cable installation day, Project vessels within and around the Lease Area may include a heavy lift pile installation vessel (the Orion), two Big Bubble Curtain (BBC) support vessels, two safety vessels, two crew transfer vessels, two accommodation vessels, one jack-up vessel installing monopile foundations, one pipe-burying vessel installing array cables, and one service operating vessel supporting foundation installation. During pile driving operations with favorable weather conditions, the Orion thrusters typically operate at approximately 25 percent capacity with a maximum capacity (1100 kW/4,500 kW). Thrusters may operate at higher capacity during higher wind speeds, waves, and currents.

In general, the Orion would be positioned at each pile driving location until after the pile is installed, after which time it would slowly transit at 10 kn (11.5 mph) or less (per the Construction and Operations Plan (COP) condition that vessels within the wind development area must travel at 10 kn (11.5 mph) or less at all times) to the next site. Because operating thrusters is inefficient with respect to cost due to fuel usage, the thrusters are typically engaged only when necessary to maintain position at the pile site or for safety reasons (*e.g.*, during rough weather).

Inter-array cables would be buried using a jet trencher. Noise emitted by jet trenching activities is broadband and generally consistent with that produced from routine vessel operations (Nedwell *et al.*, 2003).

NMFS' generalized 120-dB acoustic threshold for exposures to continuous noise is guidance to help predict when marine mammals will likely respond in a manner that constitutes Level B harassment and estimate how many marine mammals are likely to respond

in that manner; contrary to the suggestion of the commenter, it is not something that NMFS needs to “enforce.” As described in the proposed IHA notice, NMFS generally predicts that marine mammals are likely to be affected in a manner considered to be Level B harassment when exposed to underwater anthropogenic noise above 120 dB (RMS SPL) for continuous sources (e.g., vessel noise considered here). However, contextual factors and qualitative parameters play an important role in determining the potential for take and should be considered as well when determining the likelihood of incidental take. As described in the proposed IHA notice, the potential for behavioral response to an anthropogenic source can be highly variable and context-specific (Ellison *et al.*, 2012). In addition to received sound level, factors such as activity state, the novelty of a sound, and distance between the sound source and the receiver may influence whether an animal exhibits a behavioral response (Ellison *et al.*, 2012). As NMFS has previously articulated, there are situations in which other contextual factors may appropriately support a determination that take is unlikely, even if an animal is exposed to levels above the behavioral harassment threshold.

NMFS acknowledges that, in limited cases, take of marine mammals by Level B harassment has been authorized incidental to vessel-related activities such as tugging and positioning activities that emit continuous noise into the underwater environment for extended periods of time (e.g., 87 FR 62364, October 14, 2022). However, in recent cases where NMFS authorized take for these activities, the take was requested by an applicant and NMFS made a case-specific decision based on the specific circumstances, explaining the conservative nature of the analysis and/or discussing specific factors other than the received level alone that contributed to the decision. In the cited case, for example, NMFS considered the potential for Level B harassment from tugging and positioning activities in a concentrated area for an extended period of time, in an area inhabited by a small resident stock of marine mammals in a fairly enclosed body of water (Cook Inlet), and authorized take, by Level B harassment, for tugging and positioning activities.

While NMFS recognizes elevated noise levels from vessels, the determination of whether harassment occurs in response to exposure to activities other than pile driving is based on several factors. Monitoring reports received under earlier take

authorizations show few, if any, behavioral responses during activities involving thruster use and other broadband or continuous construction noises similar to noise levels at or below typical vessel levels. For example, during the Neptune Liquefied Natural Gas (LNG) pipeline operations project in Massachusetts Bay from July 1, 2009, through June 30, 2010, twenty-six marine mammals were sighted, and twenty of these marine mammals entered the Level B harassment zone while construction activities, including thruster use, were taking place. None of the marine mammals observed within the Level B harassment zone exhibited “any modifications to their behavior that could be directly and definitively related to the construction activities” (ECOES Consulting, Inc., 2010). In 2015, Northeast Gateway L.P., (Northeast Gateway) requested take by Level B harassment incidental to Deepwater port repair activities occurring in Massachusetts Bay, including active use of DP thrusters. NMFS authorized the requested take incidental to the specified activities. The only two marine mammal sightings that occurred during the effective period of the authorization took place while vessels were actively using thrusters, and no behaviors that would suggest harassment were observed (TetraTech, 2017).

NMFS acknowledges that noise emitted by Vineyard Wind project-related vessels and their DP thrusters, as well as jet trenching activities, may sometimes result in marine mammals being exposed to received levels above 120 dB and that vessel noise impacts the soundscape. However, as described in the *Behavioral Effects* section of the *Potential Effects of Specified Activities on Marine Mammals and their Habitat* of the proposed IHA notice, the likelihood of Level B harassment is not based upon received level alone. There are a variety of studies (Nowacek *et al.*, 2004; Kastelein *et al.*, 2012 and 2015) indicating that contextual variables play a very important role in response to anthropogenic noise, and the severity of effects are not necessarily linear when compared to a received level (RL). Nowacek *et al.* (2004) found that North Atlantic right whales exposed to alert signals and approaching vessel sounds exhibited a variety of responses. While 5 of the 6 whales altered their behavior in response to the alert signal, the whales did not exhibit a response to a vessel noise recording which simulated a 120 m container ship passing within 100 meters (m), equating to approximately 135 dB received level, or

the noise of transiting vessels passing within 1 nautical mile (nm) from the whales (Nowacek *et al.*, 2004). During Vineyard Wind 1’s 2023 construction activities (RPS, 2024), PSOs observed more baleen whales, engaged in various activity states, in the Project Area while the impact hammer was off (77 detection events) than when it was on (22 detection events), although multiple vessels and DP thrusters were present and likely engaged while the impact hammer was off. These observations suggest that noise emitted from vessels, including those operating DP thrusters and jet trenching activities, is notably less likely to elicit avoidance and other behavioral responses from marine mammals that constitute Level B harassment. Given marine mammal exposure to extensive vessel traffic in the Atlantic Ocean, including from major ports and major shipping lanes near the project site, habituation to similar noise from vessels, thrusters, and trenching may be expected. As described in the proposed IHA notice, habituation can occur when an animal’s response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok *et al.*, 2003) as is typically considered the case with exposure to noise from vessel propulsion, noting that the typical predictable movement and operation of vessels also influences the lower likelihood of behavioral disturbance. In the case of the Vineyard Wind 1 Project, the marine mammal species potentially affected by the project inhabit areas subject to very high, consistent ship traffic (Hatch *et al.*, 2008; Van Parijs *et al.*, 2023).

Based on the available data, project-related vessels, including those operating thrusters, are not significantly louder than large cargo vessels marine mammals in the project area are accustomed to encountering. The median rms sound pressure level (SPL) measured at a range of 750 m from the piling (the Orion), and support vessels prior to pile driving of the first 13 piles from the Vineyard Wind 1 2023 construction activities measured approximately 134 dB (Küsel *et al.*, 2024 Nédwell *et al.* (2003) backcalculated SPL source levels for jet trenching activities to be 178 dB, assuming a propagation loss of 22logR and recording 160 m from trenching activity. A reasonable estimate for source level of a container ship, estimated from the bulk data of MacGillivray and de Jong (2021), is approximately 180 dB. Using practical spreading, this source level yields

approximately 137 dB at a range of 750 m.

Although lack of detected behavioral disruption during previous monitoring described above does not prove there are no undetected responses that may qualify as Level B harassment, these findings clearly suggest that marine mammals continue their regular behavior patterns in the presence of vessels, including those operating DP thrusters for the project. In consideration of the discussion above, we conclude that exposure to vessel noise for this Project, including from DP thrusters and trenching activities, is not likely to result in Level B harassment simply based on exposure above the 120 dB threshold.

*Comment 5:* Commenters suggest the NMFS should mitigate for behavioral take that may occur incidental to exposure to noise from vessels, thrusters, and trenching that exceed NMFS' behavioral harassment threshold for continuous noise (120 dB rms).

*Response:* As described in Comment 4, NMFS disagrees that exposure to vessel noise from the Project, including from DP thrusters and trenching activities, is likely to result in take under the MMPA (see response to Comment 4 above). However, NMFS does agree that vessel quieting, in general, is an important tool for protecting marine species and acoustic habitat. Vineyard Wind has committed to minimally use DP thrusters such that unnecessary use of thrusters and emission of continuous noise into the underwater environment is avoided. In addition, Vineyard Wind is required to abide by any existing vessel speed regulations as well as vessel strike avoidance measures in the IHA. When vessels are required to maintain a 10 knot (kn) (11.5 mph) speed restriction (see Vessel Strike Avoidance Measures in the Mitigation section), continuous noise released into the environment from the vessels is also reduced. The relationship between vessel speed and its associated underwater radiated noise is well established and it is generally assumed that noise levels depend on vessel speed as  $60 \log_{10}(V)$  (MacGillivray and de Jong, 2021), where  $V$  is the vessel speed. Further, speed limitations have been shown to be an effective tool in mitigation, as even small speed reductions of many vessels are capable of substantially reducing noise impacts to marine mammals (Findlay *et al.*, 2023).

*Comment 6:* Commenters note that it is inappropriate for Vineyard Wind 1 to estimate its own impacts, analyze its own impacts, and then restrict IHA

public document estimates to what it has determined to be appropriate.

*Response:* NMFS disagrees that the process of Vineyard Wind 1 estimating and analyzing impacts of the proposed construction activity is inappropriate. NMFS' implementing regulations require applicants to include in their request a detailed description of the specified activity or class of activities that can be expected to result in incidental taking of marine mammals, 50 CFR 216.104(a)(1), as well as an analysis of the impacts of the activity on marine mammal species or stocks and their habitat. Thus, the "specified activity" for which incidental take coverage is being sought under section 101(a)(5)(D) is generally defined and described by the applicant. NMFS evaluates the applicant's analysis using the best available information and makes the necessary findings and determinations on how the proposed activities may impact marine mammals, their habitats, and availability of marine mammals for subsistence uses, if relevant. As indicated in the proposed IHA, based on our independent evaluation, NMFS concurred with the analysis methods and results presented by Vineyard Wind 1 and carried them forward in the proposed IHA. NMFS is required to post proposed IHAs for public comment in addition to supporting information. NMFS also posts all monitoring reports (including any past monitoring reports for past authorizations) on our website: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-other-energy-activities-renewable>. As the required documentation mentioned above has been posted for the Vineyard Wind IHA request, NMFS disagrees that "IHA public documents" have been restricted.

*Comment 7:* Commenters request that the pile driving noise model, with all assumptions, be made public along with any technical information relevant to the initial noise exceedances during pile driving in 2023.

*Response:* Relevant information on how the pile driving noise model works, assumptions, and technical information related to sound field verification (SFV) results were publicly available. Of note, only the modeled distances to the Level A harassment thresholds were applied to this IHA; the distance to the Level B harassment threshold is based on in situ data collected during foundation installation in 2023. A description of the pile driving source and propagation models used to estimate distances to PTS thresholds was made publicly available as an appendix within the Vineyard Wind 1 Construction and

Operations Plan (COP), in the form of an acoustic modeling report (Pyc *et al.*, 2018) and is available online as Appendix III in the COP at: <https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/MA/Vineyard-Wind/Vineyard-Wind-COP-Volume-III-Appendix-III-M.pdf>. While source and propagation models are proprietary (most developed by JASCO) and not available to the public, Appendix A of Pyc *et al.* (2018) includes references describing their theory of calculation. Technical information and results related to SFV conducted during pile driving in 2023, upon which the Level B threshold analysis for the current IHA is based, are also publicly available on NMFS' website.

*Comment 8:* Commenters indicate that NMFS and Vineyard Wind 1 have underestimated both impulsive and continuous noise levels and suggest that the actual exposure to noise levels from pile driving is greater than NMFS acknowledges in its existing protective measures. Commenters request that NMFS conduct a reassessment of RMS computation methods.

*Response:* NMFS disagrees with the commenters that noise levels are underestimated and a reassessment of RMS computation methods is necessary. NMFS continuously assesses its analysis based on new science, including acceptable and ideal methods for calculating underwater sound metrics. Our current methodology is to use a 90 percent energy window for computing RMS sound pressure levels for impulsive sources (Madsen, 2005). The 90 percent energy envelope used by NMFS is a commonly used convention (Merchant *et al.*, 2015), and is even stated as the recommended energy window in the ISO standard 'Underwater acoustics—Measurement of radiated underwater sound from percussive pile driving' (ISO 18406, 2017). Importantly, the distance to the Level B threshold is based upon *in situ* SFV measurements, and not modeling. Finally, there is no take expected or authorized from continuous sources.

*Comment 9:* A commenter notes that condition 3(b) of the proposed IHA indicates that no take by Level A harassment is authorized, however, proposed take by Level A harassment is listed for species in table 1.

*Response:* NMFS appreciates the commenter's recognition that take by Level A harassment was included in table 1 yet not described in condition 3(b) of the IHA. This inconsistency has been corrected in the final IHA.

### Mitigation

*Comment 10:* Multiple commenters stated that bubble curtains are not an efficient mitigation measure as bubble curtains do not attenuate sounds at lower frequencies and therefore are not effective in preventing take by Level A harassment of North Atlantic right whales. A commenter further indicated that this lack of mitigation should be incorporated into take calculations. Commenters also cite seabed refraction as a mechanism for sound to circumvent bubble curtains and impact marine mammals, thus resulting in the use of bubble curtains being insufficient as a mitigation measure. Commenters further note that since bubble curtains will be used as a mitigative measure yet are not effective for mitigation, NMFS will not be able to measure impacts to ESA-listed baleen whale species.

*Response:* In the **Federal Register** notice for the proposed IHA (89 FR 31008, April 23, 2024), NMFS described the best available science, which supports the assumption that attenuation can be reliably achieved using noise attenuation systems such as a double bubble curtain. The commenters indicated that sound may circumvent bubble curtains (such as through seabed refraction), citing Rand (2023). NMFS agrees that attenuation levels vary by frequency band and that bubble curtains attenuate higher frequency sounds more effectively; however, NMFS disagrees that lower frequency bands, which are important to consider when evaluating impacts, are not attenuated at all. The data from Bellmann (2021) shows that for both single and double bubble curtains, more than 10 dB of attenuation was achieved for bands as low as 32 Hz. While it is true that performance diminishes significantly at lower frequencies (<32 Hz), those bands also contain significantly less pile driving sound and are 16+ dB outside the most susceptible frequency range for low-frequency cetaceans. NMFS agrees that a fraction of the sound does travel through the sediment and rejoin the water column beyond the extent of the bubble curtain, and therefore is not attenuated by the bubble curtain. NMFS is not aware of any noise mitigation system available which directly deals with sediment-borne noise. Despite this limitation, bubble curtains have been shown to be highly effective in mitigating sound in the water column (Bellmann, 2021; Caltrans, 2020).

*Comment 11:* One commenter notes that while the proposed IHA includes language about soft starts as a mitigation measure, there is no evidence for the

efficacy of this measure. The commenter further notes that the Vineyard Wind 1 Biological Opinion states that there is insufficient evidence that the soft start measure would alter take estimates.

*Response:* NMFS disagrees with the commenter that there is no evidence for the efficacy of soft start as a mitigation measure, and also notes that the soft start measure was not used as a basis for altering take estimates. A soft start, in which an initial set of hammer strikes is performed at a reduced energy level, is designed to provide a warning to marine mammals and a chance to leave the pile driving area before the hammer begins operating at full capacity. The soft start method has been found to reduce the cumulative sound exposure of animals in an area (Ainslie and von Benda-Beckmann, 2012). Ainslie and von Benda-Beckmann (2012) modeled the efficacy of the soft start method and found that soft start can be an effective mitigation measure when the animals respond to the sound source by swimming away. Various species of marine mammals have been observed to behaviorally respond to soft starts (also called ramp-ups) such that the risk of PTS and TTS is decreased (*e.g.*, Stone *et al.*, 2017) and modeling studies have demonstrated similar effectiveness (von Benda Beckmann, *et al.*, 2013). As described in the Potential Effects of Specified Activities on Marine Mammals and their Habitat in the **Federal Register** notice of the proposed IHA, marine mammals may avoid areas of impact pile driving (*e.g.*, Tougaard *et al.*, 2009; Dähne *et al.*, 2013; Thompson *et al.*, 2013; Russell *et al.*, 2016; Brandt *et al.*, 2018).

Also, the Biological Opinion specifies that while NMFS is “not able to predict the extent to which the soft start will reduce the number of whales exposed to pile driving noise or the extent to which it will reduce the duration of exposure. Therefore, while the soft start is expected to reduce effects of pile driving, we are not able to modify the estimated take numbers to account for any benefit provided by the soft start.” This language appropriately expresses the expected benefits of soft start, while acknowledging that they are difficult to quantify, which is why there are no adjustments to take numbers based on the fact that soft start is required.

*Comment 12:* Multiple commenters cite the Rand Acoustics report (Rand, 2024) as calculating acoustic impacts greater than estimated by Vineyard Wind 1 and indicating the need for larger clearance zones. Rand Inc., (2024) asserts that pile driving noise rivals the loudness and frequency range of seismic air gun arrays. Commenters claim that

the proposed clearance and shutdown zones are insufficient to effectively reduce impacts to marine mammals because sound exposure, in terms of impulsive and continuous noise levels, is underestimated. Commenters indicate that more research on marine mammal avoidance of impulsive sound should be incorporated into the analysis to determine how to expand mitigation zones, and that the current mitigation zones for endangered species are not large enough. One commenter further notes without justification that all mitigation zones, as well as clearance and shutdown procedures, proposed for North Atlantic right whales should be applicable to all endangered marine mammal species, specifically the sperm whale, fin whale, and sei whale.

*Response:* NMFS reviewed the Rand Inc. (2024) report and found that the initial modeling done for Vineyard Wind 1 considered source levels reasonably consistent with both Rand’s results and the Vineyard Wind 1 2023 SFV report. The extensive measurements performed during the 2023 IHA for Vineyard Wind 1 construction allowed NMFS an opportunity to review data collected at several distances from the source. Based on those data, NMFS has determined that the distances to the Level A and Level B harassment thresholds (and any associated mitigation zones) during the 2024 Phase 2 pile installation activities are reasonable estimates based on the best available science. The results show that for Level A harassment, the model predicted acoustic ranges were on average conservative. Therefore, considerations related to Level A take based on the initial modeling were validated by the 2023 SFV campaign. For Level B, the IHA analysis here was based directly on applicable measurements from the 2023 campaign. Thus, with regard to impact pile driving, NMFS’s acoustic ranges and take estimates are well supported by extensive field measurements, are consistent with the data presented in Rand (2024), and therefore do not warrant revisions.

NMFS disagrees that expanded shutdown and clearance zones are necessary under the least practicable adverse impact standard for marine mammal species or stocks, including those listed under the ESA. As described in the *Proposed Mitigation* section in the **Federal Register** notice for the proposed IHA and the Mitigation section of this notice, there is a required shutdown if a North Atlantic right whale is visually observed at any distance or acoustically detected within the 10 km PAM monitoring zone. In



addition, impact pile driving may not begin if a North Atlantic right whale is visually sighted or acoustically detected within the pre-start clearance zone at any distance during the 30-minute clearance period. NMFS neither anticipates nor authorizes any take by Level A harassment of North Atlantic right whales.

Some mitigation measures in the IHA are centered around North Atlantic right whales because of the species status and general fitness of individuals. NMFS acknowledges that seasonal closures are based on North Atlantic right whale densities and that the maximum density months for other ESA-listed species may occur outside of the seasonal closures. Other enhanced mitigation for North Atlantic right whales includes delaying or shutting down pile driving should a North Atlantic right whale be observed at any distance by a foundation installation PSO or acoustically detected within the PAM monitoring zone. If clearance and shutdown zones were increased for other ESA-listed species, it would result in longer construction time frames, prolonging the time periods over which marine mammals may be exposed to construction-related stressors, as well as creating impracticable operational scenarios for the applicant. It has been modeled and is logical that projects should be constructed as quickly as possible during times when the potential for a species of concern to be present is lowest (Southall *et al.* 2021). Accordingly, NMFS has determined that the current clearance and shutdown zones together with other mitigation measures effect the least practicable adverse impact on the affected species or stocks of marine mammals.

*Comment 13:* A commenter states that the proposed shutdown procedures are not strict enough and should be more comparable to oil/gas authorizations that require shutdown for live marine mammal strandings and “millings within 50 km of survey operations.”

*Response:* NMFS agrees that the addition of the measure the commenter recommended is appropriate and has added a measure to the IHA for Vineyard Wind 1 to cease pile driving in the event of a live cetacean stranding (or near-shore atypical milling) event within 50 km of the pile driving operations, where the NMFS Marine Mammal Stranding Network is engaged in herding or other interventions to return animals to the water.

*Comment 14:* While commenters acknowledge that time of year restrictions on pile driving are effective mitigation measures, multiple commenters suggested that the proposed

seasonal restrictions are insufficient as the restriction period does not account for North Atlantic right whales, sperm whales, and fin whales in the Project Area outside of those months. Commenters further note that endangered marine mammal species are present in the Project Area year-round, especially North Atlantic right whales during the late summer.

*Response:* NMFS has restricted foundation installation pile driving from January through May, which represents the period when North Atlantic right whales are most likely to be in the Project Area in higher numbers and engaged in foraging behavior. A commenter indicated that the seasonal restriction period of January through May does not account for the heightened presence of North Atlantic right whales in southern New England during the late summer (Quintana-Rizzo *et al.*, 2021). However, North Atlantic right whale presence during the summer is typically closer to Nantucket Shoals (Quintana-Rizzo *et al.*, 2021; Van Parijs *et al.*, 2023) and not concentrated within the lease area or the LIA. In addition, North Atlantic right whale densities are highest in the lease area and LIA from January through May (Roberts *et al.*, 2023), further supporting that period as an appropriate time frame for implementing seasonal restrictions for North Atlantic right whales. NMFS acknowledges that seasonal closures are based on North Atlantic right whale densities and the maximum density months for other ESA-listed species, such as fin whales and sperm whales, and stocks experiencing UMEs, such as minke whales, may occur outside of the seasonal closures (table 9). However, no UMEs are active for ESA-listed marine mammals other than the North Atlantic right whale and there is other mitigation for those species. See Comment 12 for additional detail on implementing additional mitigation measures for Endangered Species Act (ESA)-listed and species and stocks experiencing UMEs.

Seasonal restrictions are not in place from June through December because North Atlantic right whale densities are lower. During those months pile driving may take place, Vineyard Wind 1 is required to implement mitigation measures during pile driving to reduce impacts to marine mammals. These mitigation measures include clearance and shutdown zones, visual and acoustic monitoring of zones by PSOs and PAM operators, and use of noise attenuation devices to reduce impacts to marine mammals. These measures are consistent with those required and successfully implemented under

previous incidental take authorizations, as described in the Mitigation section. Furthermore, VW1 is required to establish stronger mitigation measures for endangered species, such as fin whales and sperm whales; for example those species have larger clearance and shutdown distances than other marine mammals.

During November and December, Vineyard Wind 1 will be required to follow enhanced mitigation measures if impact pile driving occurs. From November 1–December 31, if pile driving has been shut down or delayed due to the presence of 3 or more North Atlantic right whales, pile driving will be postponed until the next day. As December represents the highest density month for North Atlantic right whale outside of the January through May restriction, Vineyard Wind 1 will be required to follow additional enhanced measures beyond those required in November. In December, Vineyard Wind 1 must conduct, in addition to PAM, extended surveys using the dedicated PSOs vessels prior to starting or resuming pile driving as described in their Pile Driving Monitoring Plan. With the application of these enhanced mitigation and monitoring measures in November and December, impacts to NARW will be further reduced. Accordingly, NMFS has determined that the seasonal restrictions, together with other mitigation measures, effect the least practicable adverse impact on marine mammals.

*Comment 15:* One commenter claims that as more research is needed on marine mammal hearing, the precautionary principle should be employed by expanding mitigation zones, increasing accountability of vessel operators to offshore wind vessels, applying more checks and balances to those conducting construction activities, and reviewing vessel transcripts. The commenter specifically states that limited data on PTS onset thresholds as a result of data coming from the same species and/or same captive animals results in dependent data sets, and requests that 6 month moratorium be placed on all east coast wind projects until detailed study can be conducted by independent researchers.

*Response:* MMPA and its implementing regulations require that IHAs be issued based on the best scientific evidence available, if the required findings can be made. NMFS agrees with the commenter that additional research will continue to improve our understanding of the impacts of anthropogenic noise on marine mammal hearing, yet disagrees

that expanded mitigation and monitoring measures or a moratorium on east coast wind projects are necessary under the least practicable adverse impact standard. See Comment 26 for details on data related to PTS onset thresholds. The IHA includes general conditions to hold Vineyard Wind 1 and its designees (including vessel operators and other personnel) accountable while performing operations under this IHA. In addition to requiring Vineyard Wind 1 to abide by vessel strike avoidance measures and a NMFS-approved marine mammal vessel strike avoidance plan, Vineyard Wind 1 is also required to equip all vessels with properly installed, operational Automatic Identification System (AIS) device and report all Maritime Mobile Service Identity (MMSI) numbers to NMFS. See Comment 12 for additional detail on expanding mitigation zones. The required mitigation and monitoring measures described in the **Federal Register** notice for the proposed IHA and this notice were designed based upon the best available science. In terms of a moratorium on east coast wind projects, it is beyond the scope of NMFS' authority to place a moratorium on these projects as NMFS only authorizes marine mammal take incidental to an activity (provided we make the necessary findings) and not the activity itself.

*Comment 16:* One commenter notes that the vessel speed restriction of traveling a maximum of 10 kn (11.5 mph) does not apply to crew transfer vessels. The commenter suggests that these restrictions should apply to crew transfer vessels as these vessels undertake the majority of project trips.

*Response:* NMFS agrees with the commenter that the vessel speed restriction of traveling a maximum of 10 kn (11.5 mph) should apply to all project vessels in a transit corridor if PAM is not used to monitor the transit corridor. NMFS included this measure in the **Federal Register** notice for the proposed IHA as well as the final IHA.

*Comment 17:* A commenter notes that the IHA should be more specific in defining the vessel transit corridor.

*Response:* NMFS appreciates the commenter's request to define the vessel transit corridor. The transit corridor is defined as the route a vessel takes from a port to the lease area and return. This definition is provided in the Vessel Strike Avoidance Measures section of this **Federal Register** notice as well as condition 5(b)(viii) of the IHA.

#### *Monitoring, Reporting, and Adaptive Management*

*Comment 18:* Multiple commenters claim that NMFS should require 100 percent on board agency enforcement coverage during the proposed Vineyard Wind 1 construction activities instead of allowing self-reporting and self-verification of acoustic impacts by Vineyard Wind 1, specifically regarding critically endangered species. The commenters further note that NMFS should require enforcement personnel on board project vessels or camera coverage of all offshore wind activity with camera footage that is reviewed by NOAA's Office of Law Enforcement (OLE). In order to verify that Vineyard Wind 1 adheres to all sound attenuation measures, a commenter further recommends that NMFS place an Office of Protected Resource "observer" on the vessel to confirm sound attenuation for each monopile. A commenter also suggests that NMFS hire a third-party safety officer to observe pile driving, confirm pile refusal or use of lower hammer energies, and create a safety plan for PSOs and PAM operators in the event of pile refusal.

*Response:* The IHA requires multiple mitigation and monitoring measures to effect the least practicable adverse impact on affected species or stocks of marine mammals, as well as extensive reporting requirements that document compliance and observed marine mammal responses to the activities by independent NMFS-approved PSOs. In terms of vessel strike avoidance measures, NMFS maintains an Enforcement Hotline for members of the public to report violations of vessel speed restrictions. While it is beyond the scope of 101(a)(5)(D) of the MMPA to include requirements of NMFS OLE personnel, the IHA includes two provisions related to the commenters recommendation: one states that by accepting the issued IHA, Vineyard Wind 1 consents to on-site observation and inspections by Federal agency personnel (including NOAA personnel) during activities this IHA covers, for the purposes of evaluating the implementation and effectiveness of measures contained within the IHA; the other states that it is prohibited to assault, harm, harass (including sexually harass), oppose, impede, intimidate, impair, or in any way influence or interfere with a PSO, PAM Operator, or vessel crew member acting as an observer, or attempt the same. This prohibition includes, but is not limited to, any action that interferes with an observer's responsibilities, or that creates an intimidating, hostile, or

offensive environment and indicates that personnel may report any violations to the NMFS Office of Law Enforcement.

NMFS is also not requiring additional observers to "confirm sound attenuation" for each monopile. As described in both the **Federal Register** notice for the proposed IHA and this notice, NMFS has included requirements for sound attenuation methods that were previously evaluated in SFV measurements conducted during Vineyard Wind 1 construction activities in 2023. Further, additional in situ SFV measurements will be conducted to ensure that sound levels are at or below those modeled (assuming 6 dB attenuation for Level A harassment) or those measured and expected (for Level B harassment) in 2023. In addition, Vineyard Wind 1 will be required to follow specific protocol when conducting SFV measurements, as described in conditions 5(a)(xvi–xxi) in the IHA, and report SFV measurements to NMFS Office of Protected Resources within 48 hours of each foundation installation as well as on a weekly, monthly, and annual basis. Frequent reporting will ensure that NMFS is aware of any threshold exceedances and the measures Vineyard Wind 1 would be implementing to ensure the Level A and Level B harassment isopleths do not exceed those modeled or expected for foundation installation.

*Comment 19:* One commenter expressed concern that NMFS should hold Vineyard Wind 1 accountable for maintaining sound levels during construction activities. The commenter further noted that submitting final SFV measurements within 90 days of completing SFV is not acceptable and removes accountability from Vineyard Wind 1. The commenter suggested that NMFS should require Vineyard Wind 1 to complete the final results of SFV measurements within 48 hours of pile driving completion for each pile, instead of 90 days, and future piles should be dependent upon completion, review, and NMFS acceptance of daily SFV reports. Another commenter suggested that each monopile should be required to have its own SFV measurements registered throughout pile driving with a NMFS observer who can monitor and stop by pile driving, if necessary, until attenuation is achieved.

*Response:* NMFS agrees with the commenters that Vineyard Wind 1 should be held accountable for maintaining sound levels analyzed for the IHA during construction activities, though, as described above in Comment 18, while

it is possible to measure the overall sound levels that include the NAS, there is no way to specifically confirm a 6-dB sound reduction as compared to an unattenuated pile. *In situ* measurements will continue to be conducted to verify sound levels are at or below those modeled or measured, as specified.

Although NMFS requires a SFV report to be submitted within 90 days of activity completion, NMFS also requires Vineyard Wind 1 to review SFV results within 24 hours and submit weekly, monthly, annual, and situational reports. As described in the **Federal Register** notice for the proposed IHA and this notice, Vineyard Wind 1 is required to provide the initial results of the SFV measurements to NMFS in an interim report after each foundation installation event as soon as they are available and prior to a subsequent foundation installation, but no later than 48 hours after each completed foundation installation event. In addition, each monopile must be acoustically monitored either using thorough SFV or abbreviated SFV. Again, it is not known if attenuation is achieved until results are reviewed within 24 hours, however, if SFV measurements exceed those distances that are modeled (Level A harassment) or measured (Level B harassment), Vineyard Wind 1 must notify NMFS and implement mitigative measures, as described in condition 5(a)(xxi) of the IHA.

*Comment 20:* A commenter claims that it is insufficient to visually and acoustically monitor for marine mammals for only 1 hour prior to beginning construction activities. Another commenter further indicates that NMFS should require two active PAM operators (instead of one) to increase situational awareness and active monitoring of hydrophones during the 60 minute pre-start clearance period.

*Response:* NMFS agrees with the commenter that monitoring more than one hour prior to beginning construction is appropriate. In addition to a 60 minute pre-start clearance period for visual observation and the requirement for PAM operator(s) to actively monitor hydrophones for 60 minutes prior to commencement of construction activities, both the proposed and final IHA include a requirement that Vineyard Wind 1 must also review PAM data collected for at least 24 hours in advance of pile driving activity to increase situational awareness of marine mammals in the area. Davis et al. (2023) found that by increasing pre-construction acoustic monitoring from 1 hour to 18 hours

increased the likelihood of detecting a North Atlantic right whale from 4 percent to 74 percent.

At least one PAM operator is required to actively monitor and review PAM data from at least the past 24 hours to increase situational awareness. However, the number of active on-duty PAM operators must be sufficient to meet the requirements of the IHA. Vineyard Wind 1 is required to submit a PAM Plan for NMFS approval, which will specify the planned number of PAM operators that would be active to meet the IHA requirements.

*Comment 21:* Commenters claim that PSOs have poor detection capabilities and should not be relied upon for monitoring, most notably in low visibility conditions. A commenter cited the Williams *et al.* (2016) study, specifically noting that in the “worst visibility conditions” PSO detection probability was near zero at 1,000 m and did not exceed 50 percent until the distance is less than about 500 meters. The same commenter also indicated that the “overall efficacy of PSOs is approximately 9 percent in detection” and the “overall efficacy” of PAM “is approximately 25 percent.” A commenter further claims that PAM and low visibility equipment (*i.e.*, night vision goggles, infrared devices) proposed for monitoring are not effective and offer unreliable rates of detection, citing that PAM as a monitoring tool includes numerous limitations such as detecting marine mammals when they are not actively vocalizing and vocalizations of sufficient magnitude.

*Response:* NMFS disagrees that monitoring using a combination of PSOs and PAM will not be effective at detecting marine mammals. As described in the **Federal Register** notice for the proposed IHA, NMFS is requiring that Vineyard Wind 1 employ both visual and PAM methods for monitoring. Visual and PAM approaches are well understood to provide best results when combined together (*e.g.*, Barlow and Taylor, 2005; Clark *et al.*, 2010; Gerrodette *et al.*, 2011; Van Parijs *et al.*, 2021). The use of PAM will augment visual detections for foundation pile driving, especially for activities with the largest zones. NMFS is requiring the use of PAM to monitor 10 km zones around the piles and that the systems be capable of detecting marine mammals during pile driving within this zone. For these reasons, NMFS finds that the suite of visual and acoustic monitoring measures in the **Federal Register** notice for the proposed IHA and carried forward in the IHA are based on the best

available scientific information and are effective at detecting marine mammals.

We recognize that the distances at which marine mammals may be observed are both species and weather dependent. The commenter relies on Williams *et al.* (2016), in claiming that PSO detection probability was near zero at 1,000 m, however, this detection probability was based upon monitoring during poor visibility conditions. As visibility conditions improved during the study, PSO detection probability increased. Under this IHA, Vineyard Wind 1 is required to conduct monitoring in a manner such that PSOs can visually monitor an area no smaller than the minimum visibility zone (4,000 m; 13,123 ft). Pile driving may not occur in any conditions (including poor visibility conditions such as fog, rain, or darkness) if PSOs are not able to sight marine mammals in this minimum visibility zone out to this distance. During construction of Vineyard Wind 1 in 2023 and South Fork Wind, PSOs observed baleen whales at ranges as distant as 4 km (13, 123 ft) and 23 km (75,459 ft), respectively (RPS, 2024; South Fork Wind, 2024). The commenter did not provide evidence to support claims the minimum visibility zone could not be effectively monitored during good weather conditions, and NMFS disagrees with the commenters that, during good weather conditions, Vineyard Wind 1 would not be able to effectively monitor the minimum visibility zone.

NMFS recognizes that visual detection may not be 100 percent effective. Animals may be missed because they are underwater (*i.e.*, availability bias) or because they are available to be seen but are missed by observers (*i.e.*, perception and detection biases) (*e.g.*, Marsh and Sinclair, 1989). However, visual observation remains one of the best available methods for marine mammal detection.

The commenter indicates that PAM is limited to only detecting animals that are vocalizing, and vocalizations must be of “sufficient magnitude to surmount background noise” and be detected at the receiving station. NMFS acknowledges these limitations, however, there are a wide variety of PAM systems available on the market (van Parijs *et al.*, 2021), ranging from omnidirectional independent acoustic buoys to multi-channel hydrophone arrays that are capable of detecting marine mammals in real-time. Real-time (or near real-time) stationary and mobile PAM systems are currently being used to inform management decisions and literature supports the effectiveness of real-time PAM at detecting marine

mammals, including North Atlantic right whales (Ceballos *et al.*, 2022; Murray *et al.*, 2022; Baumgartner *et al.*, 2020; Baumgartner *et al.*, 2019). In 2023, Vineyard Wind documented 253 acoustic detections of protected species during the project (with and in the absence of pile driving). Of the detections, 206 detections were unidentified dolphin, 45 detections of fin whales, and two detections of unidentified baleen whales (RPS, 2024). Vineyard Wind 1 is required to submit a PAM Plan to NMFS that demonstrates the system will be able to detect North Atlantic right whales at ranges up to 10 km (32,808.4 ft). To date, offshore wind developers have used bottom-mounted PAM systems located at distance from piles being installed. The final IHA requires the PAM system be placed no closer than 1 km (3,280.8 ft) from the pile being installed to minimize masking of North Atlantic right whale calls by construction noise.

*Comment 22:* A commenter indicates that all reports of endangered species should be logged and reported to NMFS within 24 hours.

*Response:* As described in the proposed IHA, Vineyard Wind 1 is required to report North Atlantic right whale sightings and acoustic detections to NMFS within 24 hours. As mentioned above in Comment 12 above, some mitigation, monitoring, and reporting measures are focused on North Atlantic right whales due to the species status and general fitness of individuals. It is not practicable or necessary to require Vineyard Wind 1 to report all sightings of endangered species to NMFS within 24 hours, unless a detection is of an injured, entangled, or dead marine mammal (see *Reporting* section of Monitoring and Reporting), and the commenter does not provide a rationale for the recommended change. However, all whale sightings must be reported to vessel captains and PSOs. In addition, NMFS is requiring all acoustic and visual detections of marine mammals to be submitted in weekly, monthly, and annual reports. NMFS disagrees that more frequent reporting of all ESA-listed marine mammal species is necessary and considers the required monitoring and reporting requirements in the IHA to be robust and appropriate.

#### *Effects Assessment*

*Comment 23:* Multiple commenters have expressed concern for impacts of offshore wind construction activities on marine mammal prey. One commenter expressed concern specifically regarding impacts to North Atlantic right whale prey, such as copepods, due to heat emanating from electric cables

associated with offshore wind farm development. In addition, commenters express concern for operational impacts on North Atlantic right whale prey. One commenter indicates that based upon the size of the turbines, impacts to North Atlantic right whale prey could occur up to 60 miles outside of the Lease Area. Another commenter notes that the **Federal Register** notice for the proposed IHA also does not address potential operational impacts to water circulation patterns that produce zooplankton aggregations near Nantucket Shoals. The commenter claims that due to the overlap between a NOAA conservation buffer near Nantucket Shoals and the Project Area, NMFS should not issue the IHA to Vineyard Wind 1.

*Response:* In the **Federal Register** notice for the proposed IHA, NMFS considered the potential impacts of structures and operational noise on marine mammals and their habitat, including prey, based on the best available science (see the *Potential Effects to Marine Mammal Habitat and Potential Effects from Offshore Wind Farm Operational Noise* in the **Federal Register** notice for the proposed IHA). NMFS provides further analysis of the impacts of turbine operation on marine mammal habitat and prey in the *Impact on Habitat and Prey* section of the Negligible Impact Analysis and Determination section of this **Federal Register** notice as well as in the reinitiated Biological Opinion. The commenter did not provide scientific evidence that suggests the analysis within the **Federal Register** notice for the proposed IHA was unsupported. NMFS has fully evaluated the potential impacts of both issuing this IHA over the one-year effective period and the potential impacts from long-term operations via the Biological Opinion (BiOp). We refer the reader to the Potential Effects of the Specified Activities on Marine Mammals and Their Habitat section and the Negligible Impact Determination section in the proposed and final IHA notice for further details.

NMFS is evaluating the effects of authorizing the take of marine mammals incidental to pile driving 15 monopile foundations. Vineyard Wind operations commenced in 2023 and would be ongoing without installation of the remaining piles. BOEM is the agency responsible for approving construction and operations of offshore wind farms. Impacts to the environment for other project related activities such as sending power to shore through buried electric cables was analyzed in BOEM's Environmental Impact Study (EIS) for

the Project and are outside the scope of the NMFS' MMPA decision.

*Comment 24:* Commenters claim that due to impacts to the North Atlantic right whales, the proposed IHA violates the Endangered Species Act (ESA) and reinitiation of consultation indicates that Vineyard Wind 1 was not compliant with the 2021 IHA. In addition, one commenter suggests that all reasons and information necessitating the reinitiation of the Vineyard Wind 1 Biological Opinion be made available for public comment including an extension to the public comment period.

*Response:* NMFS disagrees with commenters that the proposed IHA violates the ESA or that the reinitiation of the consultation indicates that Vineyard Wind was not compliant with the 2023 IHA. On May 23, 2024, NMFS Office of Protected Resources reinitiated its ESA section 7 consultation due to consideration of updated marine mammal density data which have become available since issuance of the 2023 IHA and analysis of SFV data collected by Vineyard Wind 1 during the 2023 construction campaign in the analysis for this IHA. NMFS also considered modified mitigation and monitoring measures in this analysis. NMFS Greater Atlantic Regional Fisheries Office (GARFO) completed its consultation on August 23, 2024 and concluded that the proposed actions were likely to adversely affect but were not likely to jeopardize the continued existence of the North Atlantic right whale, fin whale, sei whale, or sperm whale. The reasons and information necessitating the reinitiation of the Vineyard Wind 1 Biological Opinion are described in the Endangered Species Act section of this **Federal Register** notice. The **Federal Register** notice for the proposed IHA also described the request for reinitiation of consultation. NMFS did not deem extension of the public comment period for the proposed IHA necessary or appropriate.

*Comment 25:* Multiple commenters claim that NMFS did not evaluate the cumulative effects of all projects (e.g., the offshore wind projects of other companies) on marine mammals. One commenter claims that NMFS should conduct a cumulative impact assessment of all offshore wind surveys and construction projects on marine mammals. Another commenter further notes that "dividing and segmenting the estimated take analysis for Vineyard Wind 1 across two years provides an inaccurate picture of total and cumulative effects" on North Atlantic right whales.

*Response:* NMFS is required to authorize the requested incidental take of small numbers of marine mammals of a species or stock by U.S. citizens if it finds the total take “while engaging in that (specified) activity” within a specified geographical region will have a negligible impact on such species or stock and, where applicable, will not have an unmitigable adverse impact on the availability of such species or stock for subsistence uses (16 U.S.C. 1371(a)(5)(A)). Negligible impact is defined 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 effect on annual rates of recruitment or survival” (50 CFR 216.103). Consistent with the preamble of NMFS’ implementing regulations (54 FR 40338, September 29, 1989), the impacts from other past and ongoing anthropogenic activities are factored into the baseline, which is used in the negligible impact analysis. Here, NMFS has factored into its negligible impact analysis the impacts of other past and ongoing anthropogenic activities via their impacts on the baseline (*e.g.*, as reflected in the density/distribution and status of the species, population size and growth rate, and other relevant stressors).

The preamble of NMFS’ implementing regulations also addresses cumulative effects from future, unrelated activities. Such effects are not considered in making the negligible impact determination under MMPA section 101(a)(5). NMFS considers: (1) cumulative effects that are reasonably foreseeable when preparing a National Environmental Policy Act (NEPA) analysis; and (2) reasonably foreseeable cumulative effects under section 7 of the ESA for ESA-listed species, as appropriate. Accordingly, NMFS has reviewed BOEM’s 2021 EIS as part of its inter-agency coordination and determined that the analysis in the 2021 EIS for the Vineyard Wind 1 Offshore Wind Project is sufficient to cover the more limited scope of the remaining construction activities for this project. The EIS addresses cumulative impacts related to the Project and substantially similar activities in similar locations. Cumulative impacts regarding the issuance of an IHA for construction activities planned by Vineyard Wind 1 have been adequately addressed in the adopted EIS that supports NMFS’ determination that this action has been appropriately analyzed under NEPA. Separately, the cumulative effects of the Project on ESA-listed species, including the North Atlantic right whale, were

analyzed in NMFS’ biological opinion issued under section 7 of the ESA following formal inter-agency consultation with the NOAA Greater Atlantic Regional Field Office (GARFO). Following reinitiated consultation on May 23, 2024, GARFO issued a new BiOp that determined that NMFS’ issuance of an IHA for construction activities, individually and cumulatively, are likely to adversely affect, but not jeopardize, listed marine mammals.

NMFS disagrees that dividing estimated take analysis for Vineyard Wind 1 across two years provides an inaccurate picture of cumulative effects on North Atlantic right whales. The take authorized in this IHA represents a subset of the take authorized under the 2023 IHA and is based upon the reduced scope of work remaining for the project. As NMFS has determined the 2021 EIS remains appropriate for this analysis, cumulative effects on marine mammal species, including North Atlantic right whales, are taken into account.

*Comment 26:* Citing to new data in Finneran *et al.* (2023), commenters raise questions about the validity of NMFS’ current noise exposure guidelines for dolphins at frequencies below ~1kHz and how to accurately estimate received noise levels from free-swimming animals. Commenters recommend NMFS conduct a new analysis and enlarge the exclusion and clearance zones for marine mammals, particularly bottlenose dolphins and long finned pilot whales. Commenters also criticize specific facets of the methodology in NMFS 2018 Revised Technical Guidance, suggest the need for additional research, and suggested ongoing construction at Vineyard Wind cease or the IHA be withdrawn until NMFS updated its PTS/TTS thresholds for mid-frequency cetaceans.

*Response:* NMFS disagrees that the analysis or mitigation zones for marine mammals (and MF species specifically) require adjustments and that the IHA process be paused (or withdrawn) until more information is known on whether animals will move out of the area or NMFS finalizes updates to the 2018 Technical Guidance. Under section 101(a)(5)(D) of the MMPA, NMFS is required to issue the IHA if the taking will be for small numbers of the affected species or stocks and if NMFS is able to make the statutorily required negligible impact finding. Among other things, the IHA must prescribe the means of effecting the least practicable adverse impact on the affected species or stocks and their habitat. All of these standards

are based on the best available information.

Our analyses for predicting auditory impacts on marine mammals are based primarily on our 2018 Technical Guidance for Assessing the Impacts of Anthropogenic Sound on Marine Mammal Hearing (NMFS, 2018). NMFS is currently in the process of updating that Technical Guidance, following a rigorous process involving external peer review, Federal agency review, and public comment (89 FR 36762, May 3, 2024). As the commenter notes, Finneran *et al.* (2023) suggests that high-frequency cetaceans (formerly classified as mid-frequency cetaceans in our 2018 Revised Technical Guidance) are more susceptible to noise-induced hearing loss below 1 kHz that previously thought, which will likely result in a change in the Technical Guidance. However, given the rigorous review process to update the Technical Guidance is not complete, the future updates are not quantitatively applied to this project. We note, however, potential anticipated changes to the Technical Guidance would not be expected to change the findings that support the issuance of this IHA.

Regarding some of the specific methodological concerns raised by commenters, NMFS disagrees that the use of means and medians is inappropriate or that the methodology should be compared to that used in the calculation of potential biological removal (PBR). The Technical Guidance’s methodology is designed to predict the mostly likely (realistic) outcome using the central tendencies (means/median) associated with the best available science. The intent is not to predict the worst-case-scenario by relying on the lowest limits for every possible step in the methodology (*i.e.*, Technical Guidance is for accurately predicting exposures and not for establishing “safe limits,” where there is limited to no risk). Further, within the development of the criteria, several assumptions were made to address uncertainty, including the amount of threshold shift defining TTS onset (*e.g.*, 6 dB threshold shift, which is the minimum threshold shift clearly larger than any day-to-day or session-to-session variation) and PTS onset (40 dB shift, where there have been no reports of PTS in a marine mammal whose initial behavioral threshold shift was 40 dB or less) and that there is no recovery between intermittent exposures. Regarding the observation that the data upon which the Technical Guidance is based are limited in some ways, we do not disagree, but are nonetheless charged with basing our analyses on the

best available information and have described a reasonable methodology that does so.

Contrary to the commenters' assertions, NMFS has not drawn any conclusions about TTS based on PSO observations and a commenter incorrectly implies that the clearance and shutdown zones in the proposed IHA, including the 160-m zone for dolphins, are intended to avoid TTS. As described in the **Federal Register** notice for the proposed IHA, NMFS does not quantitatively distinguish Level B harassment in the form of direct behavioral disturbance from a disruption of behavioral patterns resulting indirectly from TTS, but, rather, notes that the predicted takes by Level B harassment could include either. Moreover, the distances at which TTS onset is likely are smaller relative to those where behavioral disruption without any TTS is expected. Regarding the comment related to auditory brainstem response (ABR), NMFS disagrees that conclusions in Finneran *et al.* 2023 cast doubt on the NMFS TTS threshold methodology generally for all species. The results of Finneran *et al.* 2023 show that hearing and TTS data, relying on behavioral methodology, cannot be directly compared to measurements using ABR methods. Finneran *et al.* 2023 indicate "Correlation between TTS measured behaviorally and with ABRs was weak (figure 13) and ABR-measured TTS was typically lower and more variable than that measured behaviorally for the same exposure" and later that "In practice, however, ABR measurements in the present study provided only limited value." While we acknowledge the differences in these two methods in predicting TTS onset, especially at lower frequencies, the information does not support the commenters assertion that NMFS analysis needs to change or that mitigation zones must be enlarged, since, as noted above, the analysis already acknowledges that the potential for TTS in the quantified takes by Level B harassment and the mitigation zones are intended to avoid or minimize PTS, not TTS. Finally, the relationship between ABR and behavioral hearing measurements is not relevant to PSO observations of behavior.

Finally, regarding our mitigation under the applicable least practicable adverse impact standard, our proposed IHA notice explains clearance and shutdown zones are intended to avoid or minimize the likelihood of Level A harassment and reduce the severity or likelihood of Level B harassment. Importantly, the size of the clearance and shutdown zones for all marine

mammals is larger than the modeled Level A harassment (PTS) distances which, based on SFV data from the 2023 pile driving season, is an overestimate. Specifically for mid frequency cetaceans, the estimated distance to PTS is 43 m; however, the clearance and shutdown zone is set at 160 m due to presence of the bubble curtain. For the North Atlantic right whale, the distance to the clearance and shutdown zone is independent of both PTS and TTS in that they are any distance by PSOs or within 10 km if acoustically detected.

*Comment 27:* Multiple commenters urged NMFS to deny the proposed project and/or postpone any offshore wind activities until NMFS determines effects of all offshore wind activities on marine mammals in the region and determines that the recent whale deaths are not related to OSW activities. Similarly, some commenters provided general concerns regarding recent whale stranding events on the Atlantic Coast, including speculation that the strandings may be related to wind energy development-related activities. A commenter further states that offshore wind construction activities have been linked to marine mammal injury and deafness.

*Response:* While NMFS acknowledges that offshore wind development activities, including HRG survey effort, have increased in the Atlantic Ocean during the time period of increased whale strandings, there is no scientific evidence that these development activities, such as HRG survey effort and turbine construction, are contributing factors to the strandings. Further, HRG surveys are not part of the specified activity. NMFS does not agree that mortality is an anticipated outcome of these specified activities, and there is no evidence to suggest otherwise, as described below. Further, the proposed IHA (89 FR 31008, April 23, 2024) clearly states that no serious injury and/or mortality was requested by Vineyard Wind 1, is expected, or was proposed to be authorized.

The best available science indicates that the anticipated impacts from pile driving of turbines potentially include temporary avoidance of localized areas, cessation of foraging or communication, TTS, stress, masking, *etc.*, (as described in the Effects of the Specified Activities on Marine Mammals and their Habitat section in the **Federal Register** notice for the proposed IHA). NMFS emphasizes that there is no evidence that noise resulting from offshore wind development would cause marine mammal strandings, and there is no evidence linking recent large whale mortalities and currently ongoing

offshore wind activities (*e.g.*, HRG surveys or construction). The commenters offer no such evidence or other scientific information to substantiate their claim. This point has been well supported by other agencies, including the Marine Mammal Commission (Marine Mammal Commission Newsletter, Spring 2023). Additionally, a recent paper by Thorne and Wiley (2024) reviewed spatiotemporal patterns of strandings, mortalities, and serious injuries of humpback whales along the U.S. East Coast from 2016–2022. Humpback whales were chosen as a case study for this analysis as they are currently undergoing a UME and strand more often than other large whale species. Thorne and Wiley (2024) found vessel strikes to be a major driver in the increase of humpback whale strandings, mortalities, and serious injury along the east coast. The potential for vessel strike increased during the study period due to increased vessel traffic in new foraging areas, the increased presence of juvenile humpback whales, and humpback whale foraging in shallow areas that overlap with vessel traffic. Based upon the spatiotemporal analysis, no evidence was found that offshore wind development played a role in the increased number of strandings over time. Future studies should focus on gaining a greater understanding of spatial and seasonal habitat use patterns of large whales, spatiotemporal changes in prey abundance and distribution, and how habitat use and foraging behavior affect the risk of vessel strike. While several species of delphinids and beaked whales have also stranded off New Jersey since 2011 (per data provided from the National Marine Stranding Network), there is no evidence that the acoustic sources used during HRG surveys contributed to these events. NMFS will continue to gather data to help us determine the cause of death for these stranded whales.

Recently, NMFS was made aware of a media article wherein a member of the public conducted a statistical analysis on the correlation between offshore wind vessel use and whale deaths along the U.S. east coast (Climate Change Dispatch, 2024). The parameters considered in the analysis were limited to offshore wind vessel movement and whale deaths. NMFS has long recognized that marine mammal strandings have increased over the years, including increases in strandings of three large whale species resulting in the declaration of Unusual Mortality Events for minke, humpback, and North

Atlantic right whales in 2018, 2017, and 2017 respectively. Offshore wind development has increased over the same time period, so the correlation was not surprising. However, the analysis presented in the article was not peer-reviewed, was limited, not fully described, does not appear to separate out vessel movement from survey activities, did not consider other known factors that are increasing ship strike risk in general (e.g., Thorne and Wiley, 2024) or other factors leading to increased strandings (e.g., entanglement, climate change), and did not demonstrate that offshore wind vessel traffic or HRG surveys are the cause of strandings. Overall, while NMFS considered this information, it did not provide new information that links whale strandings to offshore wind vessel movement or surveys.

There is an ongoing UME for humpback whales along the Atlantic coast from Maine to Florida, which includes animals stranded since 2016, and we provide further information on the humpback whale and North Atlantic right whale UMEs in the Description of Marine Mammals in the Area of Specified Activities section of this notice. For humpback whales, partial or full necropsy examinations were conducted on approximately half of the whales that were recently stranded along the U.S. East Coast. Necropsies were not conducted on other carcasses because they were too decomposed, not brought to land, or stranded on protected lands (e.g., national and state parks) with limited or no access. Of the whales examined (roughly 90), about 40 percent had evidence of human interaction, either ship strike or entanglement. Vessel strikes and entanglement in fishing gear are the greatest human threats to large whales. The remaining 50 necropsied whales either had an undetermined cause of death (due to a limited examination or decomposition of the carcass) or had other causes of death including parasite-caused organ damage and starvation. For North Atlantic right whales, starting in 2017, evaluated mortalities were documented in both Canada and the United States, with the whales documented for this UME as being dead, injured, and/or sick to the extent that more than 20 percent of the population has been affected. The preliminary cause of mortality, serious injury, and morbidity (sublethal injury and illness) in most of these whales is from entanglements or vessel strikes and human impacts continue to threaten the survival of this species. See NMFS' websites (<https://www.fisheries.noaa.gov/national/marine-life-distress/2016-2024-humpback-whale-unusual-mortality-event-along-atlantic-coast> and <https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2024-north-atlantic-right-whale-unusual-mortality-event>) for more information on the ongoing humpback whale and North Atlantic right whale UMEs. More information about interactions between offshore wind energy projects and whales can be found at <https://www.fisheries.noaa.gov/new-england-mid-atlantic/marine-life-distress/frequent-questions-offshore-wind-and-whales>.

*Comment 28:* A commenter indicates that NMFS has not taken new information into account for the presence and behaviors of sperm whales in the proposed Project Area. The commenter further notes that due to high sperm whale presence in the Project Area, as described by Farmer *et al.* (2018) and Westell *et al.* (2024), NMFS should strengthen mitigation measures for sperm whales.

*Response:* NMFS disagrees that new information to account for the presence and behaviors of sperm whales in the Project Area have not been taken into account. Although Westell *et al.* (2024) acoustically identified sperm whale presence in the lease area during June and July 2020–2021, Vineyard Wind 1 PSO data collected during the 2023 construction campaign during June through December 2023 did not document any sightings of sperm whales in the Lease Area (RPS, 2024). In addition, there is no designated critical habitat or biologically important areas (BIAs) for this species in the vicinity of the LIA. The commenter also references the Farmer *et al.* (2018) study of disturbances to sperm whales, however, that study discusses the Gulf of Mexico stock of sperm whales specifically in the Gulf of Mexico. NMFS has included a robust suite of mitigation measures specific to sperm whales in the IHA, including a 500 m visual pre-start clearance zone, 500 m visual shutdown zone, a 500 m PAM clearance zone, and a 500 m PAM monitoring zone in addition to general mitigation measures regarding soft start, noise attenuation, and seasonal and daily pile driving restrictions. Due to limited documented occurrence during Vineyard Wind 1 activities in the lease area, NMFS does not agree that it is appropriate or warranted to extend mitigation measures for sperm whales.

*Comment 29:* One commenter claims that the NEPA process for the Vineyard Wind 1 IHA is segmented and that a cumulative EIS should be developed for the RI–MA WEA. The commenter further indicates that a cumulative EIS should include nine lease areas, including the proposed Vineyard Wind 1 Project Area within the WEA.

*Response:* NMFS' proposed action to issue an IHA to Vineyard Wind constitutes a major Federal action under NEPA. In 2021, after independent review, with specific attention given to its evaluation of effects to marine mammals and their habitat, NMFS adopted BOEM's Vineyard Wind 1 Final Environmental Impact Study (FEIS) to satisfy NMFS' independent NEPA obligations related to its decision under the MMPA of whether or not to issue an IHA to the Vineyard Wind and signed a Record of Decision on May 10, 2021. The FEIS evaluated the direct and indirect impacts of the project as well as the cumulative impacts of all past, present and foreseeable future actions, including full offshore wind build-out of the OCS. Therefore, the cumulative impacts from constructing wind farms in all proposed lease areas, including those in southern New England, is included in the FEIS. BOEM's Vineyard Wind 1 FEIS was challenged and upheld by a court. For these reasons, NMFS disagrees that a separate EIS that considers the nine lease areas in the RI–MA WEA alone is necessary to comply with NEPA for issuance of the IHA.

*Comment 30:* Commenters suggest that supplemental NEPA is necessary for the proposed action and the Vineyard Wind 1 EIS should be reopened to incorporate this analysis. One commenter recommends that the Vineyard Wind 1 Record of Decision (ROD) and project construction be suspended until a new FEIS is completed. Another commenter claims that the Vineyard Wind 1 ROD is in violation of NEPA as it was completed and approved before the reinitiated Biological Opinion in 2021 and also supported halting construction of the project. An additional commenter claims that supplemental NEPA would be necessary if any larger piles or a greater number (than 15) pile were to be installed and this NEPA should consider any changes to hammer type, hammer size, effects to the substrate, and effects on marine mammals.

*Response:* NMFS disagrees with commenters that a supplemental NEPA document is necessary for this action or that the FEIS is deficient. The planned completion of pile installation, including reduced scope of work, inclusion of *in situ* SFV data into the analysis, additional mitigation, monitoring, and reporting measures, and updated marine mammal density data, have been reviewed by NMFS to determine if supplementation is

needed. NMFS' proposed action to issue an IHA to Vineyard Wind constitutes a major Federal action under NEPA. In 2021, after independent review, with specific attention given to its evaluation of effects to marine mammals and their habitat, NMFS adopted BOEM's Vineyard Wind 1 Final Environmental Impact Study (FEIS) to satisfy NMFS' independent NEPA obligations related to its decision under the MMPA of whether or not to issue an IHA to the Vineyard Wind and signed a Record of Decision on May 10, 2021. The FEIS evaluated the direct and indirect impacts of the project as well as the cumulative impacts of all past, present and foreseeable future actions, including full offshore wind build-out of the OCS. Therefore, the cumulative impacts from constructing wind farms in all proposed lease areas, including those in southern New England, is included in the FEIS. BOEM's Vineyard Wind 1 FEIS was challenged and upheld by a court. For these reasons, NMFS disagrees that a separate EIS that considers the nine lease areas in the RI–MA WEA alone is necessary to comply with NEPA for issuance of the IHA.

warranted. Vineyard Wind 1 has proposed to install the same size of the remaining 15 piles using the same hammer type. Supplementation of the Vineyard Wind 1 EIS is not required because this proposed action does not represent a substantial change to the Project and the proposed changes do not change the impact determinations. Therefore, the changes referenced here do not present significant new circumstances or information relevant to environmental concerns pertaining to the proposed action or its impacts (see 40 CFR 1502.9(d)(1)). NMFS has determined that the Vineyard Wind 1 FEIS is sufficient and a supplemental NEPA document is not necessary.

As the Vineyard Wind 1 FEIS is sufficient for the proposed action and a new FEIS does not need to be prepared, it is not necessary to suspend the ROD or project construction. In addition, the original Biological Opinion was finalized on September 11, 2020, in advance of the Vineyard Wind 1 ROD, finalized on May 10, 2021.

#### Changes From the Proposed IHA to the Final IHA

The text of several measures in the draft IHA was revised to improve the clarity and consistency of the measures. In addition, reporting requirements on marine mammals have been updated in accordance with Greater Atlantic Regional Fisheries Office (GARFO), Southeast Regional Office (SERO), and the Northeast Fisheries Science Center (NEFSC) most recent guidance. Several other measures were changes from the proposed IHA to the final IHA in consideration of public comments or other information. Changes are summarized here, with additional explanation provided later in the notice, as necessary:

- The requirement for NMFS approval for pile driving in December was removed as a mitigation requirement from the IHA. After the 30-day public comment period on the proposed IHA, Vineyard Wind 1 notified NMFS that pile driving would likely commence in November and continue into December. Therefore, NMFS removed the requirement for Vineyard Wind 1 to obtain prior approval from NMFS to pile drive in December;
- Pilot whales and Risso's dolphins were moved from the 500 m clearance and shutdown zone category to the 160 m clearance and shutdown zone category in the IHA. The distance to the Level A harassment zone for other mid-frequency cetaceans is 43 m, and a 160 m clearance and shutdown zone is sufficient to encompass this zone. In

addition, the clearance and shutdown distance for other mid-frequency delphinids is 160 m. This change was also made to align with the Vineyard Wind 1 original request in the application;

- The timeframe for the use of vessel-based surveys to confirm the clearance zone is clear of North Atlantic right whales prior to pile driving has been extended from the original period of December 1–December 31, described in the proposed IHA notice to the period of November 1–December 31. This change was made to align with the Vineyard Wind 1 original request in the application and to provide increased mitigation during the month of November as well when North Atlantic right whale density begins to increase in the Project area;

- In response to a public comment, NMFS has added a measure to require Vineyard Wind 1 to cease pile driving if there is a live cetacean stranding within 50 km of pile driving activities and the NMFS Marine Mammal Stranding Network is attempting to herd or return animals to the water;

- The IHA measure describing the procedures for Vineyard Wind 1 to implement if any of the SFV measurements exceed the distance expected or modeled to any isopleth of concern was revised in the final IHA for clarity. The examples for a pile being installed with a single bubble curtain and near field sound attenuation device and the example for a double bubble curtain without a near field sound attenuation device were removed as Vineyard Wind 1 would be required to use both a double bubble curtain and near field sound attenuation device. In addition, the requirement for Vineyard Wind 1 to request concurrence from NMFS to proceed with pile driving after providing a written explanation of isopleth exceedance was removed. If any isopleth of concern is exceeded, Vineyard Wind 1 would be required to provide written explanation to NMFS Office of Protected Resources supporting their determination that adjustments to mitigation measures would be sufficient in reducing pile driving noise below the isopleth of concern and implement those measures;

- NMFS updated the SFV requirements in the IHA to align with the Biological Opinion Terms and Conditions;

- The educational requirement for PSOs and PAM operators to receive a bachelor's degree "from an accredited college or university" have been removed, although PSOs and PAM operators are still required to hold a bachelor's degree; and

- The requirement for full PAM detection data to be submitted with monthly reports has been updated due to a change in Northeast Fisheries Science Center reporting requirements. Vineyard Wind 1 must submit full PAM detection data within 90 days after foundation installation ceases and every 90 calendar days for transit lane PAM.

In addition, the following measure was added to the IHA section 5(a) to describe Vineyard Wind 1's obligation if SFV measurements show exceedance of expected Level A harassment or Level B harassment thresholds, including while implementing additional mitigation measures:

- If, after all practicable measures that could be taken to reduce noise levels have been successfully implemented and exhausted, Thorough SFV measurements continue to indicate that the distances to marine mammal Level A harassment thresholds are greater than those modeled assuming 6 dB attenuation and the Level B harassment thresholds based on SFV during the 2023 campaign, Vineyard Wind 1 must meet with NMFS within 3 three business days to discuss: the results of SFV monitoring, the severity of exceedance of distances to identified isopleths of concern, the species affected, modeling assumptions, and whether the SFV results demonstrate the magnitude and degree of impacts from the Project are greater than those considered in this final IHA.

#### Description of Marine Mammals in the Area of Specified Activities

Thirty-eight marine mammal species, comprising 39 stocks, under NMFS' jurisdiction have geographic ranges overlapping the western North Atlantic OCS (Hayes *et al.*, 2023). However, for reasons described below, Vineyard Wind 1 has requested, and NMFS has authorized, take of only 14 species (comprising 14 stocks) of marine mammals. Sections 3 and 4 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history of the potentially affected species. NMFS fully considered all of this information, and we refer the reader to these descriptions, instead of reprinting the information. See **ADDRESSES**. Additional information regarding population trends and threats may be found in NMFS' Stock Assessment Reports (SARs; [www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments](http://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments)) and more general information about these species (e.g., physical and behavioral descriptions) may be found on NMFS'



website (<https://www.fisheries.noaa.gov/find-species>).

Table 1 lists all species or stocks for which take is expected and authorized for this activity and summarizes information related to the population or stock, including regulatory status under the MMPA and ESA and PBR, where known. PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS' SARs; 16 U.S.C. 1362(20)). While no serious injury or mortality is anticipated or authorized, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species or stocks and other threats. Four of the

marine mammal species for which take is authorized are listed as endangered under the ESA, including the North Atlantic right whale, fin whale, sei whale, and sperm whale.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS' stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprise that stock. For some species, this geographic area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS' U.S. 2023 draft SARs and NMFS' U.S. 2022 SARs. For the majority of species potentially present in the specific geographic region, NMFS has

designated only a single generic stock (e.g., "western North Atlantic") for management purposes. This includes the "Canadian east coast" stock of minke whales, which includes all minke whales found in U.S. waters and is also a generic stock for management purposes. For humpback and sei whales, NMFS defines stocks on the basis of feeding locations (i.e., Gulf of Maine and Nova Scotia, respectively). However, references to humpback whales and sei whales in this document refer to any individuals of the species that are found in the specific geographic region. All values presented in table 1 are the most recent available at the time of publication and are available online at: [www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments](https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments).

TABLE 1—MARINE MAMMAL SPECIES THAT MAY OCCUR IN THE LIA AND BE TAKEN BY HARASSMENT

Common name <sup>a</sup>	Scientific name	Stock	ESA/ MMPA status; strategic (Y/N) <sup>b</sup>	Stock abundance (CV, N <sub>min</sub> , most recent abundance survey) <sup>c</sup>	PBR	Annual M/SI <sup>d</sup>
<b>Order Artiodactyla—Cetacea—Mysticeti (baleen whales)</b>						
Family <i>Balaenidae</i> : North Atlantic right whale	<i>Eubalaena glacialis</i> .....	Western Atlantic .....	E, D, Y	340 (0; 337; 2021) <sup>e</sup> .....	0.7	17.2
Family <i>Balaenopteridae</i> (rorquals):						
Fin whale .....	<i>Balaenoptera physalus</i> .....	Western North Atlantic .....	E, D, Y	6,802 (0.24, 5,573, 2021) .....	11	2.05
Sei whale .....	<i>Balaenoptera borealis</i> .....	Nova Scotia .....	E, D, Y	6,292 (1.02, 3098, 2021) .....	6.2	0.6
Minke whale .....	<i>Balaenoptera acutorostrata</i> .....	Canadian Eastern Coastal .....	- , - , N	21,968 (0.31, 17,002, 2021) ..	170	9.4
Humpback whale .....	<i>Megaptera novaeangliae</i> .....	Gulf of Maine .....	- , - , Y	1,396 (0, 1,380, 2016) .....	22	12.15
<b>Superfamily Odontoceti (toothed whales, dolphins, and porpoises)</b>						
Family <i>Physeteridae</i> : Sperm whale .....	<i>Physeter macrocephalus</i> .....	North Atlantic .....	E, D, Y	5,895 (0.29, 4,639, 2021) .....	9.28	0.2
Family <i>Delphinidae</i> : Long-finned pilot whale .....	<i>Globicephala melas</i> .....	Western North Atlantic .....	- , - , N	39,215 (0.3, 30,627, 2021) ....	306	5.7
Bottlenose dolphin .....	<i>Tursiops truncatus</i> .....	Western North Atlantic Off-shore.	- , - , N	64,587 (0.24, 52,801, 2021) <sup>g</sup> ..	507	28
Common dolphin .....	<i>Delphinus delphis</i> .....	Western North Atlantic .....	- , - , N	93,100 (0.56, 59,897, 2021) ..	1,452	414
Risso's dolphin .....	<i>Grampus griseus</i> .....	Western North Atlantic .....	- , - , N	44,067 (0.19, 30,662, 2021) ..	307	18
Atlantic white-sided dolphin.	<i>Lagenorhynchus acutus</i> .....	Western North Atlantic .....	- , - , N	93,233 (0.71, 54,443, 2021) ..	544	28
Family <i>Phocoenidae</i> (porpoises): Harbor porpoise .....	<i>Phocoena phocoena</i> .....	Gulf of Maine/Bay of Fundy ...	- , - , N	85,765 (0.53, 56,420, 2021) ..	649	145
<b>Order Carnivora—Pinnipedia</b>						
Family <i>Phocidae</i> (earless seals): Harbor seal .....	<i>Phoca vitulina</i> .....	Western North Atlantic .....	- , - , N	61,336 (0.08, 57,637, 2018) ..	1,729	339
Gray seal <sup>h</sup> .....	<i>Halichoerus grypus</i> .....	Western North Atlantic .....	- , - , N	27,911 (0.20, 23,924, 2021) ..	1,512	4,570

<sup>a</sup> Information on the classification of marine mammal species can be found on the web page for The Society for Marine Mammalogy's Committee on Taxonomy (<https://marinemammalscience.org/science-and-publications/list-marine-mammal-species-subspecies/>; Committee on Taxonomy (2023)).

<sup>b</sup> ESA status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR, or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.

<sup>c</sup> NMFS 2022 marine mammal stock assessment reports online at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments>. CV is the coefficient of variation; N<sub>min</sub> is the minimum estimate of stock abundance.

<sup>d</sup> These values, found in NMFS's SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (e.g., commercial fisheries, ship strike).

<sup>e</sup> The draft 2023 SAR includes an estimated population (N<sub>best</sub> 340) based on sighting history through December 2021 (89 FR 5495, January 29, 2024). In October 2023, NMFS released a technical report identifying that the North Atlantic right whale population size based on sighting history through 2022 was 356 whales, with a 95 percent credible interval ranging from 346 to 363 (Linden, 2023).

<sup>f</sup> Total annual average observed North Atlantic right whale mortality during the period 2017–2021 was 7.1 animals and annual average observed fishery mortality was 4.6 animals. Numbers presented in this table (27.2 total mortality and 17.6 fishery mortality) are 2016–2020 estimated annual means, accounting for undetected mortality and serious injury.

<sup>g</sup> As noted in the draft 2023 SAR (89 FR 5495, January 29, 2024), abundance estimates may include sightings of the coastal form.

<sup>h</sup> NMFS' stock abundance estimate (and associated PBR value) applies to the U.S. population only. Total stock abundance (including animals in Canada) is approximately 394,311. The annual M/SI value given is for the total stock.

As indicated above, all 14 species (with 14 managed stocks) in table 1 temporally and spatially co-occur with the activity to the degree that take is expected to occur. The following species are not expected to occur in the LIA due to their known distributions, preferred habitats, and/or known temporal and spatial occurrences: the blue whale (*Balaenoptera musculus*), northern bottlenose whale (*Hyperoodon ampullatus*), false killer whale (*Pseudorca crassidens*), pygmy killer whale (*Feresa attenuata*), melon-headed whale (*Peponocephala electra*), dwarf and pygmy sperm whales (*Kogia* spp.), killer whale (*Orcinus orca*), Cuvier's beaked whale (*Ziphius cavirostris*), four species of Mesoplodont whale (*Mesoplodon densirostris*, *M. europaeus*, *M. mirus*, and *M. bidens*), Fraser's dolphin (*Lagenodelphis hosei*), Clymene dolphin (*Stenella clymene*), spinner dolphin (*Stenella longirostris*), rough-toothed dolphin (*Steno bredanensis*), Atlantic spotted dolphin (*Stenella frontalis*), pantropical spotted dolphin (*Stenella attenuata*), short-finned pilot whale (*Globicephala macrorhynchus*), striped dolphin (*Stenella coeruleoalba*), white-beaked dolphin (*Lagenorhynchus albirostris*), and hooded seal (*Crysophora cristata*). None of these species were observed during the 2023 construction season or during previous site assessment/characterization surveys (Vineyard Wind 2018, 2019, 2023a–f). Due to the lack of sightings of these species in the MA WEA (Kenney and Vigness-Raposa, 2010; ESS Group Inc., 2016; Kraus *et al.*, 2016; Vineyard Wind, 2018; 2019; O'Brien *et al.*, 2020; 2021; 2022; 2023; EPI Group, 2021; Palka *et al.*, 2017; 2021; RPS, 2022; Vineyard Wind, 2023a–f; Hayes *et al.*, 2023) as well as documented habitat preferences and distributions, we have determined that each of these species will not be considered further. Furthermore, the northern limit of the northern migratory coastal stock of the common bottlenose dolphin (*Tursiops truncatus*) does not extend as far north as the LIA. Thus, take is only authorized for the offshore stock which may occur within the LIA. Although harp seals (*Pagophilus groenlandicus*) are expected to occur within the WDA, no harp seals were observed by PSOs during the Vineyard Wind 1 site characterization surveys (2016, 2018–2021; ESS Group Inc., 2016; Vineyard Wind 2018; 2019) nor during the 2023 construction campaign (Vineyard Wind, 2023a–f). Thus, Vineyard Wind 1 did not request, and

NMFS is not authorizing, take for this species.

A detailed description of the species likely to be affected by the Project, including brief introductions to the species and relevant stocks as well as available information regarding population trends and threats, and information regarding local occurrence, were provided in the proposed IHA notice (89 FR 31008, April 23, 2024). Other than UME updates, we are not aware of any changes in the status of the species and stocks listed in table 1; therefore, detailed descriptions are not provided here. Please refer to the proposed IHA notice for these descriptions (89 FR 31008, April 23, 2024). Please also refer to NMFS' website (<https://www.fisheries.noaa.gov/find-species>) for generalized species accounts.

Since the publication of the proposed IHA, the following updates have occurred to the below species in regards to general information or their active UMEs.

#### North Atlantic Right Whale

As described in the proposed IHA notice, elevated North Atlantic right whale mortalities have occurred since June 7, 2017, along the U.S. and Canadian coast, with the leading category for the cause of death for this UME determined to be “human interaction,” specifically from entanglements or vessel strikes. Since publication of the proposed IHA, the number of animals considered part of the UME has increased. As of September 5, 2024, there have been 40 confirmed mortalities (dead, stranded, or floaters), 1 pending mortalities, and 35 seriously injured free-swimming whales for a total of 76 whales. The UME also considers animals with sublethal injury or illness (called “morbidity”; n=66) bringing the total number of whales in the UME to 142. More information about the North Atlantic right whale UME is available online at: <https://www.fisheries.noaa.gov/national/marine-life-distress/active-and-closed-unusual-mortality-events>.

#### Humpback Whale

Since January 2016, elevated humpback whale mortalities have occurred along the Atlantic coast from Maine to Florida. This event was declared a UME in April 2017. Partial or full necropsy examinations have been conducted on approximately half of the known cases. Since publication of the proposed IHA, the number of animals

considered part of the UME has increased to 227 total mortalities (as of September 5, 2024). More information is available at: <https://www.fisheries.noaa.gov/national/marine-life-distress/active-and-closed-unusual-mortality-events>.

#### Minke Whale

Since January 2017, a UME has been declared based on elevated minke whale mortalities detected along the Atlantic coast from Maine through South Carolina. As of September 5, 2024, a total of 174 minke whales have stranded during this UME. Full or partial necropsy examinations were conducted on more than 60 percent of the whales. Preliminary findings have shown evidence of human interactions or infectious disease in several of the whales, but these findings are not consistent across all of the whales examined, so more research is needed. More information is available at: <https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2024-minke-whale-unusual-mortality-event-along-atlantic-coast>.

#### Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Not all marine mammal species have equal hearing capabilities (e.g., Richardson *et al.*, 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007, 2019a) recommended that marine mammals be divided into hearing groups based on directly measured (behavioral or auditory evoked potential techniques) or estimated hearing ranges (behavioral response data, anatomical modeling, *etc.*). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 dB threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. Marine mammal hearing groups and their associated hearing ranges are provided in table 2.

TABLE 2—MARINE MAMMAL HEARING GROUPS  
[NMFS, 2018]

Hearing group	Generalized hearing range *
Low-frequency (LF) cetaceans (baleen whales) .....	7 Hz to 35 kHz.
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales) .....	150 Hz to 160 kHz.
High-frequency (HF) cetaceans (true porpoises, <i>Kogia</i> , river dolphins, <i>Cephalorhynchid</i> , <i>Lagenorhynchus cruciger</i> & <i>L. australis</i> ).	275 Hz to 160 kHz.
Phocid pinnipeds (PW) (underwater) (true seals) .....	50 Hz to 86 kHz.
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals) .....	60 Hz to 39 kHz.

\* Represents the generalized hearing range for the entire group as a composite (*i.e.*, all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall *et al.*, 2007) and PW pinniped (approximation).

The pinniped functional hearing group was modified from Southall *et al.* (2007) on the basis of data indicating that phocid species have consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä *et al.*, 2006; Kastelein *et al.*, 2009; Reichmuth *et al.*, 2013).

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information.

#### Potential Effects of Specified Activities on Marine Mammals and Their Habitat

Exposure to underwater noise from the specified activities has the potential to result in Level A harassment or Level B harassment of marine mammals in the specific geographic region, but no serious injury or mortality. The proposed IHA Federal Register notice (89 FR 31008, April 23, 2024) included a discussion of the effects of anthropogenic noise on marine mammals and the potential effects of underwater noise from the Project's specified activities on marine mammals and their habitat. While some new literature regarding marine mammal distribution and habitat use has been published since publication of the proposed IHA (*e.g.*, Bellman *et al.*, 2023; Holdman *et al.*, 2023; Meyer-Gutbrod *et al.*, 2023; Roberts *et al.*, 2024; Thorne and Wiley, 2024), there is no new information that NMFS is aware of that changes the analysis in the proposed IHA notice. We provide a summary of these papers below.

Bellmann *et al.* (2023) collected 27 operational noise measurements across 24 offshore wind farms consisting of 16 different WTG types of powers ranging from 2.3 to 8 mega watts (MW). It should be noted that the results from Holme *et al.* (2023) are based on a subset of these data. Similar to Holme *et al.* (2023), Bellmann *et al.* (2023) note that no relationship between nominal WTG power and operational noise was

observed, in contrast with the linear models used by Tougaard *et al.* (2020) and Stöber and Thomsen (2021). It is theorized that this is related to gearless and more modern WTGs measured as well as increased size and weight reducing transmission of vibrations. With regard to the extent of operational noise levels, Bellmann *et al.* (2023) concluded that tonal components of the operational noise are clearly observable at a range of 100 meters, but typically are not resolvable within the prevailing ambient noise at a range of 5 km. However, Bellmann *et al.* (2023) also comment that these measurements were taken within the first year of operation, and that previous experience indicates noise levels will change significantly over time, likely due to wear and tear in gearbox WTGs, but that it is not clear at this time if these changes will also be present in direct-drive systems.

Holdman *et al.* (2023) studied harbor porpoise habitats in the Gulf of Maine (GOM) and Southern New England waters providing baseline data on the occurrence and foraging activity of porpoises from 2020 to 2022. Harbor porpoises were present year-round in the GOM with peak detections in the summer and fall. The observed seasonal pattern of harbor porpoise occurrence in this study is consistent with prior information on the general distribution of the GOM/Bay of Fundy stock (Wingfield *et al.*, 2017; Hayes *et al.*, 2022). In line with previously reported distribution patterns, harbor porpoise occurrence in Southern New England was high in fall, winter and spring, but porpoises were largely absent in the summer. Results from generalized additive models suggest that time of year, hour of day, lunar illumination, and temperature are significant contributors to harbor porpoise presence (detection mainly through echolocation clicks) and/or foraging effort. This study emphasized the importance of early identification of important harbor porpoise habitat to mitigate impacts and

monitor change in the event of overlap between these habitats and areas proposed for offshore wind development.

Meyer-Gutbrod *et al.* (2023) studied North Atlantic right whale sightings from 1990–2018 to examine patterns in monthly habitat use in 12 high-use areas to broadly characterize new seasonal habitat-use patterns across the core North Atlantic right whale range. As North Atlantic right whale foraging habitat selection is driven by complex spatial and temporal patterns (*e.g.*, prey abundance), abundances of *Calanus finmarchicus* (a species of copepod and a component of the zooplankton found in the northern Atlantic Ocean) and *Calanus hyperboreus* (species of copepod found in the Arctic Ocean and northern Atlantic Ocean) were also analyzed for decadal variations in the North Atlantic right whale foraging habitats. The research found that in comparison to the 2000s, the 1990s and the 2010s were similar in that North Atlantic right whale sightings (*i.e.*, Sightings Per Unit Effort (SPUE)) declined in the foraging habitats of the Gulf of Maine and Scotian Shelf during the seasons when abundance of *C. finmarchicus* was relatively low (spring, summer, fall). The drop in sightings is associated with extended duration of habitat use by North Atlantic right whales in Cape Cod Bay into the late spring and increased use of Southern New England waters and the Gulf of St. Lawrence in the spring and summer in the 2010s. Summertime declines in the 2010s for copepod abundances in the traditional foraging habitat (*e.g.*, Gulf of Maine) indicate that the increased use of the Gulf of St. Lawrence in more recent years is driven by a decline in prey in traditional foraging habitats rather than by an increase in prey in the new foraging habitat. Overall, while some patterns in seasonal habitat use remained consistent across all three decades, including the winter migration to the Southeast U.S. calving ground

and early spring foraging in Cape Cod Bay, there were notable differences in the seasonality and persistence of North Atlantic right whales in some foraging habitats across the study period which indicate that the North Atlantic right whale distribution patterns are shifting.

In 2022, the Duke University Marine Geospatial Ecology Laboratory provided updated habitat-based marine mammal density models for the U.S. Atlantic (Roberts *et al.*, 2016; Roberts *et al.*, 2023). The take estimate analysis for the Vineyard Wind 1 IHA incorporates these density models into methodology for estimating take from foundation installation (89 FR 504, January 4, 2024). Recently, North Atlantic right whale density model results were evaluated using independently collected passive acoustic monitoring (PAM data) (Roberts *et al.*, 2024). Positive correlations between North Atlantic right whale densities and acoustic detection rates indicated concurrence between visual and acoustic observations of North Atlantic right whales. Results of this study also further quantify the North Atlantic right whale distribution shifts that occurred in 2010.

Moreover, new data also supports our inclusion of certain mitigation measures in the proposed and this final IHA. For example, Crowe *et al.* (2023) discussed the use and importance of real-time data for detecting North Atlantic right whales. The shift in North Atlantic right whale habitat use motivated the integration of additional ways to detect the presence of North Atlantic right whales, and passive acoustic detections of right whale vocalizations reported in near real-time became an increasingly important tool to supplement visual sightings. The proposed IHA included real-time and daily awareness measures and sighting communication protocols, NMFS evaluated these measures and added details for clarity or updated the reporting mechanisms, such as in the case of sighting an injured North Atlantic right whale. Davis *et al.* (2023) analyzed North Atlantic right whale individual upcalls from 2 years of acoustic recordings in southern New England, which showed that North Atlantic right whales were detected at least 1 day every week throughout both years, with highest North Atlantic right whale presence from October to April. Within Southern New England (SNE), on average, 95 percent of the time North Atlantic right whales persisted for 10 days, and recurred again within 11 days. An evaluation of the time period over which it is most effective to monitor prior to commencing pile driving activities showed that with 1 hour of pre-construction monitoring there was

only 4 percent likelihood of hearing a North Atlantic right whale, compared to a 74 percent likelihood at 18 hours. Therefore, monitoring for at least 24 h prior to activity will increase the likelihood of detecting an up-calling North Atlantic right whale.

Overall, there is no new scientific information regarding the general anticipated effects of offshore wind construction on marine mammals and their habitat that was not discussed in the proposed IHA. The information and analysis regarding the potential effects on marine mammals and their habitat included in the proposed IHA **Federal Register** notice is referenced and used for this final IHA notice and is not repeated here; please refer to the proposed IHA **Federal Register** notice (89 FR 31008, April 23, 2024).

Globally, there are more than 341,000 operating WTGs (Global Wind Energy Council). Turbine failures are known to occur but are considered rare events (Katsprakakis *et al.*, 2021, DOE, 2024a). For example, fewer than 40 incidents were identified in the modern fleet of more than 40,000 onshore turbines installed in the United States as of 2014 (DOE, 2024b). In 2022, the total global capacity of offshore wind reached 59,009 MW from 292 operating projects and over 11,900 operating wind turbines in 2022 (DOE, 2023), and a review of the relevant literature and media reports indicate blade failure among this cohort of turbines continues to be rare, consistent with industry performance in onshore wind turbines. On July 13, 2024, however, a blade on one of the WTGs at Vineyard Wind 1 was damaged during the “warm up” phase of operations, causing a portion of the blade, primarily composed of fiberglass, to fall into the water. In cooperation with Vineyard Wind 1, GE Vernova, the blade manufacturer, initiated debris recovery efforts and an investigation. Following this blade failure incident, the Bureau of Safety and Environmental Enforcement (BSEE), Department of Interior, issued a Suspension Order on July 17, 2024 (<https://www.bsee.gov/newsroom/latest-news/statements-and-releases/press-releases/bsee-statement-on-vineyard-wind>) and an additional Order for clarification on July 26, 2024 (<https://www.bsee.gov/newsroom/latest-news/statements-and-releases/press-releases/bsee-issues-new-order-to-vineyard-wind>), which suspends power production and any further wind turbine generator construction until the suspension is lifted. GE Vernova has preliminarily identified a defect in the manufacturing process, specifically insufficient bonding, of this particular blade that the quality assurance program

should have identified. On August 9, 2024, Vineyard Wind and GE Vernova released an action plan that outlines the steps necessary to remove the remainder of the damaged blade, continue debris cleanup response efforts, and resume turbine installation and operations of the project. The plan specifies that no blades will be installed or used in operation until each is inspected. In addition, GE has developed and will implement real-time monitoring technology to monitor blades during operations to avoid this type of incident from occurring in the future.

As noted above, wind turbine failure is considered rare, and NMFS still considers the likelihood that blade failure would occur pursuant to Vineyard Wind 1’s specified activity during the effective period of the IHA so low as to be discountable. Furthermore, GE Vernova’s quality assurance program will complete thorough inspections on the remaining blades to be installed to ensure additional blade malfunction incidents do not occur. Vineyard Wind 1 did not request, NMFS does not anticipate, and NMFS has not authorized, take of marine mammals incidental to a turbine blade failure and, therefore the topic is not discussed further.

#### Estimated Take of Marine Mammals

This section provides an estimate of the number of incidental takes authorized through this IHA, which will inform NMFS’ consideration of “small numbers” and the negligible impact determinations (impacts on subsistence uses is not relevant here).

Harassment is the only type of take expected to result from these activities. 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).

Authorized takes would primarily be by Level B harassment, as noise from pile driving has the potential to result in disruption of marine mammal behavioral patterns. Impacts such as masking and TTS can contribute to the disruption of behavioral patterns and are accounted for within those authorized takes. There is also some potential for high frequency species (harbor porpoise) and phocids (harbor

seal and gray seal) to experience a limited amount of auditory injury (PTS; Level A harassment) primarily because predicted auditory injury zones are large enough and these species are cryptic enough that the potential for PTS cannot be fully discounted or mitigated. For mysticetes, the Level A harassment ER95<sub>percent</sub> ranges are also large (0.043 km to 3.191 km); however, the extensive marine mammal mitigation and monitoring planned by Vineyard Wind 1 and required by NMFS, as well as natural avoidance behaviors is expected to reduce the potential for PTS to discountable levels. Nevertheless, Vineyard Wind 1 has requested, and NMFS has authorized a small amount of Level A harassment incidental to installing piles (table 11). Auditory injury is unlikely to occur for mid-frequency species as thresholds are higher and PTS zones are very close to the pile, such that PTS is unlikely to occur. While NMFS has authorized Level A harassment and Level B harassment, the planned mitigation and monitoring measures are expected to avoid or minimize overall the taking to the extent practicable (see Mitigation and Monitoring and Reporting).

As described previously, no serious injury or mortality is anticipated or authorized incidental to the specified activity. Even without mitigation, pile driving activities are unlikely to directly cause marine mammal mortality or serious injury. There is no documented case wherein pile driving resulted in marine mammal mortality or stranding and the scientific literature demonstrates that the most likely behavioral response to pile driving (or similar stimulus source) is avoidance and temporary cessation of behaviors such as foraging or socialization (see Avoidance and Displacement in Potential Effects of Specified Activities on Marine Mammals and Their Habitat section of the proposed IHA **Federal Register** notice (89 FR 31008, April 23, 2024). While in general there is a low probability that mortality or serious injury of marine mammals could occur from vessel strikes, the mitigation and monitoring measures contained within this IHA are expected to avoid vessel strikes (see Mitigation section). No other activities have the potential to result in mortality or serious injury.

For acoustic impacts, we estimate take by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the

density or occurrence of marine mammals within these ensonified areas; and (4) the number of days of activities. We note that while these factors can contribute to a basic calculation to provide an initial prediction of potential takes, additional information that can qualitatively inform take estimates is also sometimes available (e.g., previous monitoring results or average group size). Below, we describe the factors considered here in more detail and present the authorized take estimates.

As described below, there are multiple methods available to estimate the density or number of a given species in the area appropriate to inform the take estimate. For each species and activity, the largest value resulting from the three take estimation methods described below (*i.e.*, density-based, PSO-based, or mean group size) was carried forward as the amount of take authorized by Level B harassment. The amount of take authorized by Level A harassment reflects the density-based exposure estimates and, for some species and activities, consideration of other data such as mean group size.

Below, we describe NMFS' acoustic thresholds, acoustic and exposure modeling methodologies, marine mammal density calculation methodology, occurrence information, and the modeling and methodologies applied to estimate take for the Project's planned construction activities. NMFS considered all information and analysis presented by Vineyard Wind, as well as all other applicable information and, based on the best available science, concurs that the estimates of the types and amounts of take for each species and stock are reasonable, and has authorized the amount requested. NMFS notes the take estimates described herein for foundation installation can be considered conservative because the estimates do not reflect the implementation of clearance and shutdown zones for any marine mammal species or stock.

#### *Acoustic Thresholds*

NMFS recommends the use of acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals are likely to be behaviorally harassed (Level B harassment) or to incur PTS of some degree (Level A harassment). A summary of all NMFS' thresholds can be found at <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance>.

**Level B Harassment**—Though significantly driven by received level, the onset of behavioral disturbance from

anthropogenic noise exposure is also informed to varying degrees by other factors related to the source or exposure context (e.g., frequency, predictability, duty cycle, duration of the exposure, signal-to-noise ratio, distance to the source, ambient noise, and the receiving animal's hearing, motivation, experience, demography, behavior at time of exposure, life stage, depth) and can be difficult to predict (e.g., Southall *et al.*, 2007, 2021, Ellison *et al.*, 2012). Based on what the available science indicates and the practical need to use a threshold based on a metric that is both predictable and measurable for most activities, NMFS typically uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment.

NMFS generally predicts that marine mammals are likely to be taken in a manner considered to be Level B harassment when exposed to underwater anthropogenic noise above RMS SPL of 120 dB (referenced to 1 micropascal (re 1  $\mu$ Pa)) for continuous (e.g., vibratory pile driving, drilling) and above RMS SPL 160 dB re 1  $\mu$ Pa for non-explosive impulsive (e.g., seismic airguns) or intermittent (e.g., scientific sonar) sources. Generally speaking, Level B harassment take estimates based on these thresholds are expected to include any likely takes by TTS as, in most cases the likelihood of TTS occurs at closer distances from the source. TTS of a sufficient degree can manifest as behavioral harassment, as reduced hearing sensitivity and the potential reduced opportunities to detect important signals (conspecific communication, predators, prey) may result in changes in behavior patterns that would not otherwise occur.

The Project's planned construction activities include the use of impulsive sources (e.g., impact pile driving), and therefore the 160-dB re 1  $\mu$ Pa (rms) threshold is applicable to our analysis.

**Level A Harassment**—NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0, Technical Guidance) (NMFS, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). As dual metrics, NMFS considers onset of PTS (Level A harassment) to have occurred when either one of the two metrics is exceeded (*i.e.*, metric resulting in the largest isopleth). As described above, the Vineyard Wind 1 planned activities include the use of impulsive sources.

NMFS' thresholds identifying the onset of PTS are provided in table 3. The references, analysis, and methodology used in the development of the

thresholds are described in NMFS' 2018 Technical Guidance, which may be accessed at: <https://www.fisheries.noaa.gov/national/marine-mammal->

[protection/marine-mammal-acoustic-technical-guidance.](#)

TABLE 3—PERMANENT THRESHOLD SHIFT (PTS) ONSET THRESHOLDS [NMFS, 2018]

Hearing group	PTS onset thresholds* (received level)	
	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	$L_{p,0-pk,flat}$ : 219 dB; $L_{E,p,LF,24h}$ : 183 dB	$L_{E,p,LF,24h}$ : 199 dB.
Mid-Frequency (MF) Cetaceans	$L_{p,0-pk,flat}$ : 230 dB; $L_{E,p,MF,24h}$ : 185 dB	$L_{E,p,MF,24h}$ : 198 dB.
High-Frequency (HF) Cetaceans	$L_{p,0-pk,flat}$ : 202 dB; $L_{E,p,HF,24h}$ : 155 dB	$L_{E,p,HF,24h}$ : 173 dB.
Phocid Pinnipeds (PW) (Underwater)	$L_{p,0-pk,flat}$ : 218 dB; $L_{E,p,PW,24h}$ : 185 dB	$L_{E,p,PW,24h}$ : 201 dB.
Otariid Pinnipeds (OW) (Underwater)	$L_{p,0-pk,flat}$ : 232 dB; $L_{E,p,OW,24h}$ : 203 dB	$L_{E,p,OW,24h}$ : 219 dB.

\* Dual metric 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 are recommended for consideration.

**Note:** Peak sound pressure level ( $L_{p,0-pk}$ ) has a reference value of 1  $\mu$ Pa, and weighted cumulative sound exposure level ( $L_{E,p}$ ) has a reference value of 1  $\mu$ Pa<sup>2</sup>s. In this Table, thresholds are abbreviated to be more reflective of International Organization for Standardization standards (ISO, 2017). The subscript "flat" is being included to indicate peak sound pressure are flat weighted or unweighted within the generalized hearing range of marine mammals (*i.e.*, 7 Hz to 160 kHz). The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The weighted cumulative sound exposure level thresholds could be exceeded in a multitude of ways (*i.e.*, varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these thresholds will be exceeded.

Below, we describe the assumptions and methodologies used to estimate take, in consideration of acoustic thresholds and appropriate marine mammals density and occurrence information, for WTG monopile installation. Resulting distances to thresholds, densities and occurrence (*i.e.*, PSO sightings, group size) data used, exposure estimates (as relevant to the analysis), and activity-specific take estimates can be found below.

*Acoustic and Exposure Modeling*

During the 2023 Vineyard Wind 1 pile installation activities, Vineyard Wind 1 conducted a SFV study to compare with model results of the 2018 modeling (Küsel *et al.*, 2024). The SFV study included acoustic monitoring of the impact installation of 12 monopile foundations from June 6 through September 7, 2023. Five of the 12 acoustically monitored monopiles were determined to be representative of the noise attenuation system (NAS) configuration and maintenance

schedule that would be proposed for the remaining 15 monopiles to be installed in 2024. These five representative monopiles (piles 7, 8, 10, 11, and 12 in the Vineyard Wind 1 SFV Monitoring Report) were monitored using a DBBC and Hydrosound Damper System (HSD), which Vineyard Wind 1 will be required to use for use as the noise attenuation system setup for the remaining 15 monopiles. Vineyard Wind 1 also followed an enhanced bubble curtain maintenance schedule for these 5 monopiles; this maintenance schedule will be used for the remaining 15 monopiles to be installed under this IHA (see the Vineyard Wind 1 Enhanced Big Bubble Curtain (BBC) Technical Memo). Peak (pk), SEL, and RMS SPL received distances for each acoustically monitored pile are reported in the VW1 SFV Final Report Appendix A (Küsel *et al.*, 2024) For additional details on how acoustic ranges were derived from SFV measurements, see the VW1 SFV Final Report sections 2.3 and 3.3 (Küsel *et al.*, 2024). JASCO modeled a maximum

range to the Level A harassment threshold of 3.191 km (1.99 mi) with 6 dB attenuation (for low-frequency cetaceans) (Küsel *et al.*, 2024).

In addition to the 15 piles being installed under the same noise attenuation scenario as the 5 aforementioned representative piles, they are also anticipated to be installed under similar pile driving specifications and in a similar acoustic environment. Table 4 describes the key piling assumptions and planned impact pile driving schedule for 2024. These assumptions and schedule are based upon the 2023 piling and hammer energy schedule for installing monopiles. Vineyard Wind 1 expects installation of the 15 remaining piles will necessitate similar operations. Further, as described in detail in section 6.1 of the Vineyard Wind 1 application, the water depth and bottom type are similar throughout the Lease Area and therefore sound propagation in the LIA is not expected to differ from where the SFV data were collected in 2023.

TABLE 4—KEY PILING ASSUMPTIONS AND HAMMER ENERGY SCHEDULE FOR MONOPILE INSTALLATION

Pile type	Project component	Max hammer energy rating (kJ)	Number of hammer strikes	Max piling time duration per pile (min)	Number piles/day
9.6-m monopile	WTG	4,000	2,884–4,329 (average 3,463) <sup>a</sup>	117	1

<sup>a</sup> The number of hammer strikes represents the range of strikes needed to install the 12 monopiles for which SFV was conducted in 2023.

Vineyard Wind 1 compared the acoustic ranges to the Level A harassment and Level B harassment

thresholds derived from the 2018 acoustic modeling (Pyć *et al.*, 2018) to the maximum ranges with absorption

for the five representative monopiles acoustically monitored in 2023. They applied the greater results to the

analysis in their application and NMFS has included that approach in this IHA. The maximum measured range to PTS thresholds of the five representative monopiles was less than the maximum 2018 modeled ranges for all hearing

groups assuming 6 dB attenuation (table 5) (with the exception of high-frequency cetaceans, although Vineyard Wind 1 attributes this extended range to non-piling noise (Vineyard Wind 1, 2023)). Therefore, Vineyard Wind 1 based the

expected distance to the Level A harassment threshold and associated estimated take analysis on the 2018 modeled data.

TABLE 5—MODELED AND MEASURED RANGES TO SEL<sub>cum</sub> PTS THRESHOLDS FOR MARINE MAMMAL HEARING GROUPS

Marine mammal hearing group	Modeled range to SEL <sub>cum</sub> PTS threshold (km) <sup>a</sup>	Measured maximum range to SEL <sub>cum</sub> PTS threshold (km) <sup>b</sup>
Low-frequency cetaceans .....	3.191	2.370
Mid-frequency cetaceans .....	0.043	0.010
High-frequency cetaceans .....	0.071	0.200
Phocid pinnipeds .....	0.153	0.100

<sup>a</sup> Based upon modeling conducted for the 2023 IHA (Pyc *et al.*, 2018).

<sup>b</sup> Based upon the five representative monopiles from the Vineyard Wind 1 2023 construction campaign (Küsel *et al.*, 2024).

The maximum range with absorption to the Level B harassment threshold for acoustically monitored piles was 5.72 km (3.6 mi) (pile 13, AU-38; Küsel *et al.*, 2024), which was greater than the 2018 modeled distance to the Level B harassment threshold of 4.1 km (2.5 mi) (Pyc *et al.* 2018). Therefore, Vineyard Wind 1 based the expected distance to the Level B harassment threshold for this IHA and associated estimated take analysis on the 5.72 km acoustically monitored distance.

In 2018, Vineyard Wind 1 conducted animal modeling to estimate take, by Level A harassment (PTS), incidental to the project. In order to best evaluate the SEL<sub>cum</sub> harassment thresholds for PTS, it is necessary to consider animal movement, as the results are based on how sound moves through the environment between the source and the receiver. Applying animal movement and behavior within the modeled noise fields provides the exposure range, which allows for a more realistic indication of the distances at which PTS acoustic thresholds are reached that considers the accumulation of sound over different durations (note that in all cases the distance to the peak threshold is less than the SEL-based threshold). As described above, Vineyard Wind 1 based the Level A harassment estimated take analysis on the modeled Level A harassment acoustic ranges and therefore appropriately used the results of the JASCO’s Animal Simulation Model Including Noise Exposure (JASMINE) animal movement modeling conducted for the 2023 IHA (86 FR 33810, June 25, 2021). Sound exposure models like JASMINE use simulated animals (also known as “animats”) to forecast behaviors of animals in new situations and locations based upon previously documented behaviors of those animals.

The predicted 3D sound fields (*i.e.*, the output of the acoustic modeling process described earlier) are sampled by animats using movement rules derived from animal observations. The output of the simulation is the exposure history for each animat within the simulation. The precise locations of animats and their pathways are not known prior to a project; therefore, a repeated random sampling technique (*i.e.*, Monte Carlo) is used to estimate exposure probability with many animats and randomized starting positions. The combined exposure history of all animats gives a probability density function of exposure during the Project.

Since the time that the JASMINE animal movement modeling was conducted for the 2023 IHA (86 FR 33810, June 25, 2021), no new behavior data is available that would have changed how animats move in time and space in that model and, therefore, NMFS has determined that the JASMINE outputs from the 2018 modeling effort are reasonable for application here. However, the post processing calculations used more recent density data (table 6). The mean number of modeled animats exposed per day with installation of one 9.6-m monopile were scaled by the maximum monthly density for the LIA (Roberts *et al.*, 2023) for each species (table 6) to estimate the real-world number of animats of each species that could be exposed per day in the LIA. This real-world number of animals was multiplied by the expected number of days of pile installation (15 days) to derive a total take estimate by Level A harassment for each species. The number of potential exposures by Level A harassment was estimated for each species using the following equation:  
 Density-based exposure estimate<sub>Level A harassment</sub> = number of animats

exposed above the Level A harassment threshold × ((mean maximum monthly density (animals/km<sup>2</sup>)/modeled 2018 density (animats/km<sup>2</sup>)) × number of days (15).

To estimate the amount of take by Level B harassment incidental to installing the remaining 15 piles, Vineyard Wind 1 applied a static method (*i.e.*, did not conduct animal movement modeling). Vineyard Wind 1 calculated the Level B harassment ensonified area using the following equation:

$$A = \pi r^2,$$

where *A* is equal to the ensonified area and *r* is equal to the radial distance to the Level B harassment threshold from the pile driving source (*r*<sub>Level B harassment</sub> = 5.72 km).

The ensonified area (102.7 km<sup>2</sup>) was multiplied by the mean maximum monthly density estimate (table 8) and expected number of days of pile driving (15 days) to determine a density-based take estimate for each species. The number of potential exposures by Level B harassment was estimated for each species using the following equation:

$$\text{Density-based exposure estimate}_{\text{Level B harassment}} = \text{ensonified area (km}^2\text{)} \times \text{maximum mean monthly density estimate (animals/km}^2\text{)} \times \text{number of days (15)}.$$

*Density and Occurrence and Take Estimation*

In this section we provide information about marine mammal density, presence, and group dynamics that informed the take calculations for the planned activities. Vineyard Wind applied the 2022 Duke University Marine Geospatial Ecology Laboratory Habitat-based Marine Mammal Density Models for the U.S. Atlantic (Duke

Model-Roberts *et al.*, 2016; Roberts *et al.*, 2023) to estimate take from foundation installation. The models estimate absolute density (individuals/km<sup>2</sup>) by statistically correlating sightings reported on shipboard and aerial surveys with oceanographic conditions. For most marine mammal species, densities are provided on a monthly basis. Where monthly densities are not available (*e.g.*, pilot whales), annual densities are provided. Moreover, some species are represented as guilds (*e.g.*, seals (representing *Phocidae spp.*, primarily harbor and gray seals and pilot whales (representing short-finned and long-finned pilot whales))).

The Duke habitat-based density models delineate species' density into 5 \* 5 km (3.1 \* 3.1 mi) grid cells. Vineyard Wind 1 calculated mean monthly densities by using a 10-km buffered polygon around the remaining WTG foundations to be installed and overlaying this buffered polygon on the density maps. The 10-km buffer defines the area around the LIA used to calculate mean species density. Mean monthly density for each species was determined by calculating the unweighted mean of all 5x5 km grid cells (partially or fully) within the

buffered polygon. The unweighted mean refers to using the entire 5 km x 5 km (3.1 mi x 3.1 mi) grid cell for each cell used in the analysis, and was not weighted by the proportion of the cell overlapping with the density perimeter if the entire grid cell was not entirely within the buffer zone polygon. Vineyard Wind 1 calculated densities for each month, except for species for which annual density data only was available (*e.g.*, long-finned pilot whale). Vineyard Wind 1 used maximum monthly density from June to December for density-based calculations.

The density models (Roberts *et al.*, 2023) provided density for pilot whales and seals as guilds. Based upon habitat and ranging patterns (Hayes *et al.*, 2023), all pilot whales occurring in the LIA are expected to be long-finned pilot whales. Therefore, all pilot whale density estimates are assumed to represent long-finned pilot whales. Seal guild density was divided into species-specific densities based upon the proportions of each species observed by PSOs during 2016 and 2018–2021 site characterizations surveys within SNE (ESS Group, 2016; Vineyard Wind 2018, 2019, 2023a–f). Of the 181 seals identified to species and sighted within the WDA, 162 were gray seals and 19

were harbor seals. The equation below shows how the proportion of each seal species sighted was calculated to compute density for seals.

$$P_{\text{seal species identified}} = N_{\text{seal species}} / \text{Number}_{\text{total seals}}$$

where *P* represents density and *N* represents number of seals.

These calculations resulted in proportions of 0.895 for gray seals and 0.105 for harbor seals. The proportion for each species was then multiplied by the maximum monthly density for the seal guild (table 6) to determine the species-specific densities used in take calculations.

The density models (Roberts *et al.*, 2023) also do not distinguish between bottlenose dolphin stocks and only provide densities for bottlenose dolphins as a species. However, as described above, based upon ranging patterns (Hayes *et al.*, 2023), only the Western North Atlantic offshore stock of bottlenose dolphins is expected to occur in the LIA. Therefore, it is expected that the bottlenose dolphin density estimate is entirely representative of this stock. Maximum mean monthly density estimates and month of the maximum estimate are provided in table 6 below.

TABLE 6—MAXIMUM MEAN MONTHLY MARINE MAMMAL DENSITY ESTIMATES (ANIMALS per km<sup>2</sup>) CONSIDERING A 10-KM BUFFER AROUND THE LIMITED INSTALLATION AREA

Species	Maximum mean density	Maximum density month
North Atlantic right whale *	0.0043	December.
Fin whale *	0.0036	July.
Humpback whale	0.0022	June.
Minke whale	0.0180	June.
Sei whale *	0.0008	November.
Sperm whale *	0.0008	September.
Atlantic white-sided dolphin	0.0204	June.
Bottlenose dolphin <sup>a</sup>	0.008	August.
Common dolphin	0.1467	September.
Long-finned pilot whale <sup>b</sup>	0.001	N/A.
Risso's dolphin	0.0013	December.
Harbor porpoise	0.0713	December.
Seals (gray and harbor) <sup>c</sup>	0.1745	May.

**Note:** \* denotes species listed under the Endangered Species Act.

<sup>a</sup> Density estimate represents the Northwestern Atlantic offshore stock of bottlenose dolphins.

<sup>b</sup> Only annual densities were available for the pilot whale guild.

<sup>c</sup> Gray and harbor seals represented as a guild.

For some species, PSO survey and construction data for SNE (ESS Group, 2016; Vineyard Wind, 2018, 2019, 2023a–f) and mean group size data compiled from the AMAPPS (Palka *et al.*, 2017; 2021) indicate that the density-based exposure estimates may be insufficient to account for the number of individuals of a species that may be encountered during the planned activities. Hence, local PSO and AMAPPS data were considered to

ensure the potential for take is adequately assessed.

In cases where the density-based Level B harassment exposure estimate for a species was less than the mean group size-based exposure estimate, the take request was increased to the mean group size (in some cases multiple groups were assumed) and rounded to the nearest integer (table 7). For all cetaceans, with the exception of North Atlantic right whales, Vineyard Wind 1

used the mean of the spring, summer, and fall AMAPPS group sizes for each species for the Rhode Island/Massachusetts Wind Energy Area (RI/MA WEA) as shown in tables 2–2, 2–3, and 2–4 in Palka *et al.* (2021) appendix III. These seasons were selected as they would represent the time period in which pile driving activities would take place. Mean group sizes for cetacean species derived from RI/WEA AMAPPS data is shown below in table 7.



However, North Atlantic right whale seasonal group sizes for the RI/MA WEA were not available through the AMAPPS dataset (Palka *et al.*, 2021). Vineyard Wind 1 calculated mean group size for North Atlantic right whales using data from the northeast (NE) shipboard surveys as provided in table 6–5 of Palka *et al.* (2021). Vineyard Wind 1 calculated mean group size by dividing the number of individual right whales sighted (four) by the number of right whale groups (two) (Palka *et al.*, 2021). The NE shipboard surveys were conducted during summer (June 1

through August 31) and fall (September 1 through November 30) seasons (Palka *et al.*, 2021).

For seals, mean group size data was also not available for the RI/MA WEA through AMAPPS (Palka *et al.*, 2021). Vineyard Wind 1 used 2010–2013 AMAPPS NE shipboard and aerial survey at-sea seal sightings for gray and harbor seals, as well as unidentified seal sightings from spring, summer, and fall to calculate mean group size for gray and harbor seals (table 19–1, Palka *et al.*, 2017). To calculate mean group size for seals, Vineyard Wind 1 divided the total

number of animals sighted by the total number of sightings. As the majority of the sightings were not identified to species, Vineyard Wind 1 calculated a single group size for all seal species (table 7).

Additional detail regarding the density and occurrence as well as the assumptions and methodology used to estimate take is included below and in section 6.2 of the incidental take authorization (ITA) application. Mean group sizes used in take estimates, where applicable, for all activities are provided in table 7.

TABLE 7—MEAN MARINE MAMMAL GROUP SIZES USED IN TAKE ESTIMATE CALCULATIONS

Species	Mean group size	Source
North Atlantic right whale *	2	Table 6–5 of Palka <i>et al.</i> 2021.
Fin whale *	1.2	Palka <i>et al.</i> 2021.
Humpback whale	1.2	Palka <i>et al.</i> 2021.
Minke whale	1.4	Palka <i>et al.</i> 2021.
Sei whale *	1	Palka <i>et al.</i> 2021.
Sperm whale *	2	Palka <i>et al.</i> 2021.
Atlantic white-sided dolphin	21.7	Palka <i>et al.</i> 2021.
Bottlenose dolphin	11.7	Palka <i>et al.</i> 2021.
Common dolphin	30.8	Palka <i>et al.</i> 2021.
Long-finned pilot whale	12.3	Palka <i>et al.</i> 2021.
Risso's dolphin	1.8	Palka <i>et al.</i> 2021.
Harbor porpoise	2.9	Palka <i>et al.</i> 2021.
Seals (gray and harbor)	1.4	Table 19–1 of Palka <i>et al.</i> 2017.

Note: \* denotes species listed under the Endangered Species Act.

Vineyard Wind 1 also looked at PSO survey data (June through October 2023) in the LIA collected during Vineyard Wind 1 construction activities and calculated a daily sighting rate for species to compare with density-based take estimates and average group size estimates from AMAPPS (table 7). The number of animals of each species sighted from all survey vessels with active PSOs was divided by the sum of all PSO monitoring days (77 days) to

calculate the mean number of animals of each species sighted (see table 11 in the ITA application). However, for each species, the PSO data-based exposure estimate was less than the density-based exposure estimate (see table 14 in the ITA application) and, therefore, density-based exposure estimates were not adjusted according to PSO data-based exposure estimates.

Here we present the amount of take requested by Vineyard Wind 1 and

authorized by NMFS. To estimate take, Vineyard Wind 1 used the pile installation construction schedule shown in table 4, assuming 15 total days of monopile installation. NMFS has reviewed these methods to estimate take and agrees with this approach. The authorized take numbers in table 9 appropriately consider SFV measurements collected in 2023 and represent the maximum amount of take that is reasonably expected to occur.

TABLE 8—MODELED LEVEL A HARASSMENT AND LEVEL B HARASSMENT ACOUSTIC EXPOSURE ESTIMATES

Species	Density-based exposure estimate	
	Level A harassment	Level B harassment
North Atlantic right whale * <sup>a</sup>	0.503	6.6
Fin whale *	0.598	5.5
Humpback whale	1.11	3.4
Minke whale	0.372	27.7
Sei whale *	0.144	1.2
Sperm whale *	0	1.2
Atlantic white-sided dolphin	0	31.4
Bottlenose dolphin	0	12.3
Common dolphin	0	226.0
Long-finned pilot whale	0	1.5
Risso's dolphin	0	2.00
Harbor porpoise	2.758	109.8
Gray Seal	0	240.8
Harbor seal	0.028	28.2

Note: \* denotes species listed under the Endangered Species Act.

<sup>a</sup> Although modeling shows a very low but non-zero exposure estimate for take by Level A harassment, mitigation measures will be applied to ensure there is no take by Level A harassment of this species.

TABLE 9—AUTHORIZED TAKES (BY LEVEL A HARASSMENT AND LEVEL B HARASSMENT)

Species	NMFS stock abundance	Authorized take by Level A harassment	Authorized take by Level B harassment	Total authorized take	Percent of stock abundance
North Atlantic right whale* <sup>a</sup>	338	0	7	7	2.07
Fin whale*	6,802	1	6	7	0.10
Humpback whale	1,396	2	4	6	0.43
Minke whale	21,968	1	28	29	0.13
Sei whale*	6,292	1	2	3	0.05
Sperm whale*	4,349	0	2	2	0.05
Atlantic white-sided dolphin	93,233	0	32	32	0.03
Bottlenose dolphin	62,851	0	13	13	0.02
Common dolphin <sup>b,c</sup>	172,974	0	462	462	0.27
Long-finned pilot whale <sup>b</sup>	39,215	0	13	13	0.03
Risso's dolphin	35,215	0	2	2	0.001
Harbor porpoise	95,543	3	110	113	0.19
Gray Seal	27,300	0	241	241	0.88
Harbor seal	61,336	1	29	30	0.05

**Note:** \* denotes species listed under the Endangered Species Act.

<sup>a</sup> Although modeling shows a very low but non-zero exposure estimate for take by Level A harassment, mitigation measures will be applied to ensure there is no take by Level A harassment of this species.

<sup>b</sup> Authorized take by Level B harassment adjusted according to mean group size.

<sup>c</sup> Authorized take by Level B harassment is based upon the assumption that one group of common dolphins (30.8 dolphins; see table 7) would be encountered per each of the 15 days of pile driving.

## Mitigation

In order to issue an IHA under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of effecting the least practicable impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stock for taking for certain subsistence uses (latter not applicable for this action). NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting the activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to effect the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, NMFS considers two primary factors:

(1) The manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as planned), the

likelihood of effective implementation (probability implemented as planned); and

(2) The practicability of the measures for applicant implementation, which may consider such things as cost and impact on operations.

For a fuller discussion of the least practicable adverse impact standard, see 89 FR 31488, 31517 (April 24, 2024); NMFS' final rule for Taking and Importing Marine Mammals Incidental to Geophysical Surveys in the Gulf of Mexico.

The mitigation strategies described below are consistent with those required and successfully implemented under previous incidental take authorizations issued in association with in-water construction activities (e.g., soft-start, establishing shutdown zones). Additional measures have also been incorporated to account for the fact that the planned construction activities would occur offshore. In addition, several measures in this IHA (i.e., seasonal restrictions, vessel strike avoidance, and clearance and shutdown zones) are more rigorous than measures previously incorporated into the 2023 IHA.

Generally speaking, the mitigation measures considered and required here fall into three categories: temporal (seasonal and daily) work restrictions, real-time measures (shutdown, clearance, and vessel strike avoidance), and noise attenuation/reduction measures. Seasonal work restrictions are designed to avoid or minimize operations when marine mammals are concentrated or engaged in behaviors that make them more susceptible or

make impacts more likely, in order to reduce both the number and severity of potential takes, and are effective in reducing both chronic (longer-term) and acute effects. Real-time measures, such as implementation of shutdown and clearance zones, as well as vessel strike avoidance measures, are intended to reduce the probability or severity of harassment by taking steps in real time once a higher-risk scenario is identified (e.g., once animals are detected within an impact zone). Noise attenuation measures, such as bubble curtains, are intended to reduce the noise at the source, which reduces both acute impacts as well as the contribution to aggregate and cumulative noise that may result in longer-term chronic impacts. Below, we also describe the required training, coordination, and vessel strike avoidance measures that apply to foundation installation and vessel use.

### Training and Coordination

NMFS requires all Vineyard Wind's employees and contractors conducting activities on the water, including, but not limited to, all vessel captains and crew, to be trained in marine mammal detection and identification, communication protocols, and all required measures to minimize impacts on marine mammals and support Vineyard Wind 1 compliance with the IHA. Additionally, all relevant personnel and the marine mammal species monitoring team(s) are required to participate in joint, onboard briefings prior to the beginning of project activities. The briefing must be repeated whenever new relevant personnel (e.g., new PSOs, construction contractors,

relevant crew) join the project before work commences. During this training, Vineyard Wind 1 is required to instruct all project personnel regarding the authority of the marine mammal monitoring team(s). For example, pile driving personnel are required to immediately comply with any call for a delay or shut down by the Lead PSO. Any disagreement between the Lead PSO and the project personnel must only be discussed after delay or shutdown has occurred. In particular, all captains and vessel crew must be trained in marine mammal detection and vessel strike avoidance measures to ensure marine mammals are not struck by any project or project-related vessel.

Prior to the start of in-water construction activities, Vineyard Wind 1 will conduct training for construction and vessel personnel and the marine mammal monitoring team (PSO and PAM operators) to explain responsibilities, communication procedures, marine mammal detection and identification, mitigation, monitoring, and reporting requirements, safety and operational procedures, and authorities of the marine mammal monitoring team(s). A description of the training program must be provided to NMFS at least 60 days prior to the initial training before in-water activities begin. Vineyard Wind 1 will provide confirmation of all required training documented on a training course log sheet and reported to NMFS Office of Protected Resources prior to initiating project activities.

#### *North Atlantic Right Whale Awareness Monitoring*

Vineyard Wind must use available sources of information on North Atlantic right whale presence, including daily monitoring of the Right Whale Sightings Advisory System, U.S. Coast Guard very high-frequency (VHF) Channel 16, WhaleAlert, and the PAM system throughout each day to receive notifications of any sightings, and information associated with any regulatory management actions (e.g., establishment of zones identifying the need to reduce vessel speeds). Maintaining daily awareness and coordination affords increased protection of North Atlantic right whales by understanding North Atlantic right whale presence in the area through ongoing visual and PAM efforts and opportunities (outside of Vineyard Wind 1 efforts), and allows for planning of construction activities, when practicable, to minimize potential impacts on North Atlantic right whales. The vessel strike avoidance measures apply to all vessels associated with the

Project within U.S. waters and on the high seas.

#### *Vessel Strike Avoidance Measures*

This final IHA contains numerous vessel strike avoidance measures that reduce the risk that a vessel and marine mammal could collide. While the likelihood of a vessel strike is generally low, it is one of the most common ways that marine mammals are seriously injured or killed by human activities. Therefore, the IHA contains enhanced mitigation and monitoring measures to avoid vessel strikes, to the extent practicable. While many of these measures are proactive, intending to avoid the heavy use of vessels during times when marine mammals of particular concern may be in the area, several are reactive and occur when a project personnel sights a marine mammal. Vineyard Wind 1 is required to comply with these measures except under circumstances when doing so would create an imminent and serious threat to a person or vessel or to the extent that a vessel is unable to maneuver and, because of the inability to maneuver, the vessel cannot comply.

While underway, Vineyard Wind 1 is required to monitor for and maintain a safe distance from marine mammals, and operate vessels in a manner that reduces the potential for vessel strike. Regardless of the vessel's size, all vessel operators, crews, and dedicated visual observers (i.e., PSO or trained crew member) must maintain a vigilant watch for all marine mammals and slow down, stop their vessel, or alter course as appropriate to avoid striking any marine mammal. The dedicated visual observer, equipped with suitable monitoring technology (e.g., binoculars, night vision devices), must be located at an appropriate vantage point for ensuring vessels are maintaining required vessel separation distances from marine mammals (e.g., 500 m from North Atlantic right whales).

For all project-related vessels, regardless of size, the vessel operator is required to immediately reduce speeds to 10 kn (11.5 mph) or less if any large whale, mother/calf pair, or large assemblage of non-delphinid cetaceans are observed within 500 m of the vessel. Additionally, all project vessels, regardless of size, must maintain a 500-m minimum separation zone from North Atlantic right whales, and a 100-m minimum separation zone from sperm whales and non-North Atlantic right whale baleen species. Vessels are also required to keep a minimum separation distance of 50 m from all delphinid cetaceans and pinnipeds, with an exception made for those species that

approach the vessel (i.e., bow-riding dolphins) (table 10). All reasonable steps must be taken to not violate minimum separation distances. If any of these species are sighted within their respective minimum separation zone, the underway vessel must shift its engine to neutral (if it is safe to do so) and turn away from the animal(s). The engines must not be engaged until the animal(s) have been observed to be outside of the vessel's path and beyond 100 m (for sperm whales and non-North Atlantic right whale large whales) or 50 m (for delphinids and pinnipeds).

If any North Atlantic right whales are sighted at any distance by any project personnel or acoustically detected, project vessels must reduce speeds to 10 kn (11.5 mph) and turn away from the animal. Additionally, if any large whale (other than a North Atlantic right whale) is sighted within 500 m of an underway vessel by project personnel, the vessel is required to immediately reduce speeds to 10 kn (11.5 mph) or less and turn away from the animal.

All of the Project-related vessels are required to comply with the measures within this IHA for operating vessels around North Atlantic right whales and other marine mammals, as well as any existing NMFS vessel speed restrictions in effect for North Atlantic right whales (see 50 CFR 224.105). When NMFS vessel speed restrictions are not in effect and a vessel is traveling at greater than 10 kn (11.5 mph), in addition to the required dedicated visual observer, Vineyard Wind 1 is required to monitor the transit corridor, defined as from a port to the lease area or return, in real-time with PAM prior to and during transits. To maintain awareness of North Atlantic right whale presence in the Project Area, vessel operators, crew members, and the marine mammal monitoring team will monitor U.S. Coast Guard VHF Channel 16, WhaleAlert, the Right Whale Sighting Advisory System (RWSAS), and the PAM system. Any North Atlantic right whale or large whale detection will be immediately communicated to PSOs, PAM operators, and all vessel captains. All vessels will be equipped with a properly installed, operational AIS and Vineyard Wind 1 must report all MMSI numbers to NMFS Office of Protected Resources prior to initiating in-water activities. Vineyard Wind 1 must submit a Marine Mammal Vessel Strike Avoidance Plan that must be approved by NMFS prior to commencement of vessel use, and Vineyard Wind 1 must abide by this plan.

Compliance with these measures will reduce the likelihood of vessel strike to the extent practicable. These measures

increase awareness of marine mammals in the vicinity of project vessels and require project vessels to reduce speed when marine mammals are detected (by PSOs, PAM, and/or through another source, *e.g.*, RWSAS) and maintain separation distances when marine mammals are encountered. While visual monitoring is useful, reducing vessel speed is one of the most effective,

feasible options available to reduce the likelihood of and effects from a vessel strike. Numerous studies have indicated that slowing the speed of vessels reduces the risk of lethal vessel collisions, particularly in areas where right whales are abundant and vessel traffic is common and otherwise traveling at high speeds (Vanderlaan and Taggart, 2007; Conn and Silber,

2013; Van der Hoop *et al.*, 2014; Martin *et al.*, 2015; Crum *et al.*, 2019).

Given the inherent low probability of vessel strike, combined with the vessel strike avoidance measures included herein, NMFS considers the potential for vessel strike to be unlikely and does not authorize take from this activity under this IHA.

TABLE 10—VESSEL STRIKE AVOIDANCE SEPARATION ZONES

Marine mammal species	Vessel separation zone (m)
North Atlantic right whale .....	500
Other ESA-listed species and non-North Atlantic right whale large whales .....	100
Other marine mammals <sup>a</sup> .....	50

<sup>a</sup> With the exception of seals and delphinid(s) from the genera *Delphinus*, *Lagenorhynchus*, *Stenella*, or *Tursiops*, as described below.

*Seasonal and Daily Restrictions*

Temporal restrictions in places where marine mammals are concentrated, engaged in biologically important behaviors, and/or present in sensitive life stages are effective measures for reducing the magnitude and severity of human impacts. The temporal restrictions described here are built around North Atlantic right whale protection. Based upon the best scientific information available (Roberts *et al.*, 2023), the highest densities of North Atlantic right whales in the specific geographic region are expected during the months of January through May, with an increase in density starting in December. However, North Atlantic right whales may be present in the LIA throughout the year.

NMFS is requiring seasonal work restrictions to minimize risk of noise exposure to the North Atlantic right whales incidental to pile driving activities to the extent practicable. These seasonal work restrictions are expected to reduce the number of takes of North Atlantic right whales and further reduce vessel strike risk. These seasonal restrictions also afford protection to other marine mammals that are known to use the LIA with greater frequency during winter months, including other baleen whales.

As described previously, no impact pile driving activities may occur January 1 through May 31st. Vineyard Wind plans to install no more than 1 pile per day and only initiate impact pile driving during daylight hours. Foundation installation will not be initiated later than 1.5 hours before civil sunset. Generally, foundation installation may continue after dark when the installation of the same pile began during daylight (1.5 hours before civil sunset), when clearance zones were

fully visible for at least 30 minutes and must proceed for human safety or installation feasibility reasons.

Monopiles must be no larger than 9.6 m in diameter. The impact hammer operator must not exert more than 4,000 kJ on the pile being installed. No more than one pile may be installed at a given time (*i.e.*, concurrent/simultaneous pile driving may not occur).

*Noise Attenuation Systems*

Vineyard Wind 1 is required to employ noise abatement systems (NASs), also known as noise attenuation systems, during all foundation installation activities to reduce the sound pressure levels that are transmitted through the water. This will reduce acoustic ranges to the Level A harassment and Level B harassment acoustic thresholds and minimize, to the extent practicable, any acoustic impacts resulting from these activities. Vineyard Wind is required to use a double big bubble curtain (DBBC) and HSD in addition to an enhanced BBC maintenance schedule. The refined NAS design (DBBC + HSD + enhanced BBC maintenance schedule) used during the 2023 construction activities will be used on the 15 remaining piles to minimize noise levels. A single bubble curtain, alone or in combination with another NAS device, may not be used for pile driving, as received SFV data reveals this approach was unlikely to attenuate sound sufficiently to be consistent with the target sound reduction of 6 dB. Moreover, the Level B harassment take estimates and impact analysis, as well as the associated findings, are based upon the assumption that the refined NAS design (DBBC + HSD + enhanced BC maintenance schedule) will be used and that the ensonification distances measured in the 2023 SFVs under the

same conditions will occur for the 15 remaining piles. The DBC and HSD must reduce noise levels to those not exceeding expected ranges to Level A harassment and Level B harassment isopleths corresponding to those modeled assuming 6-dB sound attenuation, pending results of SFV (see Sound Field Verification section below).

Noise abatement systems, such as bubble curtains, are used to decrease the sound levels radiated from a source. Bubbles create a local impedance change that acts as a barrier to sound transmission. The size of the bubbles determines their effective frequency band, with larger bubbles needed for lower frequencies. There are a variety of bubble curtain systems, confined or unconfined bubbles, and some with encapsulated bubbles or panels. Attenuation levels also vary by type of system, frequency band, and location. Small bubble curtains have been measured to reduce sound levels, but effective attenuation is highly dependent on depth of water, current, and configuration and operation of the curtain (Austin *et al.*, 2016; Koschinski and Lüdemann, 2013). Bubble curtains vary in terms of the sizes of the bubbles; those with larger bubbles tend to perform a bit better and more reliably, particularly when deployed with two separate rings (Bellmann, 2014; Koschinski and Lüdemann, 2013; Nehls *et al.*, 2016). Encapsulated bubble systems (*i.e.*, HSDs) can be effective within their targeted frequency ranges (*e.g.*, 100–800 Hz) and when used in conjunction with a bubble curtain appear to create the greatest attenuation. The literature presents a wide array of observed attenuation results for bubble curtains. The variability in attenuation levels is the result of variation in design as well as differences in site conditions

and difficulty in properly installing and operating in-water attenuation devices. Dähne *et al.* (2017) found that single bubble curtains that reduce sound levels by 7 to 10 dB reduced the overall sound level by approximately 12 dB when combined as a double bubble curtain for 6-m steel monopiles in the North Sea. During installation of monopiles (consisting of approximately 8-m in diameter) for more than 150 WTGs in comparable water depths ( $\leq 25$  m) and conditions in Europe indicate that attenuation of 10 dB is readily achieved (Bellmann, 2019; Bellmann *et al.*, 2020) using single BBCs for noise attenuation.

When a double big bubble curtain is used, Vineyard Wind 1 will be required to maintain numerous operational performance standards, including the enhanced BBC maintenance protocol (Vineyard Wind 1 Enhanced BBC Technical Memo, 2023). These standards are defined in the IHA and include, but are not limited to, a requirement that construction contractors train personnel in the proposed balancing of airflow to the bubble ring; and a requirement that Vineyard Wind 1 submit a performance test and maintenance report to NMFS within 72 hours following the performance test. Corrections to the attenuation device to meet regulatory requirements must occur prior to use during foundation installation activities. In addition, a full maintenance check (e.g., manually clearing holes) must occur prior to each pile being installed. The HSD system Vineyard Wind 1 plans to use would be employed, in coordination with the DBBC, as a near-field attenuation device close to the monopiles (Küsel *et al.*, 2024). Vineyard Wind 1 also plans to follow a DBBC enhanced maintenance protocol, which was used during the 2023 Vineyard Wind 1 pile installation activities. The DBBC enhanced maintenance protocol includes an adjustment from typical bubble curtain operations to drill hoses after every deployment to maximize performance in siltier sediments which are present in the Lease Area. The DBBC enhanced maintenance protocol also includes DBBC hose inspection and clearance, pressure testing of DBBC hoses, visual inspection of DBBC performance, and minimizing disturbance of the DBBC hoses on the seafloor.

Vineyard Wind 1 is required to submit an updated SFV plan to NMFS for approval prior to installing foundations, and must abide by this plan. Vineyard Wind 1 is also required to submit interim and final SFV data results to NMFS and make corrections to the NASs in the case that any SFV

measurements demonstrate noise levels are above those expected. These frequent and immediate reports allow NMFS to better understand the sound fields to which marine mammals are being exposed and require immediate corrective action should they be misaligned with anticipated noise levels within our analysis.

#### *Clearance and Shutdown Zones*

NMFS requires the establishment of both clearance and shutdown zones during impact pile driving. The purpose of “clearance” of a particular zone is to minimize potential instances of auditory injury and more severe behavioral disturbances by delaying the commencement of an activity if marine mammals are near the activity. The purpose of a “shutdown” is to prevent a specific acute impact, such as auditory injury or severe behavioral disturbance of sensitive species, by halting the activity. Due to the increased density of North Atlantic right whales during the months of November and December, as compared to densities in June through October, more stringent clearance and shutdown mitigation measures are planned for these months.

All relevant clearance and shutdown zones during project activities will be monitored by NMFS-approved PSOs and PAM operators. PAM would be conducted at least 24 hours in advance of any pile driving activities. At least one PAM operator would review data from at least 24 hours prior to foundation installation (to increase situational awareness) and actively monitor hydrophones for 60 minutes prior to commencement of these activities. Any North Atlantic right whale sighting at any distance by visual PSOs, or acoustically detected within the PAM monitoring zone (10 km), triggers a delay to commencing pile driving or a shutdown. Any large whale sighted by a PSO or acoustically detected by a PAM operator that cannot be identified as a non-North Atlantic right whale must be treated as if it were a North Atlantic right whale.

Prior to the start of pile driving activities, Vineyard Wind must ensure designated areas (*i.e.*, clearance zones, table 11) are clear of marine mammals before commencing activities to minimize the potential for and degree of harassment. PSOs must visually monitor clearance zones for marine mammals for a minimum of 60 minutes prior to commencing foundation installation activities. During this period, the clearance zones will be monitored acoustically by a PAM operator as well. All clearance zones (table 11) must be confirmed to be free of marine mammals

for 30 minutes immediately prior to commencing foundation installation activities. The minimum visibility zone, defined as the area over which PSOs must be able to visually detect marine mammals, would extend 4,000 m for monopile installation from the pile being driven (table 11) and must be visible for 60 minutes. The minimum visibility zone corresponds to the modeled Level A harassment distance for low-frequency cetaceans plus twenty percent, and rounded up to the nearest 0.5 km. The minimum visibility zone must be visually cleared of marine mammals. If this zone is obscured to the degree that effective monitoring cannot occur, pile driving must be delayed. Minimum visibility zone and clearance zones are defined and provided in table 11 for all species.

From November 1 to December 31, vessel-based surveys will be used to confirm the clearance zone (10 km PAM clearance zone (6.2 mi); table 11) is clear of North Atlantic right whales prior to pile driving. The survey will be supported by a team of nine PSOs coordinating visual monitoring across two PSO support vessels and the pile driving platform. The two PSO support vessels, each with three active on-duty PSOs, will be positioned at the same distance on either side of the pile driving vessel. Each PSO support vessel would transit along a steady course along parallel track lines in opposite directions. Each transect line will be surveyed at a similar speed, not to exceed 10 kn (11.5 mph) and would last for approximately 30 minutes to 1 hour. If a North Atlantic right whale is sighted at any distance during the vessel-based survey, pile driving must be delayed until the following day unless an additional vessel-based survey with additional transects is conducted to determine the clearance zone is clear of North Atlantic right whales. Further details on PSO support vessel monitoring efforts are described in the Vineyard Wind 1 application section 11, table 17.

Once pile driving activity begins, any marine mammal entering their respective shutdown zone will trigger the activity to cease. In the case of pile driving, the shutdown requirement may be waived if it is not practicable due to imminent risk of injury or loss of life to an individual or risk of damage to a vessel that creates risk of injury or loss of life for individuals, or if the lead engineer determines there is pile refusal or pile instability.

In situations when shutdown is called for, but Vineyard Wind 1 determines shutdown is not practicable due to aforementioned emergency reasons,

reduced hammer energy must be implemented when the lead engineer determines it is practicable. Specifically, pile refusal or pile instability could result in the inability to shut down pile driving immediately. Pile refusal occurs when the pile driving sensors indicate the pile is approaching refusal, and a shut-down would lead to a stuck pile which then poses an imminent risk of injury or loss of life to an individual, or risk of damage to a vessel that creates risk for individuals. Pile instability occurs when the pile is unstable and unable to stay standing if the piling vessel were to “let go.” During these periods of instability, the lead engineer may determine a shut-down is not feasible because the shut-down combined with impending weather conditions may require the piling vessel to “let go” which then

poses an imminent risk of injury or loss of life to an individual, or risk of damage to a vessel that creates risk for individuals. Vineyard Wind 1 must document and report to NMFS all cases where the emergency exemption is taken.

After shutdown, impact pile driving may be reinitiated once all clearance zones are clear of marine mammals for the minimum species-specific periods, or, if required to maintain pile stability, impact pile driving may be reinitiated but must be used to maintain stability. From June 1–October 31, if pile driving has been shut down due to the presence of a North Atlantic right whale, pile driving must not restart until the North Atlantic right whale has not been visually or acoustically detected for 30 minutes. Upon re-starting pile driving, soft-start protocols must be followed if

pile driving has ceased for 30 minutes or longer. From November 1–December 31, if a North Atlantic right whale is detected either via real-time PAM or vessel-based surveys at any distance from the pile driving location, pile driving must be delayed and must not commence until the following day unless a follow-up vessel-based survey confirms the clearance zone is clear of North Atlantic right whales upon completion of the survey, as determined by the lead PSO. During November 1–December 31, if pile driving has been shut down or delayed due to the presence of 3 or more North Atlantic right whales, pile driving will be postponed until the next day. Shutdown zones vary by species and are shown in table 11 below.

TABLE 11—MINIMUM VISIBILITY, CLEARANCE, SHUTDOWN, AND LEVEL B HARASSMENT ZONES, IN METERS (m), DURING IMPACT PILE DRIVING

Monitoring zones	North Atlantic right whales <sup>a</sup>	Other mysticetes/sperm whales (m) <sup>b</sup>	Pilot Whales, harbor porpoises, and delphinids (m) <sup>b</sup>	Pinnipeds (m) <sup>b</sup>
Minimum Visibility Zone <sup>c</sup> .....	4,000			
Visual Clearance Zone .....	Any distance from pile driving PSOs .....	500	160	160
PAM Clearance and Shutdown Zone <sup>d</sup> .....	10,000 .....	500	160	160
Visual Shutdown Zone .....	Any distance from pile driving PSOs .....	500	160	160
Distance to Level B Harassment Threshold	5,720			

<sup>a</sup>From December 1–December 31, vessel based surveys using two PSO support vessels would confirm the 10 km (6.2 mi) PAM clearance zone is clear of North Atlantic right whales. If three or more North Atlantic right whales are sighted in November or December, pile driving will be delayed for 24 hours.

<sup>b</sup>Pile driving may commence when either the marine mammal has voluntarily left the respective clearance zone and has been visually confirmed beyond that clearance zone, or when 30 minutes (North Atlantic right whales (June–October), other non-North Atlantic right whale mysticetes, sperm whales, pilot whales, Risso’s dolphins) or 15 minutes (all other delphinids and pinnipeds) have elapsed without re-detection.

<sup>c</sup>Minimum visibility zone is the minimum distance that must be visible prior to initiating pile driving, as determined by the lead PSO. The minimum visibility zone corresponds to the Level A harassment distance for low-frequency cetaceans plus twenty percent, and rounded up to the nearest 0.5 km.

<sup>d</sup>The PAM system must be capable of detecting North Atlantic right whales at 10 km during pile driving. The system should also be designed to detect other marine mammals to the maximum extent practicable; however, it is not required these other species be detected out to 10 km given higher frequency calls and echolocation clicks are not typically detectable at large distances.

For any other in-water construction heavy machinery activities (e.g., trenching, cable laying, etc.), if a marine mammal is on a path towards or comes within 10 m (32.8 ft) of equipment, Vineyard Wind 1 would be required to delay or cease operations until the marine mammal has moved more than 10 m on a path away from the activity to avoid direct interaction with equipment.

In consideration of a public comment, NMFS has included a requirement for Vineyard Wind 1 to shutdown pile driving in the event of a live cetacean stranding where the NMFS Marine Mammal Stranding Network is engaged in herding or other interventions to return animals to the water. Marine mammals involved in live stranding

events (or near-shore atypical milling) are considered especially susceptible to the effects of additional stressors. These shutdown procedures are not related to the investigation of the cause of any such stranding and their implementation is not intended to imply that the activity of the authorized entity is the cause of the stranding. Rather, shutdown procedures are intended to protect marine mammals exhibiting indicators of distress by minimizing their exposure to possible additional stressors, regardless of the factors that contributed to the stranding. Vineyard Wind 1 will be required to shut down pile driving activities according to the measure described in the IHA.

*Soft-Start*

The use of a soft-start procedure is believed to provide additional protection to marine mammals by warning them or providing them with a chance to leave the area prior to the hammer operating at full capacity. Soft-start typically involves initiating hammer operation at a reduced energy level (relative to full operating capacity) followed by a waiting period. Vineyard Wind 1 is required to utilize a soft-start protocol for impact pile driving of monopiles by performing 4–6 single hammer strikes at less than 40 percent of the maximum hammer energy followed by at least 1 minute delay before the subsequent hammer strikes. This process shall be conducted at least three times (e.g., 4–6 single strikes,

delay, 4–6 single strikes, delay, 4–6 single strikes, delay) for a minimum of 20 minutes. NMFS notes that it is difficult to specify a reduction in energy for any given hammer because of variation across drivers and installation conditions. Vineyard Wind will reduce energy based on consideration of site-specific soil properties and other relevant operational considerations.

Soft start would be required at the beginning of each day's activity and at any time following a cessation of activity of 30 minutes or longer. Prior to soft-start, the operator must receive confirmation from the PSO that the clearance zone is clear of any marine mammals.

Based on our evaluation of the applicant's measures, as well as other measures considered by NMFS, NMFS has determined that the mitigation measures provide the means of effecting the least practicable impact on the affected 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. NMFS' MMPA implementing regulations at 50 CFR 216.104(a)(13) indicate that requests for authorization 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 while conducting the activities. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density);
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the activity; or (4) biological or behavioral

context of exposure (*e.g.*, age, calving or feeding areas);

- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;

- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;

- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and,

- Mitigation and monitoring effectiveness.

Separately, monitoring is also regularly used to support mitigation implementation, which is referred to as mitigation monitoring, and monitoring plans typically include measures that both support mitigation implementation and increase our understanding of the impacts of the activity on marine mammals.

### Protected Species Observer and PAM Operator Requirements

PSOs are trained professionals who are tasked with visual monitoring for marine mammals during pile driving activities. The primary purpose of a PSO is to carry out the monitoring, collect data, and, when appropriate, call for the implementation of mitigation measures. Visual monitoring by NMFS-approved PSOs will be conducted at a minimum of 60 minutes before, during, and 30 minutes after all planned impact pile driving activities. In addition to visual observations, NMFS requires Vineyard Wind 1 to conduct PAM using NMFS-approved PAM operators during impact pile driving and vessel transit. PAM must also be conducted for 24 hours in advance and during impact pile driving activities. Visual observations and acoustic detections will be used to support the mitigation measures (*e.g.*, clearance zones). To increase understanding of the impacts of the activity on marine mammals, PSOs must record all incidents of marine mammal occurrence at any distance from the piling locations. PSOs would document all behaviors and behavioral changes, in concert with distance from an acoustic source.

NMFS will require PAM conducted by NMFS-approved PAM operators, following standardized measurement, processing methods, reporting metrics, and metadata standards for offshore wind. PAM alongside visual data monitoring is valuable to provide the

most accurate record of species presence as possible, and these two monitoring methods are well understood to provide best results when combined together (*e.g.*, Barlow and Taylor, 2005; Clark *et al.*, 2010; Gerrodette *et al.*, 2011; Van Parijs *et al.*, 2021). Acoustic monitoring (in addition to visual monitoring) increases the likelihood of detecting marine mammals within the shutdown and clearance zones of project activities, which when applied in combination with required shutdowns helps to further reduce the risk of marine mammals being exposed to sound levels that could otherwise result in acoustic injury or more intense behavioral harassment.

The exact configuration and number of PAM systems depends on the size of the zone(s) being monitored, the amount of noise expected in the area, and the characteristics of the signals being monitored. More closely spaced hydrophones would allow for more directionality and perhaps range to the vocalizing marine mammals; however, this approach would add additional costs and greater levels of complexity to the project. Larger baleen cetacean species (*i.e.*, mysticetes), which produce loud and lower-frequency vocalizations, may be able to be heard with fewer hydrophones spaced at greater distances. However, smaller cetaceans (such as mid-frequency delphinids or odontocetes) may necessitate more hydrophones and to be spaced closer together given the shorter range of the shorter, mid-frequency acoustic signals (*e.g.*, whistles and echolocation clicks). The configuration for collecting the required marine mammal data will be based upon the acoustic data acquisition methods used during the 2023 Vineyard Wind construction campaign (Küsel *et al.*, 2024).

NMFS does not formally administer any PSO or PAM operator training program or endorse specific providers but will approve PSOs and PAM operators that have successfully completed courses that meet the curriculum and trainer requirements. All PSOs and PAM operators must have successfully attained a bachelor's degree with a major in one of the natural sciences. The educational requirements may be waived if the PSO or PAM operator has acquired the relevant skills through alternate experience. Requests for such a waiver shall be submitted to NMFS and must include written justification. Alternate experience that may be considered includes, but is not limited to (1) secondary education and/or experience comparable to PSO and/or PAM operator duties; (2) previous work experience conducting academic,

commercial, or government-sponsored marine mammal surveys; and (3) previous work experience as a PSO/PAM operator (PSOs/PAM operators must be in good standing and demonstrate good performance of PSO/PAM operator duties). All PSOs and PAM operators must have successfully completed a relevant training course within the last 5 years, including obtaining a certificate of course completion that would be submitted to NMFS. All PSOs and PAM operators must demonstrate good standing and consistently good performance of all assigned duties.

For prospective PSOs and PAM operators not previously approved, or for PSOs and PAM operators whose approval is not current, NMFS must review and approve PSO and PAM operator qualifications. Vineyard Wind 1 will be required to submit PSO and PAM operator resumes for approval at least 60 days prior to PSO and PAM operator use. Resumes must include information related to relevant education, experience, and training, including dates, duration, location, and description of prior PSO and/or PAM experience, and be accompanied by relevant documentation of successful completion of necessary training. Should Vineyard Wind 1 require additional PSOs or PAM operators throughout the project, Vineyard Wind 1 must submit a subsequent list of pre-approved PSOs and PAM operators to NMFS at least 15 days prior to planned use of that PSO or PAM operator. PSOs and PAM operators must have previous experience observing marine mammals and must have the ability to work with all required and relevant software and equipment.

PAM operators are responsible for obtaining NMFS approval. To be approved as a PAM operator, the person must meet the following qualifications: The PAM operator must have completed a PAM operator training course and demonstrate that they have prior experience with PAM software, equipment, and real-time acoustic detection systems. They must have prior experience independently analyzing archived and/or real-time PAM data to identify and classify baleen whale and other marine mammal vocalizations by species, including North Atlantic right whale and humpback whale vocalizations, and experience with deconflicting multiple species' vocalizations that are similar and/or received concurrently. The PAM operator must be able to identify and classify marine mammal acoustic detections by species in real-time (prioritizing North Atlantic right whales

and noting other marine mammal vocalizations, when detected). At a minimum, for each acoustic detection, the PAM operator must be able to categorically determine whether a North Atlantic right whale is detected, possibly detected, or not detected, and notify the Lead PSO of any confirmed or possible detections, including baleen whale detections that cannot be identified to species. If the PAM software is capable of localization of sounds or deriving bearings and distance, the PAM operator must demonstrate experience using this technique. PAM operators must be independent observers (*i.e.*, not construction personnel), and must demonstrate experience with relevant acoustic software and equipment. A Lead PAM operator must meet all of these requirements and have a minimum of 90 days at-sea experience in the specified role or sufficient alternative experience.

NMFS may approve PSOs as conditional or unconditional. An unconditional PSO is one who has completed training within the last 5 years and attained the necessary experience (*e.g.*, demonstrate experience with monitoring for marine mammals at clearance and shutdown zone sizes similar to those expected to be produced during the respective activity). A conditional PSO may be one who has completed training in the last 5 years but has not yet attained the requisite field experience. Unconditionally approved PSOs are required for impact pile driving activities.

Additionally, impact pile driving activities require PSOs and/or PAM operator monitoring to have a lead on duty. The visual PSO field team, in conjunction with the PAM team (*i.e.*, marine mammal monitoring team) will have a lead member (designated as the "Lead PSO" or "Lead PAM operator") who will be required to meet the unconditional standard. Lead PSO or PAM operators must also have a minimum of 90 days at sea in the specified role, with the conclusion of the most recent relevant experience not more than 18 months previous and must also have experience specifically monitoring baleen whale species. A PSO may be trained and/or experienced as both a PSO and PAM operator and may perform either duty, pursuant to scheduling requirements (and vice versa).

PSOs must have visual acuity in both eyes (with correction of vision being permissible) sufficient enough to discern moving targets on the water's surface with the ability to estimate the

target size and distance (binocular use is allowable), ability to conduct field observations and collect data according to the assigned protocols, and the ability to communicate orally, by radio, or in-person, with project personnel to provide real-time information on marine mammals observed in the area. All PSOs must be trained in northwestern Atlantic Ocean marine mammal identification and behaviors and must be able to conduct field observations and collect data according to assigned protocols. Additionally, PSOs must have the ability to work with all required and relevant software and equipment necessary during observations.

Vineyard Wind must work with the selected third-party PSO and PAM operator provider to ensure PSOs and PAM operators have all equipment (including backup equipment) needed to adequately perform necessary tasks. For PSOs, this includes, but is not limited to, accurate determination of distance and bearing to observed marine mammals, and to ensure that PSOs are capable of calibrating equipment as necessary for accurate distance estimates and species identification. PSO equipment, at a minimum, shall include:

- At least one thermal (infrared) imaging device suited for the marine environment;
- Reticle binoculars (*e.g.*, 7 × 50) of appropriate quality (at least one per PSO, plus backups);
- Global positioning units (GPS) (at least one plus backups);
- Digital cameras with a telephoto lens that is at least 300-mm or equivalent on a full-frame single lens reflex (SLR) (at least one plus backups). The camera or lens should also have an image stabilization system;
- Equipment necessary for accurate measurement of distances to marine mammal;
- Compasses (at least one plus backups);
- Means of communication among vessel crew and PSOs; and,
- Any other tools deemed necessary to adequately and effectively perform PSO tasks.

At least two PSOs on the pile driving vessel must be equipped with functional Big Eye binoculars (*e.g.*, 25\*150; 2.7 view angle; individual ocular focus; height control), Big Eye binocular would be pedestal mounted on the deck at the best vantage point that provides for optimal sea surface observation and PSO safety. PAM operators must have the appropriate equipment (*i.e.*, a computer station equipped with a data collection software system available



wherever they are stationed) and use a NMFS-approved PAM system to conduct monitoring. During periods of low visibility (*i.e.*, fog, precipitation, darkness, poor weather conditions), PSOs must use alternative monitoring technology (*e.g.*, infrared or thermal cameras) to monitor mitigation zones. PSOs aboard the pile driving vessel must have access to two FLIR cameras with two screens, thermal clip-ons, hand-held night vision devices, and thermal monoculars. PSOs aboard the PSO support vessels must have access to one FLIR camera with a single screen, thermal clip-ons, hand-held night vision devices, and thermal monoculars. The equipment specified above may be provided by an individual PSO, the third-party PSO provider, or the operator, but Vineyard Wind 1 is responsible for ensuring PSOs have the proper equipment required to perform the duties specified in the IHA. Reference materials must be available aboard all project vessels for identification of protected species.

PSOs and PAM operators are not be permitted to exceed 4 consecutive watch hours on duty at any time, must have a 2-hour (minimum) break between watches, and must not exceed a combined watch schedule of more than 12 hours in a 24-hour period. If the schedule includes PSOs and PAM operators on-duty for 2-hour shifts, a minimum 1-hour break between watches is allowed.

The PSOs are responsible for monitoring the waters surrounding the pile driving site to the farthest extent permitted by sighting conditions, including pre-start clearance and shutdown zones, prior to, during, and following foundation installation activities. Monitoring must be done while free from distractions and in a consistent, systematic, and diligent manner. If PSOs cannot visually monitor the minimum visibility zone of 4 km (2.5 mi) prior to foundation pile driving at all times using the required equipment, pile driving operations must not commence or must shutdown if they are currently active. All PSOs must be located at the best vantage point(s) on any platform, as determined by the Lead PSO, in order to obtain 360-degree visual coverage of the entire clearance and shutdown zones, and as much of the Level B harassment zone as possible. PAM operators may be located on a vessel or remotely on-shore, and must assist PSOs in ensuring full coverage of the clearance and shutdown zones. The PAM operator must monitor to and past the clearance zones for large whales as far as possible.

All on-duty PSOs must remain in real-time contact with the on-duty PAM operator(s). PAM operators must immediately communicate all acoustic detections of marine mammals to PSOs, including any determination regarding species identification, distance, and bearing (where relevant) relative to the pile being driven and the degree of confidence (*e.g.*, possible, probable detection) in the determination. The PAM operator must inform the Lead PSO(s) on duty of animal detections approaching or within applicable ranges of interest to the activity occurring via the data collection software system (*i.e.*, Mysticetus or similar system) who must be responsible for requesting that the designated crewmember implement the necessary mitigation procedures (*i.e.*, delay). All on-duty PSOs and PAM operator(s) must remain in contact with the on-duty construction personnel responsible for implementing mitigations (*e.g.*, delay to pile driving) to ensure communication on marine mammal observations can easily, quickly, and consistently occur between all on-duty PSOs, PAM operator(s), and on-water Project personnel. It is the responsibility of the PSO(s) on duty to communicate the presence of marine mammals as well as to communicate the action(s) that are necessary to ensure mitigation and monitoring requirements are implemented as appropriate.

At least three PSOs (on the pile driving vessel) and one PAM operator must be on-duty and actively monitoring for marine mammals 60 minutes before, during, and 30 minutes after foundation installation in accordance with a NMFS-approved PAM Plan. PAM must also be conducted for at least 24 hours prior to foundation pile driving activities, and the PAM operator must review all detections from the previous 24-hour period prior to pile driving activities to increase situational awareness. Throughout the year (June through December), at least three PSOs must also be on-duty and actively monitoring from PSO support vessels. There must be at least two PSO support vessels with on-duty PSOs during any pile driving activities from June through December.

In addition to monitoring duties, PSOs and PAM operators are responsible for data collection. The data collected by PSO and PAM operators and subsequent analysis provide the necessary information to inform an estimate of the amount of take that occurred during the project, better understand the impacts of the project on marine mammals, address the effectiveness of monitoring and mitigation measures, and to adaptively

manage activities and mitigation in the future. Data reported includes information on marine mammal sightings, activity occurring at time of sighting, monitoring conditions, and if mitigative actions were taken.

For all visual monitoring efforts and marine mammal sightings, the following information must be collected and reported to NMFS Office of Protected Resources: the date and time that monitored activity begins or ends, the construction activities occurring during each observation period, the watch status (*i.e.*, sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform), the PSO who sighted the animal, the time of sighting; the weather parameters (*e.g.*, wind speed, percent cloud cover, visibility), the water conditions (*e.g.*, Beaufort sea state, tide state, water depth); all marine mammal sightings, regardless of distance from the construction activity; species (or lowest possible taxonomic level possible), the pace of the animal(s), the estimated number of animals (minimum/maximum/high/low/best), the estimated number of animals by cohort (*e.g.*, adults, yearlings, juveniles, calves, group composition, *etc.*), the description (*i.e.*, as many distinguishing features as possible of each individual seen, including length, shape, color, pattern, scars or markings, shape and size of dorsal fin, shape of head, and blow characteristics), the description of any marine mammal behavioral observations (*e.g.*, observed behaviors such as feeding or traveling) and observed changes in behavior, including an assessment of behavioral responses thought to have resulted from the specific activity, the animal's closest distance and bearing from the pile being driven and estimated time entered or spent within the Level A harassment and/or Level B harassment zone(s), use of noise attenuation device(s), and specific phase of activity (*e.g.*, soft-start for pile driving, active pile driving, *etc.*), the marine mammal occurrence in Level A harassment or Level B harassment zones, the description of any mitigation-related action implemented, or mitigation-related actions called for but not implemented, in response to the sighting (*e.g.*, delay, shutdown, *etc.*) and time and location of the action, and other human activity in the area.

On May 19, 2023, Vineyard Wind submitted a Pile Driving Monitoring Plan for the 2023 IHA, including an Alternative Monitoring Plan, which was approved by NMFS. The Plan included details regarding PSO and PAM monitoring protocols and equipment planned for use. More specifically, the

PAM portion of the plan included a description of all PAM equipment, addressed how the passive acoustic monitoring must follow standardized measurement, processing methods, reporting metrics, and metadata standards for offshore wind as described in *NOAA and BOEM Minimum Recommendations for Use of Passive Acoustic Listening Systems in Offshore Wind Energy Development Monitoring and Mitigation Programs* (Van Parijs *et al.*, 2021). This plan also identified the efficacy of the technology at detecting marine mammals in the clearance and shutdown zones under all of the various conditions anticipated during construction, including varying weather conditions, sea states, and in consideration of the use of artificial lighting. On May 15, 2024, Vineyard Wind 1 submitted an updated Pile Driving Marine Mammal Monitoring Plan to NMFS Office of Protected Resources for review. The Plan must be approved by NMFS prior to the start of foundation pile driving, and Vineyard Wind 1 must abide by this plan.

#### *Sound Field Verification*

Vineyard Wind 1 is required to conduct Thorough SFV measurements during impact pile driving activity associated with the installation of, at minimum, the first monopile foundation and Abbreviated SFV measurements during impact installation of the remaining monopiles to demonstrate noise levels are at or below those measured during the 2023 Vineyard Wind construction campaign (Küsel *et al.*, 2024) and considered as maximum distances in this IHA. NMFS recognizes that the SFV data collected in 2023 occurred in warmer weather months and that water temperature can affect the sound speed profile and thus propagation rates. Therefore, if impact pile driving takes place in December, comprehensive SFV measurements must be conducted during impact pile driving activity associated with the installation of, at minimum, the first monopile foundation. Subsequent Thorough SFV measurements will also be required should larger piles be installed or if additional piles are driven that are anticipated to produce louder sound fields than those previously measured (*e.g.*, higher hammer energy, greater number of strikes, *etc.*). The required measurements and reporting associated with SFV can be found in the IHA. These requirements are extensive to ensure monitoring is conducted appropriately and the reporting frequency is such that Vineyard Wind 1 would be required to make adjustments quickly (*e.g.*, add additional sound

attenuation) to ensure marine mammals are not experiencing noise levels above those considered in this analysis. For recommended SFV protocols for impact pile driving, please consult International Organization for Standardization (ISO) 18406 *Underwater acoustics—Measurement of radiated underwater sound from percussive pile driving* (2017). On May 15, 2024, Vineyard Wind 1 submitted an updated SFV plan to NMFS Office of Protected Resources for review. The Plan must be approved by NMFS prior to the start of foundation pile driving, and Vineyard Wind 1 must abide by this plan.

For any pile driving activities, Vineyard Wind 1 is also required to submit interim and final SFV data results to NMFS and make corrections to the noise attenuation systems in the case that any SFV measurements demonstrate noise levels are above those measured during the 2023 Vineyard Wind construction campaign (Küsel *et al.*, 2024) and considered as maximum distances in this IHA. These frequent and immediate reports will allow NMFS to better understand the sound fields to which marine mammals are being exposed and require immediate corrective action should they be misaligned with anticipated noise levels within our analysis.

#### *Reporting*

Prior to any construction activities occurring, Vineyard Wind 1 must provide a report to NMFS Office of Protected Resources that demonstrates that all Vineyard Wind 1 personnel, which includes the vessel crews, vessel captains, PSOs, and PAM operators have completed all required training. NMFS requires standardized and frequent reporting from Vineyard Wind 1 during the active period of the IHA. All data collected relating to the Project will be recorded using industry-standard software (*e.g.*, Mysticetus or a similar software) installed on field laptops and/or tablets. Vineyard Wind 1 is required to submit weekly, monthly, annual, and situational reports. Vineyard Wind 1 must review SFV results within 24 hours to determine whether measurements exceeded modeled (Level A harassment) and expected (Level B harassment) thresholds.

Vineyard Wind 1 must provide the initial results of the SFV measurements to NMFS Office of Protected Resources in an interim report after each foundation installation event as soon as they are available and prior to a subsequent foundation installation, but no later than 48 hours after each

completed foundation installation event. The report must include, at minimum: hammer energies/schedule used during pile driving, including the total number of strikes and the maximum hammer energy; peak sound pressure level ( $SPL_{pk}$ ); root-mean-square sound pressure level that contains 90 percent of the acoustic energy ( $SPL_{rms}$ ); and sound exposure level (SEL, in single strike for pile driving,  $SEL_{ss}$ ); for each hydrophone, including at least the maximum, arithmetic mean, minimum, median (L50) and L5 (95 percent exceedance) statistics for each metric; estimated marine mammal Level A harassment and Level B harassment isopleths; calculated using the maximum-over-depth L5 (95 percent exceedance level, maximum of both hydrophones) of the associated sound metric; comparison of 2023 measured results against the measured marine mammal Level A harassment and Level B harassment acoustic isopleths; estimated transmission loss coefficients, pile identifier name, location of the pile and each hydrophone array in latitude/longitude; depths of each hydrophone; one-third-octave band single strike SEL spectra; if filtering is applied, full filter characteristics; and hydrophone specifications including the type, model, and sensitivity. Vineyard Wind 1 is also required to report any immediate observations which are suspected to have a significant impact on the results including but not limited to: observed noise mitigation system issues, obstructions along the measurement transect, and technical issues with hydrophones or recording devices. If any in-situ calibration checks for hydrophones reveal a calibration drift greater than 0.75 dB, pistonphone calibration checks are inconclusive, or calibration checks are otherwise not effectively performed, Vineyard Wind 1 will be required to indicate full details of the calibration procedure, results, and any associated issues in the 48-hour interim reports.

Vineyard Wind must review Abbreviated SFV results for each pile within 24 hours of completion of the foundation installation (inclusive of pile driving and any drilling), and, assuming measured levels at 750 m did not exceed the thresholds defined during Thorough SFV, does not need to take any additional action. Results of Abbreviated SFV must be submitted with the weekly pile driving report.

The final results of SFV measurements from each foundation installation must be submitted as soon as possible, but no later than 90 days following completion of all annual SFV measurements. The final report must

include all details prescribed above for the interim report as well as, at minimum, the following: the peak sound pressure level ( $SPL_{pk}$ ); the root-mean-square sound pressure level that contains 90 percent of the acoustic energy ( $SPL_{rms}$ ); the single strike sound exposure level ( $SEL_{ss}$ ); the integration time for  $SPL_{rms}$ , the spectrum, and the 24-hour cumulative SEL extrapolated from measurements at all hydrophones. The final report must also include at least the maximum, mean, minimum, median ( $L_{50}$ ) and  $L_5$  (95 percent exceedance) statistics for each metric; the SEL and SPL power spectral density and/or one-third octave band levels (usually calculated at all decade band levels) at the receiver locations should be reported; the sound levels reported must be in median, arithmetic mean, and  $L_5$  (95 percent exceedance) (*i.e.*, average in linear space), and in dB, range of transmission loss coefficients; the local environmental conditions, such as wind speed, transmission loss data collected on-site (or the sound velocity profile); baseline pre- and post-activity ambient sound levels (broadband and/or within frequencies of concern); a description of depth and sediment type, as documented in the Construction and Operation Plan (COP), at the recording and foundation installation locations; the extents of the measured Level A harassment and Level B harassment zone(s); hammer energies required for pile installation and the number of strikes per pile; the hydrophone equipment and methods (*i.e.*, recording device, bandwidth/sampling rate; distance from the pile where recordings were made; the depth of recording device(s)); a description of the SFV measurement hardware and software, including software version used, calibration data, bandwidth capability and sensitivity of hydrophone(s); any filters used in hardware or software; any limitations with the equipment; and other relevant information; the spatial configuration of the noise attenuation device(s) relative to the pile, a description of the noise abatement system and operational parameters (*e.g.*, bubble flow rate, distance deployed from the pile, *etc.*), and any action taken to adjust the noise abatement system. A discussion which includes any observations which are suspected to have a significant impact on the results including but not limited to: observed noise mitigation system issues, obstructions along the measurement transect, and technical issues with hydrophones or recording devices.

If at any time during the project Vineyard Wind 1 becomes aware of any issue(s) that may (to any reasonable subject-matter expert, including the persons performing the measurements and analysis) call into question the validity of any measured Level A harassment or Level B harassment isopleths to a significant degree, which were previously transmitted or communicated to NMFS Office of Protected Resources, Vineyard Wind 1 must inform NMFS Office of Protected Resources within 1 business day of becoming aware of this issue or before the next pile is driven, whichever comes first.

**Weekly Report**—During foundation installation activities, Vineyard Wind 1 must compile and submit weekly marine mammal monitoring reports for foundation installation pile driving to NMFS Office of Protected Resources that document the daily start and stop of all pile driving activities; the start and stop of associated observation periods by PSOs; details on the deployment of PSOs; a record of all detections of marine mammals (acoustic and visual); any mitigation actions (or if mitigation actions could not be taken, provide reasons why); and details on the noise abatement system(s) (*e.g.*, system type, distance deployed from the pile, bubble rate, *etc.*). Weekly reports will be due on Wednesday for the previous week (Sunday to Saturday). The weekly reports are also required to identify which turbines become operational and when (a map must be provided).

**Monthly Report**—Vineyard Wind 1 is required to compile and submit monthly reports to NMFS Office of Protected Resources that include a summary of all information in the weekly reports, including project activities carried out in the previous month, vessel transits (number, type of vessel, and route); number of piles installed; all detections of marine mammals; and any mitigative actions taken. Monthly reports would be due on the 15th of the month for the previous month. The monthly report would also identify which turbines become operational and when (a map must be provided).

**Final Annual Reporting**—Vineyard Wind 1 is required to submit its draft annual report to NMFS Office of Protected Resources on all visual and acoustic monitoring conducted under the IHA within 90 calendar days of the completion of activities occurring under the IHA. A final annual report must be prepared and submitted within 60 calendar days following receipt of any NMFS comments on the draft report. Information contained within this report is described at the beginning of this

section. Full PAM detection data, metadata, and location of recorders must be submitted within 90 days following completion of impact pile driving foundations and every 90 calendar days for transit lane PAM using the International Organization for Standardization (ISO) standard metadata forms and instructions available on the NMFS Passive Acoustic Reporting System website (<https://www.fisheries.noaa.gov/resource/document/passive-acoustic-reporting-system-templates>). Concurrently, the full acoustic recordings from real-time systems must also be sent to the National Centers for Environmental Information (NCEI, <https://www.ncei.noaa.gov/products/passive-acoustic-data>) for archiving.

**Situational Reporting**—Specific situations encountered during the Project require immediate reporting. For instance, if a North Atlantic right whale is sighted with no visible injuries or entanglement at any time by project PSOs or project personnel, Vineyard Wind 1 must immediately report the sighting to NMFS as soon as possible or within 24 hours after the initial sighting. All North Atlantic right whale acoustic detections within a 24-hour period should be collated into one spreadsheet and reported to NMFS as soon as possible but must be reported within 24 hours. Vineyard Wind 1 should report sightings and acoustic detections by downloading and completing the Real-Time North Atlantic Right Whale Reporting Template spreadsheet found here: <https://www.fisheries.noaa.gov/resource/document/template-datasheet-real-time-north-atlantic-right-whale-acoustic-and-visual>. Vineyard Wind 1 must save the completed spreadsheet as a .csv file and email it to NMFS Northeast Fisheries Science Center—Protected Resources Division (NEFSC-PRD) ([ne.rw.survey@noaa.gov](mailto:ne.rw.survey@noaa.gov)), NMFS GARFO-PRD ([nmfs.gar.incidental-take@noaa.gov](mailto:nmfs.gar.incidental-take@noaa.gov)), and NMFS Office of Protected Resources (OPR) ([pr.itp.monitoringreports@noaa.gov](mailto:pr.itp.monitoringreports@noaa.gov)). If the sighting is in the Southeast (North Carolina through Florida), sightings will be reported via the template and to the Southeast Stranding Hotline 877-WHALE-HELP (877-942-5343) with the observation information provided below (PAM detections are not reported to the Hotline). If Vineyard Wind 1 is unable to report a sighting through the spreadsheet within 24 hours, Vineyard Wind 1 will call the relevant regional hotline (Greater Atlantic Region [Maine through Virginia] Hotline 866-755-6622; Southeast Stranding Hotline 877-WHALE-HELP) with the observation

information provided below.

Observation information will include: the time (note time format), date (MM/DD/YYYY), location (latitude/longitude in decimal degrees; coordinate system used) of the observation, number of whales, animal description/certainty of observation (follow up with photos/video if taken), reporter's contact information, and lease area number/project name, PSO/personnel name who made the observation, and PSO provider company (if applicable). If Vineyard Wind 1 is unable to report via the template or the regional hotline, Vineyard Wind 1 will enter the sighting via the WhaleAlert app (<http://www.whalealert.org/>). If this is not possible, the sighting will be reported to the U.S. Coast Guard via channel 16. The report to the Coast Guard must include the same information as would be reported to the Hotline (see above). PAM detections would not be reported to WhaleAlert or the U.S. Coast Guard. If a non-North Atlantic right whale large whale is observed, Vineyard Wind 1 will be required to report the sighting via WhaleAlert app (<http://www.whalealert.org/>) as soon as possible but within 24 hours.

In the event that personnel involved in the Project discover a stranded, entangled, injured, or dead marine mammal, Vineyard Wind 1 must immediately report the observation to NMFS. If in the Greater Atlantic Region (Maine through Virginia), call the NMFS Greater Atlantic Stranding Hotline (866-755-6622), and if in the Southeast Region (North Carolina through Florida) call the NMFS Southeast Stranding Hotline (877-WHALE-HELP (877-942-5343)). Separately, Vineyard Wind must report the incident within 24 hours to NMFS OPR ([PR.ITP.MonitoringReports@noaa.gov](mailto:PR.ITP.MonitoringReports@noaa.gov)) and, if in the Greater Atlantic Region to the NMFS GARFO ([nmfs.gar.incidental-take@noaa.gov](mailto:nmfs.gar.incidental-take@noaa.gov)) or if in the Southeast Region, to the NMFS Southeast Regional Office (SERO; [secmammalreports@noaa.gov](mailto:secmammalreports@noaa.gov)). Note, the stranding hotline may request the report be sent to the local stranding network response team. The report must include contact information (e.g., name, phone number, etc.), time, date, and location (i.e., specify coordinate system) of the first discovery (and updated location information, if known and applicable), species identification (if known) or description of the animal(s) involved, condition of the animal(s) (including carcass condition if the animal is dead), observed behaviors of the animal(s) (if alive), photographs or video footage of the animal(s) (if

available), and general circumstances under which the animal was discovered.

If the injury, entanglement, or death was caused by a project activity, Vineyard Wind 1 will be required to immediately cease all activities until NMFS Office of Protected Resources is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of the IHA. NMFS OPR may impose additional measures to minimize the likelihood of further prohibited take and ensure MMPA compliance consistent with the adaptive management provisions. Vineyard Wind 1 would not resume their activities until notified by NMFS Office of Protected Resources.

In the event of a suspected or confirmed vessel strike of a marine mammal by any vessel associated with the Project or other means by which Project activities caused a non-auditory injury or death of a marine mammal, Vineyard Wind 1 must immediately report the incident to NMFS. If in the Greater Atlantic Region (Maine through Virginia), call the NMFS Greater Atlantic Stranding Hotline (866-755-6622), and if in the Southeast Region (North Carolina through Florida) call the NMFS Southeast Stranding Hotline (877-WHALE-HELP (877-942-5343)). Separately, Vineyard Wind must immediately report the incident to NMFS OPR ([PR.ITP.MonitoringReports@noaa.gov](mailto:PR.ITP.MonitoringReports@noaa.gov)) and, if in the Greater Atlantic Region to the NMFS GARFO ([nmfs.gar.incidental-take@noaa.gov](mailto:nmfs.gar.incidental-take@noaa.gov)) or if in the Southeast Region, to the NMFS SERO ([secmammalreports@noaa.gov](mailto:secmammalreports@noaa.gov)). The report must include time, date, and location (i.e., specify coordinate system) of the incident; species identification (if known) or description of the animal(s) involved (i.e., identifiable features including animal color, presence of dorsal fin, body shape and size, etc.); vessel strike reporter information (name, affiliation, email for person completing the report); vessel strike witness (if different than reporter) information (e.g., name, affiliation, phone number, platform for person witnessing the event, etc.); vessel name and/or MMSI number; vessel size and motor configuration (inboard, outboard, jet propulsion); vessel's speed leading up to and during the incident; vessel's course/heading and what operations were being conducted (if applicable); part of vessel that struck marine mammal (if known); vessel damage notes; status of all sound sources in use at the time of the strike; if the marine mammal was seen before the strike event; description of behavior of the marine mammal before the strike event

(if seen) and behavior immediately following the strike; description of avoidance measures/requirements that were in place at the time of the strike and what additional measures were taken, if any, to avoid strike; environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, visibility, etc.) immediately preceding the strike; estimated (or actual, if known) size and length of marine mammal that was struck, if available; description of the presence and behavior of any other marine mammals immediately preceding the strike, other animal-specific details if known (e.g., length, sex, age class); behavior or estimated fate of the marine mammal post-strike (e.g., dead, injured but alive, injured and moving, external visible wounds (linear wounds, propeller wounds, non-cutting blunt-force trauma wounds); blood or tissue observed in the water, status unknown, disappeared), to the extent practicable; any photographs or video footage of the marine mammal(s); and, any additional notes the witness may have from the interaction. For any numerical values provided (i.e., location, animal length, vessel length, etc.), please provide if values are actual or estimated. If there is a suspected or confirmed vessel strike of a marine mammal by any vessel associated with the Project or other means by which Project activities caused a non-auditory injury or death of a marine mammal, Vineyard Wind 1 will be required to immediately cease activities until the NMFS Office of Protected Resources is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of the IHA. NMFS OPR may impose additional measures to minimize the likelihood of further prohibited take and ensure MMPA compliance. Vineyard Wind 1 may not resume their activities until notified by NMFS OPR.

**Sound Field Verification**—Vineyard Wind 1 will be required to submit interim SFV reports after each foundation installation within 48 hours. A final SFV report for all monopile foundation installation monitoring will be required within 90 days following completion of acoustic monitoring.

#### **Negligible Impact Analysis and Determination**

NMFS has defined negligible impact 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

(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. In addition to considering estimates of the number of marine mammals that might be “taken” through harassment, NMFS considers other factors, such as the likely nature of any impacts or responses (*e.g.*, intensity, duration), the context of any impacts or responses (*e.g.*, critical reproductive time or location, foraging impacts affecting energetics), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS’ implementing regulations (54 FR 40338, September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

In the Estimated Take of Marine Mammals section, we estimated the maximum number of takes by Level A harassment and Level B harassment that could occur from Vineyard Wind’s specified activities based on the methods described. The impact that any given take would have is dependent on many case-specific factors that need to be considered in the negligible impact analysis (*e.g.*, the context of behavioral exposures such as duration or intensity of a disturbance, the health of impacted animals, the status of a species that incurs fitness-level impacts to individuals, *etc.*). In this notice of the final IHA, we evaluate the likely impacts of the harassment takes that are authorized in the context of the specific circumstances surrounding these predicted takes. We also collectively evaluate this information, as well as other more taxa-specific information and mitigation measure effectiveness, in group-specific discussions that support our negligible impact conclusions for each stock. As described above, no serious injury or mortality is expected or authorized for any species or stock.

We base our analysis and negligible impact determination on the number of takes that are authorized, and extensive qualitative consideration of other contextual factors that influence the degree of impact of the takes on the

affected individuals and the number and context of the individuals affected.

To avoid repetition, we provide some general analysis in this Negligible Impact Analysis and Determination section that applies to all the species listed in table 1 given that some of the anticipated effects of the Vineyard Wind 1 construction activities on marine mammals are expected to be relatively similar in nature. Where there are meaningful differences between species or stocks—as is the case of the North Atlantic right whale—they are included as separate subsections below.

Last, we provide a negligible impact determination for each species or stock, providing species or stock-specific information or analysis where appropriate, for example for North Atlantic right whales given the population status. Organizing our analysis by grouping species or stocks that share common traits or that would respond similarly to effects of Vineyard Wind’s activities, and then providing species- or stock-specific information allows us to avoid duplication while ensuring that we have analyzed the effects of the specified activities on each affected species or stock.

As described previously, no serious injury or mortality is anticipated or authorized in this IHA. Any Level A harassment authorized would be in the form of auditory injury (*i.e.*, PTS). For all species, the amount of take authorized represents the maximum amount of Level A harassment and Level B harassment that is reasonably expected to occur.

#### *Behavioral Disturbance*

In general, NMFS anticipates that impacts on an individual that has been harassed are likely to be more intense when exposed to higher received levels and for a longer duration (though this is in no way a strictly linear relationship for behavioral effects across species, individuals, or circumstances) and less severe impacts result when exposed to lower received levels and for a brief duration. However, there is also growing evidence of the importance of contextual factors such as distance from a source in predicting marine mammal behavioral response to sound—*i.e.*, sounds of a similar received level emanating from a more distant source have been shown to be less likely to evoke a response of equal magnitude relative to a closer sound source (DeRuiter and Doukara, 2012; Falcone *et al.*, 2017). As described in the Potential Effects of Specified Activities on Marine Mammals and their Habitat section, the intensity and duration of any impact resulting from exposure to the Vineyard

Wind 1 activities is dependent upon a number of contextual factors including, but not limited to, sound source frequencies, whether the sound source is moving towards the animal, hearing ranges of marine mammals, behavioral state at time of exposure, status of individual exposed (*e.g.*, reproductive status, age class, health) and an individual’s experience with similar sound sources. Southall *et al.* (2021), Ellison *et al.* (2012) and Moore and Barlow (2013), among others, emphasize the importance of context (*e.g.*, behavioral state of the animals, distance from the sound source) in evaluating behavioral responses of marine mammals to acoustic sources. Level B harassment of marine mammals may consist of behavioral modifications (*e.g.*, avoidance, temporary cessation of foraging or communicating, changes in respiration or group dynamics, masking) and may include auditory impacts in the form of temporary hearing loss. In addition, some of the lower-level physiological stress responses (*e.g.*, change in respiration, change in heart rate) discussed previously would likely co-occur with the behavioral modifications, although these physiological responses are more difficult to detect, and fewer data exist relating these responses to specific received levels of sound. Take by Level B harassment, then, may have a stress-related physiological component as well; however, we would not expect the Vineyard Wind 1 pile driving activities to produce conditions of long-term and continuous exposure to noise leading to long-term physiological stress responses in marine mammals that could affect reproduction or survival.

In the range of behavioral effects that might be expected to be part of a response that qualifies as an instance of Level B harassment (which by nature of the way it is modeled/counted, occurs within 1 day), the less severe end might include exposure to comparatively lower levels of a sound, at a greater distance from the animal, for a few or several minutes. A less severe exposure of this nature could result in a behavioral response such as avoiding an area that an animal would otherwise have chosen to move through or feed in for some amount of time or breaking off one or a few feeding bouts. More severe effects could occur if an animal is close enough to the source to receive a comparatively higher level, is exposed continuously to one source for a longer time or is exposed intermittently to different sources throughout a day. Such effects might result in an animal having a more severe flight response and

leaving a larger area for a day or more or potentially losing feeding opportunities for a day. However, such severe behavioral effects that result in potentially lost feeding opportunities for animals are not considered a likely outcome of this activity.

Many species perform vital functions, such as feeding, resting, traveling, and socializing on a diel cycle (24-hour cycle). Behavioral reactions to noise exposure, when taking place in a biologically important context, such as disruption of critical life functions, displacement, or avoidance of important habitat, are more likely to be significant if they last more than 1 day or recur on subsequent days (Southall *et al.*, 2007) due to diel and lunar patterns in diving and foraging behaviors observed in many cetaceans (Baird *et al.*, 2008; Barlow *et al.*, 2020; Henderson *et al.*, 2016; Schorr *et al.*, 2014). It is important to note the water depth in the Limited Installation Area is shallow (ranging up to 37 to 49.5 m), so deep diving species such as sperm whales are not expected to be engaging in deep foraging dives when exposed to noise above NMFS harassment thresholds during the specified activities. Therefore, we do not anticipate impacts to deep foraging behavior to be impacted by the specified activities.

It is also important to note that the estimated number of takes does not necessarily equate to the number of individual animals Vineyard Wind 1 expects to harass (which is lower), but rather to the instances of take (*i.e.*, exposures above the Level B harassment thresholds) that may occur. Some individuals of a species may experience recurring instances of take over multiple days throughout the year while some members of a species or stock may experience one instance of take exposure as they move through an area, which means that the number of individuals taken may be smaller than the total estimated takes for a species or stock. In short, for species that are more likely to be migrating through the area and/or for which only a comparatively smaller number of takes are predicted (*e.g.*, some of the mysticetes), it is more likely that each take represents a different individual whereas for non-migrating species with larger amounts of predicted take, we expect that the total anticipated takes represent exposures of a smaller number of individuals of which some would be taken across multiple days.

Impacts from pile driving will be minimized through implementation of mitigation measures, including use of a sound attenuation system, soft-starts, the implementation of clearance zones

that would facilitate a delay to pile driving commencement, and implementation of shutdown zones. All these measures are designed to avoid or minimize harassment. For example, given sufficient notice through the use of soft-start, marine mammals are expected to move away from a sound source that is disturbing prior to becoming exposed to very loud noise levels. The requirement to couple visual monitoring and PAM before and during all foundation installation will increase the overall capability to detect marine mammals compared to one method alone.

Occasional, milder behavioral reactions are unlikely to cause long-term consequences for individual animals or populations, and even if some smaller subset of the takes is in the form of a longer (several hours or a day) and more severe response, if they are not expected to be repeated over numerous or sequential days, impacts to individual fitness are not anticipated. Also, the effect of disturbance is strongly influenced by whether it overlaps with biologically important habitats when individuals are present—avoiding biologically important habitats will provide opportunities to compensate for reduced or lost foraging (Keen *et al.*, 2021). Nearly all studies and experts agree that infrequent exposures of a single day or less are unlikely to impact an individual's overall energy budget (Farmer *et al.*, 2018; Harris *et al.*, 2017; King *et al.*, 2015; National Academy of Science, 2017; New *et al.*, 2014; Southall *et al.*, 2007; Villegas-Amtmann *et al.*, 2015).

#### *Temporary Threshold Shift (TTS)*

TTS is one form of Level B harassment that marine mammals may incur through exposure to the Vineyard Wind 1 activities and, as described earlier, the authorized takes by Level B harassment may represent takes in the form of direct behavioral disturbance, TTS, or both. As discussed in the Potential Effects of Specified Activities on Marine Mammals and their Habitat section of the **Federal Register** notice for the proposed IHA (89 FR 31008, April 23, 2024), in general, TTS can last from a few minutes to days, be of varying degree, and occur across different frequency bandwidths, all of which determine the severity of the impacts on the affected individual, which can range from minor to more severe. Impact pile driving is a broadband noise source but generates sounds in the lower frequency ranges (with most of the energy below 1–2 kHz, but with a small amount energy ranging up to 20 kHz); therefore, in general and

all else being equal, the potential for TTS is higher in low-frequency cetaceans (*i.e.*, mysticetes) than in other marine mammal hearing groups and would be more likely to occur in frequency bands in which they communicate. However, we would not expect the TTS to span the entire communication or hearing range of any species given that the frequencies produced by these activities do not span entire hearing ranges for any particular species. Additionally, though the frequency range of TTS that marine mammals might sustain would overlap with some of the frequency ranges of their vocalizations, the frequency range of TTS from the Vineyard Wind 1 pile driving activities would not typically span the entire frequency range of one vocalization type, much less span all types of vocalizations or other critical auditory cues for any given species. In addition, the required mitigation measures further reduce the potential for TTS in mysticetes.

Generally, both the degree and the duration of TTS would be greater if the marine mammal is exposed to a higher level of energy (which would occur when the peak dB level is higher or the duration is longer). The threshold for the onset of TTS was discussed previously (see Estimated Take). An animal would have to approach closer to the source or remain in the vicinity of the sound source appreciably longer to increase the received SEL, which would be unlikely considering the required mitigation and the nominal speed of the receiving animal relative to the stationary sources such as impact pile driving. The recovery time of TTS is also of importance when considering the potential impacts from TTS. In TTS laboratory studies (as discussed in Potential Effects of Specified Activities on Marine Mammals and Their Habitat), some using exposures of almost an hour in duration or up to 217 SEL, almost all individuals recovered within 1 day (or less, often in minutes). While the pile driving activities last for hours a day, it is unlikely that most marine mammals would stay in the close vicinity of the source long enough to incur more severe TTS. Overall, given the few instances in which any individual might incur TTS, the low degree of TTS and the short anticipated duration, and the unlikely scenario that any TTS would overlap the entirety of an individual's critical hearing range, it is unlikely that TTS (of the nature expected to result from the project's activities) would result in behavioral changes or other impacts that would impact any individual's (of any

hearing sensitivity) reproduction or survival.

#### *Permanent Threshold Shift (PTS)*

NMFS proposed to authorize a very small amount of take by PTS of some individual marine mammals of some species. The numbers of proposed takes by Level A harassment are relatively low for all marine mammal stocks and species (table 11). We anticipate that PTS may occur from exposure to impact pile driving, which produces sounds that are both impulsive and primarily concentrated in the lower frequency ranges (below 1 kHz) (David, 2006; Krumpel *et al.*, 2021).

There are no PTS data on cetaceans and only one instance of PTS being induced in older harbor seals (Reichmuth *et al.*, 2019). However, available TTS data (of mid-frequency hearing specialists exposed to mid- or high-frequency sounds (Southall *et al.*, 2007; NMFS, 2018; Southall *et al.*, 2019a)) suggest that most threshold shifts occur in the frequency range of the source up to one octave higher than the source. We would anticipate a similar result for PTS. Further, no more than a small degree of PTS is expected to be associated with any of the incurred Level A harassment, given it is unlikely that animals would stay in the close vicinity of a source for a duration long enough to produce more than a small degree of PTS.

PTS would consist of minor degradation of hearing capabilities occurring predominantly at frequencies one-half to one octave above the frequency of the energy produced by pile driving (*i.e.*, the low-frequency region below 2 kHz) (Cody and Johnstone, 1981; McFadden, 1986; Finneran, 2015), not severe hearing impairment. If hearing impairment occurs from impact pile driving, it is most likely that the affected animal would lose a few decibels in its hearing sensitivity, which in most cases is not likely to meaningfully affect its ability to forage and communicate with conspecifics. In addition, during impact pile driving, given sufficient notice through use of required soft-start prior to implementation of full hammer energy during impact pile driving, marine mammals are expected to move away from a sound source that is disturbing prior to it resulting in severe PTS.

#### *Auditory Masking or Communication Impairment*

The potential impacts of masking on an individual are similar to those discussed for TTS (*e.g.*, decreased ability to communicate, forage

effectively, or detect predators), but an important difference is that masking only occurs during the period of the signal, versus TTS, which continues beyond the duration of the signal. Also, though masking can result from the sum of exposure to multiple signals, none of these signals might individually cause TTS. Fundamentally, masking is considered more often in the context of chronic effects because masking is of more concern when an animal experiences masking for longer durations, which would typically happen as a result of exposure to multiple activities (*e.g.*, in more heavily industrialized areas or near shipping lanes). Specifically, reduced ability to hear or interpret critical cues becomes much more likely to cause a problem for an animal the longer it is occurring. Also, inherent in the concept of masking is the fact that it is only present during the times that the animal and the source are in close enough proximity for the effect to occur (and further, when the animal was utilizing sounds at the masked frequency).

As our analysis has indicated, we expect that impact pile driving may occur intermittently for several hours per day, for multiple days. Masking is fundamentally more of a concern at lower frequencies (which are pile driving dominant frequencies), because low-frequency signals propagate significantly further than higher frequencies and because they are more likely to overlap both the narrower low-frequency calls of mysticetes, as well as many non-communication cues related to fish and invertebrate prey, and geologic sounds that inform navigation. As mentioned above (see Description of Marine Mammals in the Area of Specified Activities), the LIA does not overlap critical habitat or BIAs for any species, and temporary avoidance of the pile driving area by marine mammals would likely displace animals to areas of sufficient habitat. In summary, the nature of the Vineyard Wind 1 activities, paired with habitat use patterns by marine mammals, does not support the likelihood of take due to masking effects or that masking would have the potential to affect reproductive success or survival, and we are not authorizing such take.

#### *Impact on Habitat and Prey*

Construction activities may result in fish and invertebrate mortality or injury very close to the source, and the Vineyard Wind 1 activities may cause some fish to leave the area of disturbance. It is anticipated that any mortality or injury would be limited to a very small subset of available prey,

and the implementation of mitigation measures such as the use of a noise attenuation system and soft start during impact pile driving would further limit the degree of impact. Behavioral changes in prey in response to construction activities could temporarily impact marine mammals' foraging opportunities in a limited portion of the foraging range but, because of the relatively small area of the habitat that may be affected at any given time (*e.g.*, around a pile being driven) and the temporary nature of the disturbance on prey species, the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences. There is no indication that displacement of prey would impact individual fitness and health, particularly since suitable prey would likely still be available in the environment in most cases following the cessation of acoustic exposure.

Cable presence is not anticipated to impact marine mammal habitat, as these would be buried, and any electromagnetic fields emanating from the cables are not anticipated to result in consequences that would impact marine mammal prey to the extent they would be unavailable for consumption. Although many species of marine mammal prey can detect electromagnetic fields, previous studies have shown little impacts on habitat use (Hutchinson *et al.*, 2018). Burying the cables and the inclusion of protective shielding on cables will also minimize any impacts of electromagnetic fields on marine mammal prey.

As discussed in the Description of the Specified Activity section, this IHA addresses the take incidental to the installation of 15 foundations, which will gradually become operational following construction completion. Turbines may also become operational during the period of the IHA. While there are likely to be oceanographic impacts from the presence of operating turbines, meaningful oceanographic impacts relative to stratification and mixing that would significantly affect marine mammal foraging and prey over large areas in key foraging habitats, resulting in impacts to the reproduction or survival of any individual marine mammals, are not anticipated from the Vineyard Wind activities covered under this IHA, yet are likely to be minor if impacts do occur.

The presence of wind turbines within the Lease Area could have longer-term impacts on marine mammal habitat, as the project would result in the persistence of the structures within marine mammal habitat for more than 30 years. For piscivorous marine

mammal species, the presence of structures could result in a beneficial reef effect which may lead to increases in the availability of prey. However, turbine presence and operation is generally likely to result in certain oceanographic effects in the marine environment, and may adversely alter aggregations and distribution of marine mammal zooplankton prey through changing the strength of tidal currents and associated fronts, changes in stratification, primary production, the degree of mixing, and stratification in the water column (Chen *et al.*, 2021; Johnson *et al.*, 2021; Christiansen *et al.*, 2022; Dorrell *et al.*, 2022). In the recently released BOEM and NOAA Fisheries North Atlantic Right Whale Strategy (BOEM *et al.*, 2024), the agencies identify the conceptual pathway by which changes to ocean circulation could potentially lead to fitness reduction of North Atlantic right whales, who primarily forage on copepods (see figure 2 in the Strategy). As described in the Potential Effects to Marine Mammal Habitat section of the **Federal Register** notice for the proposed IHA, there is uncertainty regarding the intensity (or magnitude) and spatial extent of turbine operation impacts on marine mammals habitat, including planktonic prey. Recently, a National Academy of Sciences, Engineering, and Medicine panel of independent experts concluded that the impacts of offshore wind operations on North Atlantic right whales and their habitat in the Nantucket Shoals region is uncertain due to the limited data available at this time and recognized what data is available is largely based on models from the North Sea that have not been validated by observations (NAS, 2023). The report also identifies that major oceanographic changes have occurred to the Nantucket Shoals region over the past 25 years and it will be difficult to isolate from the much larger variability introduced by natural and other anthropogenic sources (including climate change). Also, specific to this activity, the LIA is located outside of the higher North Atlantic right whale density areas in Southern New England and more than 20 km west of Nantucket Shoals, which is known to be a critical feeding area for North Atlantic right whales.

#### *Mitigation To Reduce Impacts on All Species*

The IHA includes a variety of mitigation measures designed to minimize impacts on all marine mammals, with a focus on North Atlantic right whales (the latter is described in more detail below). For

impact pile driving of foundation piles, ten overarching mitigation measures are required, which are intended to reduce both the number and intensity of marine mammal takes: (1) seasonal/time of day work restrictions; (2) use of multiple PSOs to visually observe for marine mammals (with any detection within specifically designated zones triggering a delay or shutdown); (3) use of PAM to acoustically detect marine mammals, with a focus on detecting baleen whales (with any detection within designated zones triggering delay or shutdown); (4) implementation of clearance zones; (5) implementation of shutdown zones; (6) use of soft-start; (7) use of noise attenuation technology; (8) maintaining situational awareness of marine mammal presence through the requirement that any marine mammal sighting(s) by Vineyard Wind 1 personnel must be reported to PSOs; (9) sound field verification monitoring; and (10) Vessel Strike Avoidance measures to reduce the risk of a collision with a marine mammal and vessel.

The Mitigation section discusses the manner in which the required mitigation measures reduce the magnitude and/or severity of the take of marine mammals, including the following. For activities with large harassment isopleths, Vineyard Wind 1 will be required to reduce the noise levels generated to the lowest levels practicable. Use of a soft-start during impact pile driving will allow animals to move away from (*i.e.*, avoid) the sound source prior to applying higher hammer energy levels needed to install the pile (Vineyard Wind 1 will not use a hammer with an energy rating greater than necessary to install piles). Clearance zone and shutdown zone implementation, which are required when marine mammals are within given distances associated with certain impact thresholds for all activities, will reduce the magnitude and severity of marine mammal take. Additionally, the use of multiple PSOs, PAM, and maintaining awareness of marine mammal sightings reported in the region will aid in detecting marine mammals that would trigger the implementation of the mitigation measures. For North Atlantic right whales specifically, by far the most effective mitigation is the avoidance of pile driving January through May in the months with the highest densities of whales, and when they are expected to be engaged in foraging and other important behaviors (*e.g.*, social, mating), as disruption of behavioral patterns during these month would be more likely to impact reproductive success or survival.

#### *Mysticetes*

Five mysticete species (comprising five stocks) of cetaceans (North Atlantic right whale, humpback whale, fin whale, sei whale, and minke whale) may be taken by harassment. These species, to varying extents, utilize the specific geographic region, including the LIA, for the purposes of migration, foraging, and socializing. Mysticetes are in the low-frequency hearing group.

Behavioral data on mysticete reactions to pile driving noise are scant. Kraus *et al.* (2019) predicted that the three main impacts of offshore wind farms on marine mammals would consist of displacement, behavioral disruptions, and stress. Broadly, we can look to studies that have focused on other noise sources such as seismic surveys and military training exercises, which suggest that exposure to loud signals can result in avoidance of the sound source (or displacement if the activity continues for a longer duration in a place where individuals would otherwise have been staying, which is less likely for mysticetes in this area), disruption of foraging activities (if they are occurring in the area), local masking around the source, associated stress responses, and impacts to prey, as well as TTS or PTS in some cases.

NMFS reviewed recent PSO observational data from offshore wind projects in southern New England (*i.e.*, South Fork at OCS-A-0517 and Vineyard Wind 1 at OCS-A-0501) where pile driving construction activities occurred. During pile-driving construction activities for Vineyard Wind 1, in 2023 from early June through December (RPS, 2023), there were 36 whale observations consisting of 4 unidentified non-North Atlantic right whales, 17 detections of humpback whales, eight detections of fin whales, six detections of minke whales, and one unidentified baleen whale (RPS, 2023). Three of these observations of mysticetes (one humpback whale sighting, one fin whale sighting, and one group of three fin whales) occurred while the hammer was engaged (which was operating at full power). Behaviors noted included surfacing, blowing, fluking, and feeding. At South Fork, a total of 39 hours 32 minutes of active impact pile driving was conducted across installation of the 13 monopiles on 15 different days. The most PSO visual watch effort occurred aboard the Bokalift 2 (908 hours), and PSO effort from the four dedicated monitoring vessels ranged from 426 to 757 hours. In total (with and without pile driving) foundation installation PSOs observed 348 mysticete groups comprising 552



individuals; 29 of these detections, totaling 51 individuals, occurred during pile driving (table 14 in South Fork Wind (2023)). None of the observed behaviors of mysticetes noted by either the Vineyard Wind 1 or South Fork PSOs were indicative of distress, alarm, or other adverse reactions (RPS, 2023; South Fork Wind, 2023).

Mysticetes encountered in the LIA are expected to be migrating through and/or engaged in foraging behavior. The extent to which an animal engages in these behaviors in the area is species-specific and varies seasonally. Many mysticetes are expected to predominantly be migrating through the LIA towards or from primary feeding habitats (*e.g.*, Cape Cod Bay, Great South Channel, and Gulf of St. Lawrence). While we have acknowledged in the Potential Effects to Marine Mammal Habitat section of the **Federal Register** notice for the proposed IHA (89 FR 31008, April 23, 2024) that mortality, hearing impairment, or displacement of mysticete prey species may result locally from impact pile driving, given the very short duration of and broad availability of prey species in the area and the availability of alternative suitable foraging habitat for the mysticete species most likely to be affected, any impacts on mysticete foraging are expected to be minor. Whales temporarily displaced from the LIA are expected to have sufficient remaining feeding habitat available to them, and would not be prevented from feeding in other areas within the biologically important feeding habitats, including to the east near Nantucket Shoals. In addition, any displacement of whales or interruption of foraging bouts would be expected to be relatively temporary in nature.

The potential for repeated exposures of individuals is dependent upon their residency time, with migratory animals unlikely to be exposed on repeated occasions and animals remaining in the area more likely to be exposed more than once. For mysticetes, where relatively low numbers of species-specific take by Level B harassment are predicted (compared to the abundance of each mysticete species or stock; see table 11) and movement patterns suggest that individuals would not necessarily linger in a particular area for multiple days, each predicted take likely represents an exposure of a different individual; with perhaps a subset of takes for a few species potentially representing a few repeated Level B harassment takes of a limited number of individuals across multiple days. In other words, the behavioral disturbance to any individual mysticete would, therefore, be expected to most likely

occur within a single day, or potentially across a few days, and would not be expected to impact the animal's fitness for reproduction or survival.

In general, the total duration of exposure would not be continuous throughout any given day and pile driving would not occur on all consecutive days due to weather delays or any number of logistical constraints Vineyard Wind 1 has identified, including the fact that the pile installation vessel must return to port after every 6 monopile foundations are installed to pick up additional monopiles. As mentioned in the Detailed Description of the Specified Activity section of the **Federal Register** notice for the proposed IHA, upon completion of installation of a batch of monopiles, the pile installation vessel would return to a Canadian port in Halifax to load an additional batch of monopiles. Species-specific analysis regarding potential for repeated exposures and impacts is provided below.

Humpback whales, minke whales, fin whales and sei whales are the mysticete species for which PTS is anticipated and authorized. As described previously, PTS for mysticetes from some project activities may overlap frequencies used for communication, navigation, or detecting prey. However, given the nature and duration of the activity, the mitigation measures, and likely avoidance behavior, any PTS is expected to be of a small degree, would be limited to frequencies where pile driving noise is concentrated (*i.e.*, only a small subset of their expected hearing range) and would not be expected to impact individuals' fitness for reproductive success or survival.

#### *North Atlantic Right Whales*

North Atlantic right whales are listed as endangered under the ESA and as both depleted and strategic under the MMPA. As described in the Potential Effects of Specified Activities on Marine Mammals and Their Habitat section of the **Federal Register** notice for the proposed IHA, North Atlantic right whales are threatened by a low population abundance, higher than average mortality rates, and lower than average reproductive rates. Recent studies have reported individuals showing high stress levels (*e.g.*, Corkeron *et al.*, 2017) and poor health, which has further implications on reproductive success and calf survival (Christiansen *et al.*, 2020; Stewart *et al.*, 2021; Stewart *et al.*, 2022). As described below, a UME has been designated for North Atlantic right whales. Given this, the status of the North Atlantic right

whale population is of heightened concern and, therefore, merits additional analysis and consideration.

This IHA authorizes 7 takes of North Atlantic right whale by Level B harassment only, which equates to approximately 2.1 percent of the stock abundance, if each take were considered to be of a different individual. No Level A harassment, serious injury, or mortality is anticipated or authorized for this species.

As described in the Description of Marine Mammals in the Area of Specified Activities section, North Atlantic right whales are presently experiencing an ongoing UME (beginning in June 2017). Preliminary findings support human interactions, specifically vessel strikes and entanglements, as the cause of death for the majority of North Atlantic right whales. Given the current status of the North Atlantic right whale, the loss of even one individual could significantly impact the population. Level B harassment of North Atlantic right whales resulting from the project's activities is expected to primarily be in the form of temporary avoidance of the immediate area of construction. Required mitigation measures will effect the least practicable adverse impact and the authorized number of takes of North Atlantic right whales would not exacerbate or compound the effects of the ongoing UME.

In general, North Atlantic right whales in the LIA are expected to be engaging in migratory, feeding, and/or social behavior. Migrating North Atlantic right whales would typically be moving through the LIA, rather than lingering for extended periods of time (thereby limiting the potential for repeat exposures); however, foraging whales may remain in the LIA, with an average residence time of 13 days between December and May (Quintana-Rizzo *et al.*, 2021). Southern New England, including the LIA, is part of a known migratory corridor for North Atlantic right whales and may be a stopover site for migrating North Atlantic right whales moving to or from southeastern calving grounds and northern foraging grounds. North Atlantic right whales are primarily concentrated in the northeastern and southeastern sections of the Massachusetts Wind Energy Area (MA WEA) (*i.e.*, east of the LIA) during the summer (June-August) and winter (December-February) while distribution likely shifts to the west, closer to the LIA, into the RI/MA WEA in the spring (March-May) (Quintana-Rizzo *et al.*, 2021). However, North Atlantic right whales range outside of the LIA for their main feeding, breeding, and calving

activities. It is important to note that the IHA prohibits impact pile driving activities from January through May.

Foundation installation pile driving will only occur during times when, based on the best available scientific data, North Atlantic right whales are less frequently encountered and less likely to be engaged in critical foraging behavior (although NMFS recognizes North Atlantic right whales may forage year-round in SNE). The potential types, severity, and magnitude of impacts are also anticipated to mirror that described in the general *Mysticetes* section above, including avoidance (the most likely outcome), changes in foraging or vocalization behavior, masking, a small amount of TTS, and temporary physiological impacts (e.g., change in respiration, change in heart rate). Importantly, the effects of the activities are expected to be sufficiently low-level and localized to specific areas as to not meaningfully impact important behaviors such as migration and foraging for North Atlantic right whales. As noted above, for North Atlantic right whales, this IHA would authorize up to 7 takes, by Level B harassment. These takes are expected to be in the form of temporary behavioral disturbance, such as slight displacement (but not abandonment) of migratory habitat or temporary cessation of feeding. Further, given many of these takes are generally expected to occur to different individual right whales migrating through (i.e., most individuals would not be impacted on more than one day in a year), with some subset potentially being exposed on no more than a few days within the year, they are unlikely to result in energetic consequences that could affect reproduction or survival of any individuals.

Overall, NMFS expects that any behavioral harassment of North Atlantic right whales incidental to the specified activities would not result in changes to their migration patterns or foraging success, as only temporary avoidance of an area during construction is expected to occur. As described previously, North Atlantic right whales migrate, forage, or socialize in the LIA but are not expected to remain in this habitat for extensive durations relative to core foraging habitats to the east, south of Nantucket and Martha's Vineyard, Cape Cod Bay, or the Great South Channel (Quintana-Rizzo *et al.*, 2021). Any temporarily displaced animals would be able to return to or continue to travel through the LIA and subsequently utilize this habitat once activities have ceased.

Although acoustic masking may occur in the vicinity of the foundation installation activities, based on the

acoustic characteristics of noise associated with pile driving (e.g., frequency spectra, short duration of exposure), NMFS expects masking effects to be minimal during impact pile driving. In addition, masking would likely only occur during the period of time that a North Atlantic right whale is in the relatively close vicinity of pile driving, which is expected to be intermittent within a day and confined to the months in which North Atlantic right whales are at lower densities and primarily moving through the area. TTS could also occur in some of the exposed animals, making it more difficult for those individuals to hear or interpret acoustic cues within the frequency range (and slightly above) of sound produced during impact pile driving; however, any TTS would likely be of low amount, limited duration, and limited to frequencies where most construction noise is centered (below 2 kHz). NMFS expects that right whale hearing sensitivity would return to pre-exposure levels shortly after migrating through the area or moving away from the sound source.

As described in the Potential Effects of Specified Activities on Marine Mammals and Their Habitat section of the **Federal Register** notice for the proposed IHA, the distance of the receiver from the source influences the severity of response, with greater distances typically eliciting less severe responses. NMFS recognizes North Atlantic right whales migrating could be pregnant females (in the fall) and cows with older calves (in spring) and that these animals may slightly alter their migration course in response to any foundation pile driving; however, we anticipate that course diversion would be of small magnitude. Hence, while some avoidance of the pile-driving activities may occur, we anticipate any avoidance behavior of migratory North Atlantic right whales would be similar to that of gray whales (Tyack *et al.*, 1983), on the order of hundreds of meters up to 1 to 2 km. This diversion from a migratory path otherwise uninterrupted by the project's activities is not expected to result in meaningful energetic costs that would impact annual rates of recruitment or survival. NMFS expects that North Atlantic right whales would be able to avoid areas during periods of active noise production while not being forced out of their portion of their habitat.

North Atlantic right whale presence in the LIA is year-round. However, abundance during summer months is lower compared to the winter months, with spring and fall serving as "shoulder seasons" wherein abundance

waxes (fall) or wanes (spring). Even in consideration of recent habitat-use and distribution shifts, Vineyard Wind 1 would still be installing monopile foundations when the presence of North Atlantic right whales is expected to be relatively lower.

Given this year-round habitat usage, and recognizing that where and when whales may actually occur during project activities is unknown as it depends on the annual migratory behaviors, NMFS is requiring a suite of mitigation measures designed to reduce impacts to North Atlantic right whales to the maximum extent practicable. These mitigation measures (e.g., seasonal/daily work restrictions, vessel separation distances, reduced vessel speed) would not only avoid the likelihood of vessel strikes but also would minimize the severity of behavioral disruptions, e.g., through sound reduction using attenuation systems and reduced temporal overlap of project activities and North Atlantic right whales. This would help further ensure that the takes by Level B harassment that are estimated to occur would not affect reproductive success or survivorship of individuals through detrimental impacts to energy intake or cow/calf interactions during migratory transit.

As described in the Description of Marine Mammals in the Area of Specified Activities section, the Vineyard Wind Offshore Wind Project is being constructed within the North Atlantic right whale migratory corridor BIA, which represents areas and months within which a substantial portion of a species or population is known to migrate. The area over which North Atlantic right whales may be harassed is relatively small compared to the width of the migratory corridor. The width of the migratory corridor in this area is approximately 210.0 km (while the width of the Lease Area, at the longest point at which it crosses the BIA, is approximately 14.5 km). North Atlantic right whales may be displaced from their normal path and preferred habitat in the immediate activity area (primarily from pile driving activities), however, we do not anticipate displacement to be of high magnitude (e.g., beyond a few kilometers); therefore, any associated bio-energetic expenditure is anticipated to be small. Although North Atlantic right whales may forage in the LIA, there are no known breeding or calving areas within the LIA. Prey species are mobile (e.g., calanoid copepods can initiate rapid and directed escape responses) and are broadly distributed throughout the LIA. Therefore, any

impacts to prey that may occur are also unlikely to impact marine mammals.

The most significant measure to minimize impacts to individual North Atlantic right whales is the seasonal moratorium on all foundation installation activities from January 1 through May 31 when North Atlantic right whale abundance in the LIA is expected to be highest and individuals are more likely to be engaged in foraging behaviors. NMFS also expects this measure to greatly reduce the potential for mother-calf pairs to be exposed to impact pile driving noise above the Level B harassment threshold during their annual spring migration through SNE from calving grounds to primary foraging grounds (e.g., Cape Cod Bay).

Moreover, NMFS expects that the severity of any take of North Atlantic right whales would be reduced due to the other mitigation measures that would ensure that any exposures above the Level B harassment threshold would result in only short-term effects to individuals exposed. Foundation installation may only begin in the absence of North Atlantic right whales (based on visual and passive acoustic monitoring). Once foundation installation activities have commenced, NMFS anticipates North Atlantic right whales would avoid the area, utilizing nearby waters to carry on pre-exposure behaviors. However, foundation installation activities must be shut down if a North Atlantic right whale is sighted at any distance or acoustically detected at any distance within the PAM monitoring zone, unless a shutdown is not feasible due to risk of injury or loss of life. Shutdown would be required anywhere if North Atlantic right whales are detected within or beyond the Level B harassment zone, further minimizing the duration and intensity of exposure. These measures are designed to avoid PTS and also reduce the severity of Level B harassment, including the potential for TTS. While some TTS could occur, given the mitigation measures (e.g., delay pile driving upon a sighting or acoustic detection and shutting down upon a sighting or acoustic detection), the potential for TTS to occur is low. NMFS anticipates that if North Atlantic right whales go undetected and they are exposed to foundation installation noise, it is unlikely a North Atlantic right whale would approach the sound source locations to the degree that they would expose themselves to very high noise levels. This is because typical observed whale behavior demonstrates likely avoidance of harassing levels of sound where possible (Richardson *et al.*, 1985).

The clearance and shutdown measures are most effective when detection efficiency is maximized, as the measures for North Atlantic right whales are triggered by a sighting or acoustic detection. To maximize detection efficiency, NMFS requires the combination of PAM and visual observers. NMFS also requires communication protocols with other project vessels and other heightened awareness efforts (e.g., daily monitoring of North Atlantic right whale sighting databases) such that as a North Atlantic right whale approaches the source (and thereby could be exposed to higher noise energy levels), PSO detection efficacy will increase, the whale would be detected, and a delay to commencing foundation installation or shutdown (if feasible) would occur. In addition, the implementation of a soft-start for impact pile driving will provide an opportunity for whales to move away from the source if they are undetected, reducing received levels.

As described above, no serious injury or mortality, or Level A harassment of North Atlantic right whales is anticipated or authorized. Extensive North Atlantic right whale-specific mitigation measures (beyond the robust suite required for all species) are expected to further minimize the amount and severity of Level B harassment.

Given the documented habitat use within the LIA, the seven instances of take by Level B harassment could include seven individual whales disturbed on 1 day each within the year, or it could represent a smaller number of whales impacted on 2 or 3 days, should North Atlantic right whales briefly use the LIA as a “stopover” site and stay or swim in and out of the LIA for more than day. At any rate, any impacts to North Atlantic right whales are expected to be in the form of lower level behavioral disturbance, given the extensive mitigation measures.

Given the magnitude and severity of the impacts discussed above, and in consideration of the required mitigation and other information presented, Vineyard Wind 1 activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take (by Level B harassment) anticipated and authorized would have a negligible impact on the North Atlantic right whale.

#### *Fin Whale*

The fin whale is listed as endangered under the ESA, and the western North

Atlantic stock is considered both depleted and strategic under the MMPA. No UME has been designated for this species or stock. No serious injury or mortality is anticipated or authorized for this species.

This IHA authorizes up to 7 takes, by harassment only, over the 1 year period. The maximum allowable take by Level A harassment and Level B harassment, is 1 and 6, respectively (which equates to approximately 0.10 percent of the stock abundance, if each take were considered to be of a different individual). Given the close proximity of a fin whale feeding BIA (2,933 km<sup>2</sup>) from March through October, and that southern New England is generally considered a feeding area, it is likely that the seven takes could represent a few whales taken 2–3 times during the specified activity under this IHA.

Level B harassment is expected to be primarily avoidance of the LIA where foundation installation is occurring and some low-level TTS and masking that may limit the detection of acoustic cues for relatively brief periods of time. We anticipate any potential PTS would be minor (limited to a few dB), and any PTS or TTS would be concentrated at half or one octave above the frequency band of pile driving noise (most sound is below 2 kHz), which does not include the full predicted hearing range of fin whales. If TTS is incurred, hearing sensitivity would likely return to pre-exposure levels relatively shortly after exposure ends. Any masking or physiological responses would also be of low magnitude and severity for reasons described above.

Fin whales are present in the waters off of New England year-round and are one of the most frequently observed large whales and cetaceans in continental shelf waters, principally from Cape Hatteras, North Carolina in the Mid-Atlantic northward to Nova Scotia, Canada (Sergeant, 1977; Sutcliffe and Brodie, 1977; CETAP, 1982; Hain *et al.*, 1992; Geo-Marine, 2010; BOEM 2012; Edwards *et al.*, 2015; Hayes *et al.*, 2023). In SNE, fin whales densities are highest in the spring and summer months (Kraus *et al.*, 2016; Roberts *et al.*, 2023) though detections do occur in spring and fall (Watkins *et al.*, 1987; Clark and Gagnon, 2002; Geo-Marine, 2010; Morano *et al.*, 2012; Van Parijs *et al.*, 2023). However, fin whales feed more extensively in waters in the Great South Channel north to the Gulf of Maine into the Gulf of St. Lawrence, areas north and east of the LIA (Hayes *et al.*, 2023).

As described previously, the LIA is in close proximity (approximately 8.0 km; 5.0 mi) to a small fin whale feeding BIA

(2,933 km<sup>2</sup>) east of Montauk Point, New York (figure 2.3 in LaBrecque *et al.*, 2015) that is active from March to October. Foundation installations have seasonal work restrictions (*i.e.*, spatial and temporal) such that the temporal overlap between the specified activities and the active BIA timeframe would exclude the months of March, April, and May. A separate larger year-round feeding BIA (18,015 km<sup>2</sup>) located to the east in the southern Gulf of Maine does not overlap with the LIA and is located substantially further away (approximately 76.4 km (47.5 mi)), and would thus not be impacted by project activities. We anticipate that if foraging is occurring in the LIA and foraging whales are exposed to noise levels of sufficient strength, they would avoid the LIA and move into the remaining area of the feeding BIA that would be unaffected to continue foraging without substantial energy expenditure or, depending on the time of year, travel to the larger year-round feeding BIA.

Given the documented habitat use within the area, some of the individuals taken would likely be exposed on multiple days. However, low level impacts are generally expected from any fin whale exposure. Given the magnitude and severity of the impacts discussed above (including no more than seven takes over the course of the IHA, and a maximum allowable take by Level A harassment and Level B harassment of one and six, respectively) and in consideration of the required mitigation and other information presented, Vineyard Wind's activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated and authorized will have a negligible impact on the western North Atlantic stock of fin whales.

#### *Humpback Whale*

The West Indies Distinct Population Segment (DPS) of humpback whales is not listed as threatened or endangered under the ESA but the Gulf of Maine stock, which includes individuals from the West Indies DPS, is considered strategic under the MMPA. However, as described in the Description of Marine Mammals in the Area of Specified Activities section, humpback whales along the Atlantic Coast have been experiencing an active UME as elevated humpback whale mortalities have occurred along the Atlantic coast from Maine through Florida since January 2016. Of the cases examined, approximately 40 percent had evidence

of human interaction (vessel strike or entanglement). Despite the UME, the relevant population of humpback whales (the West Indies breeding population, or DPS of which the Gulf of Maine stock is a part) remains stable at approximately 12,000 individuals and the takes of humpback whales by Level B harassment authorized would not exacerbate or compound the effects of the ongoing UME.

This IHA authorizes up to six takes by harassment only, over the 1 year period. The maximum allowable take by Level A harassment and Level B harassment is two and four, respectively (this equates to approximately 0.43 percent of the stock abundance, if each take were considered to be of a different individual). Given that feeding is considered the principal activity of humpback whales in southern New England waters, these takes could represent a few whales exposed two or three times during the year.

In the western North Atlantic, humpback whales feed during spring, summer, and fall over a geographic range encompassing the eastern coast of the U.S. Feeding is generally considered to be focused in areas north of the LIA, including in a feeding BIA in the Gulf of Maine/Stellwagen Bank/Great South Channel, but has been documented off the coast of southern New England and as far south as Virginia (Swingle *et al.*, 1993). Foraging animals tend to remain in the area for extended durations to capitalize on the food sources.

Assuming humpback whales who are feeding in waters within or surrounding the LIA behave similarly, we expect that the predicted instances of disturbance could consist of some individuals that may be exposed on multiple days if they are utilizing the area as foraging habitat. As with other baleen whales, if migrating, such individuals would likely be exposed to noise levels from the project above the harassment thresholds only once during migration through the LIA.

For all the reasons described in the Mysticetes section above, we anticipate any potential PTS and TTS would be concentrated at half or one octave above the frequency band of pile driving noise (most sound is below 2 kHz), which does not include the full predicted hearing range of baleen whales. If TTS is incurred, hearing sensitivity would likely return to pre-exposure levels relatively shortly after exposure ends. Any masking or physiological responses would also be of low magnitude and severity for reasons described above.

Given the magnitude and severity of the impacts discussed above (including no more than 6 takes over the course of

the 1-year IHA, and a maximum allowable take by Level A harassment and Level B harassment of two and four, respectively), and in consideration of the required mitigation measures and other information presented, Vineyard Wind 1 activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated and authorized will have a negligible impact on the Gulf of Maine stock of humpback whales.

#### *Minke Whale*

Minke whales are not listed under the ESA, and the Canadian East Coast stock is neither depleted nor strategic under the MMPA. There are no known areas of specific biological importance in or adjacent to the LIA. As described in the Description of Marine Mammals in the Area of Specified Activities section, a UME has been designated for this species but is pending closure. No serious injury or mortality is anticipated or authorized for this species.

This IHA authorizes up to 1 take by Level A harassment and 28 takes by Level B harassment over the 1-year period (equating to approximately 0.13 percent of the stock abundance, if each take were considered to be of a different individual). As described in the Description of Marine Mammals in the Area of Specified Activities section, minke whales inhabit coastal waters during much of the year and are common offshore the U.S. Eastern Seaboard with a strong seasonal component in the continental shelf and in deeper, off-shelf waters (CETAP, 1982; Hayes *et al.*, 2022; Hayes *et al.*, 2023). Spring through fall are times of relatively widespread and common acoustic occurrence on the continental shelf. From September through April, minke whales are frequently detected in deep-ocean waters throughout most of the western North Atlantic (Clark and Gagnon, 2002; Risch *et al.*, 2014; Hayes *et al.*, 2023). Because minke whales are migratory and their known feeding areas are north and east of the LIA, including a feeding BIA in the southwestern Gulf of Maine and George's Bank, they would be more likely to be transiting through (with each take representing a separate individual), though it is possible that some subset of individual whales exposed could be taken up to a few times during the effective period of the IHA.

As previously detailed in the Description of Marine Mammals in the Area of Specified Activities section, there is a UME for minke whales along

the Atlantic coast, from Maine through South Carolina, with the highest number of deaths in Massachusetts, Maine, and New York. Preliminary findings in several of the whales have shown evidence of human interactions or infectious diseases. However, we note that the population abundance is greater than 21,000, and the take by harassment authorized through this action is not expected to exacerbate the UME.

We anticipate the impacts of this harassment to follow those described in the general Mysticetes section above. Any potential PTS would be minor (limited to a few dB) and any PTS or TTS would be of short duration and concentrated at half or one octave above the frequency band of pile driving noise (most sound is below 2 kHz) which does not include the full predicted hearing range of minke whales. If TTS is incurred, hearing sensitivity would likely return to pre-exposure levels relatively shortly after exposure ends. Level B harassment would be temporary, with primary impacts being temporary displacement from the LIA but not abandonment of any migratory or foraging behavior.

Given the magnitude and severity of the impacts discussed above (including no more than 29 takes of the course of the 1-year IHA, and a maximum allowable take by Level A harassment and Level B harassment of 1 and 28, respectively), and in consideration of the required mitigation and other information presented, Vineyard Wind's activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated and authorized will have a negligible impact on the Canadian Eastern Coastal stock of minke whales.

#### *Sei Whale*

Sei whales are listed as endangered under the ESA, and the Nova Scotia stock is considered both depleted and strategic under the MMPA. There are no known areas of specific biological importance in or adjacent to the LIA, and no UME has been designated for this species or stock. No serious injury or mortality is anticipated or authorized for this species.

The IHA authorizes up to three takes by harassment over the 1-year period. The maximum allowable take by Level A harassment and Level B harassment is one and two, respectively (combined, this annual take (n=3) equates to approximately 0.05 percent of the stock abundance, if each take were considered to be of a different individual). As

described in the Description of Marine Mammals in the Area of Specified Activities section, most of the sei whale distribution is concentrated in Canadian waters and seasonally in northerly U.S. waters, although they can occur year-round in SNE. Because sei whales are migratory and their known feeding areas are east and north of the LIA (e.g., there is a feeding BIA in the Gulf of Maine), they would be more likely to be moving through (i.e., not foraging), and considering this and the very low number of total takes, it is unlikely that any individual would be exposed more than once within the IHA period.

With respect to the severity of those individual takes by Level B harassment, we anticipate impacts to be limited to low-level, temporary behavioral responses with avoidance and potential masking impacts in the vicinity of the WTG installation to be the most likely type of response. Any potential PTS and TTS would likely be concentrated at half or one octave above the frequency band of pile driving noise (most sound is below 2 kHz), which does not include the full predicted hearing range of sei whales. Moreover, any TTS would be of a small degree. Any avoidance of the LIA due to the Project's activities would be expected to be temporary.

Given the magnitude and severity of the impacts discussed above (including no more than three takes of the course of the 1-year IHA, and a maximum allowable take by Level A harassment and Level B harassment, of one and two, respectively), and in consideration of the required mitigation and other information presented, Vineyard Wind 1 activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated and proposed to be authorized will have a negligible impact on the Nova Scotia stock of sei whales.

#### *Odontocetes*

In this section, we include information here that applies to all of the odontocete species and stocks addressed below. Odontocetes include dolphins, porpoises, and all other whales possessing teeth and we further divide them into the following subsections: sperm whales, dolphins and small whales, and harbor porpoises. These sub-sections include more specific information, as well as conclusions for each stock represented.

No serious injury or mortality is anticipated or authorized. We anticipate that, given ranges of individuals (i.e., that some individuals remain within a

small area for some period of time) and non-migratory nature of some odontocetes in general (especially as compared to mysticetes), a larger subset of these takes are more likely to represent multiple exposures of some number of individuals than is the case for mysticetes, though some takes may also represent one-time exposures of an individual. While we expect animals to avoid the area during foundation installation, their habitat range is extensive compared to the area ensounded during these activities. As such, NMFS expects any avoidance behavior to be limited to the area near the sound source.

As described earlier, Level B harassment may include direct disruptions in behavioral patterns (e.g., avoidance, changes in feeding or vocalizations), as well as those associated with stress responses or TTS. While masking could also occur during foundation installation, it would only occur in the vicinity of and during the duration of the activity, and would not generally occur in a frequency range that overlaps most odontocete communication or any echolocation signals. The required mitigation measures (e.g., use of sound attenuation systems, implementation of clearance and shutdown zones) would also minimize received levels such that the expected severity of any behavioral response would be less than exposure to unmitigated noise exposure.

Any masking or TTS effects are anticipated to be of low severity. First, while the frequency range of pile driving falls within a portion of the frequency range of most odontocete vocalizations, odontocete vocalizations span a much wider range than the low frequency construction activities planned for the project. Also, as described above, recent studies suggest odontocetes have a mechanism to self-mitigate the impacts of noise exposure (i.e., reduce hearing sensitivity), which could potentially reduce TTS impacts. Any masking, TTS, or PTS is anticipated to be limited and would typically only interfere with communication within a portion of an odontocete's range and as discussed earlier, the effects would only be expected to be of a short duration for TTS and masking, and for TTS and PTS, a relatively small degree. Furthermore, odontocete echolocation occurs predominantly at frequencies significantly higher than low frequency construction activities. Therefore, there is little likelihood that threshold shift would interfere with feeding behaviors.

The waters off the coast of Massachusetts are used by several

odontocete species. However, none except the sperm whale are listed under the ESA and there are no known habitats of particular importance. In general, odontocete habitat ranges are far-reaching along the Atlantic coast of the U.S. and the waters off of New England, including the LIA, do not contain any particularly unique odontocete habitat features.

#### Sperm Whale

Sperm whales are listed as endangered under the ESA, and the North Atlantic stock is considered both depleted and strategic under the MMPA. The North Atlantic stock spans the East Coast out into oceanic waters well beyond the U.S. EEZ. Although listed as endangered, the primary threat faced by the sperm whale across its range (*i.e.*, commercial whaling) has been eliminated. Current potential threats to the species globally include vessel strikes, entanglement in fishing gear, anthropogenic noise, exposure to contaminants, climate change, and marine debris. There is no currently reported trend for the stock and although the species is listed as endangered under the ESA, there are no current related issues or events associated with the status of the stock that cause particular concern (*e.g.*, no UMEs). There are no known areas of biological importance (*e.g.*, critical habitat or BIAs) in or near the LIA, although Westell *et al.* (2024) found a high number of acoustic detections of sperm whales off the northeastern corner of the Lease Area. No mortality or serious injury is anticipated or authorized for this species.

The IHA authorizes up to two takes by Level B harassment over the 1-year period, which equates to approximately 0.05 percent of the stock abundance. If sperm whales are present in the LIA during any Project activities, they will likely be only transient visitors, although foraging and social behavior may occur in the shallow waters off SNE (Westell *et al.*, 2024). However, the potential for TTS is low for reasons described in the general Odontocete section. If it does occur, any hearing shift would be small and of a short duration. Because foraging is expected to be rare in the LIA, TTS is not expected to interfere with foraging behavior.

Given the magnitude and severity of the impacts discussed above (including no more than two takes by Level B harassment over the course of the 1-year IHA, and in consideration of the required mitigation and other information presented, Vineyard Wind's activities are not expected to result in

impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by Level B harassment anticipated and authorized will have a negligible impact on the North Atlantic stock of sperm whales.

#### Dolphins and Small Whales (Including Delphinids)

The five species and stocks included in this group (which are indicated in table 3 in the *Delphinidae* family) are not listed under the ESA, and nor are they listed as depleted or strategic under the MMPA. There are no known areas of specific biological importance in or around the LIA. As described above for any of these species and no UMEs have been designated for any of these species. No serious injury or mortality is anticipated or authorized for these species.

The five delphinid species (constituting five stocks) with takes authorized under the IHA are Atlantic white-sided dolphin, bottlenose dolphin, long-finned pilot whale, Risso's dolphin, and common dolphin. The IHA allows for the total authorization of 3 to 462 takes (depending on species) by Level B harassment, over the 1-year period. Overall, this annual take equates to approximately 0.01 (Risso's dolphin) up to 0.27 (common dolphin) percent of the stock abundance (if each take were considered to be of a different individual, which is not likely the case), depending on the species.

The number of takes, likely movement patterns of the affected species, and the intensity of any Level B harassment, combined with the availability of alternate nearby foraging habitat suggests that the likely impacts would not impact the reproduction or survival of any individuals. While delphinids may be taken on several occasions, none of these species are known to have small home ranges within the LIA or known to be particularly sensitive to anthropogenic noise. Some TTS can occur, but it would be limited to the frequency ranges of the activity and any loss of hearing sensitivity is anticipated to return to pre-exposure conditions shortly after the animals move away from the source or the source ceases.

Across these species, the maximum number of incidental takes, by Level B harassment (no Level A harassment is anticipated or authorized), authorized ranges between 3 (Risso's dolphin) to 462 (common dolphin). Though the estimated numbers of take are comparatively higher than the numbers for mysticetes, we note that for all

species they are low relative to the population abundance.

As described above for odontocetes broadly, given the number of estimated takes for some species and the behavioral patterns of odontocetes, we anticipate that some of these instances of take in a day represent multiple exposures of a smaller number of individuals, meaning the actual number of individuals taken is lower. Although some amount of repeated exposure to some individuals across a few days within the year is likely, the intensity of any Level B harassment combined with the availability of alternate nearby foraging habitat suggests that the likely impacts would not impact the reproduction or survival of any individuals.

Overall, the populations of all delphinid and small whale species and stocks authorized for take are stable (no declining population trends). None of these stocks are experiencing existing UMEs. No mortality, serious injury, or Level A harassment is anticipated or authorized for any of these species. Given the magnitude and severity of the impacts discussed above and in consideration of the required mitigation and other information presented, as well as the status of these stocks, the specified activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated and authorized will have a negligible impact on all of the following species and stocks: Atlantic white-sided dolphins, bottlenose dolphins, long-finned pilot whales, Risso's dolphins, and common dolphins.

#### Harbor Porpoise

Harbor porpoises are not listed as threatened or endangered under the ESA, and the Gulf of Maine/Bay of Fundy stock is neither depleted nor strategic under the MMPA. The stock is found predominantly in northern U.S. coastal waters (less than 150 m depth) and up into Canada's Bay of Fundy (between New Brunswick and Nova Scotia). Although the population trend is not known, there are no UMEs or other factors that cause particular concern for this stock. No mortality or non-auditory injury are anticipated or authorized for this stock.

The IHA authorizes up to 113 takes, by harassment only. The maximum allowable take by Level A harassment and Level B harassment is 3 and 110, respectively (combined, this annual take (n=113), which equates to approximately 0.19 percent of the stock

abundance, if each take were considered to be of a different individual). Given the number of takes, while many of the takes likely represent exposures of different individuals on 1 day a year, some subset of the individuals exposed could be taken up to a few times annually.

Regarding the severity of takes by Level A harassment and Level B harassment, because harbor porpoises are particularly sensitive to noise, it is likely that a fair number of the responses to foundation installation could be of a moderate nature. In response to foundation installation, harbor porpoises are likely to avoid the area during construction, as previously demonstrated in Tougaard *et al.* (2009) in Denmark, in Dahne *et al.* (2013) in Germany, and in Vallejo *et al.* (2017) in the United Kingdom, although a study by Graham *et al.* (2019) may indicate that the avoidance distance could decrease over time. However, foundation installation is scheduled to occur off the coast of Massachusetts and given alternative foraging areas, any avoidance of the area by individuals is not likely to impact the reproduction or survival of any individuals.

With respect to PTS and TTS, the effects on an individual are likely relatively low, given the frequency bands of pile driving (most energy below 2 kHz) compared to harbor porpoise hearing (150 Hz to 160 kHz peaking around 40 kHz). Specifically, TTS is unlikely to impact hearing ability in their more sensitive hearing ranges or the frequencies in which they communicate and echolocate. We expect any PTS that may occur to be within the very low end of their hearing range where harbor porpoises are not particularly sensitive and any PTS would be of small magnitude. As such, any PTS would not interfere with key foraging or reproductive strategies necessary for reproduction or survival.

As discussed in Hayes *et al.* (2022), harbor porpoises are seasonally distributed. During fall (October through November) and spring (April through June), harbor porpoises are widely dispersed from New Jersey to Maine with lower densities farther north and south. During winter (January to March), intermediate densities of harbor porpoises can be found in waters off New Jersey to North Carolina and lower densities are found in waters off New York to New Brunswick, Canada. In non-summer months they have been seen from the coastline to deep waters (<1800 m; Westgate *et al.*, 1998), although the majority are found over the continental shelf. While harbor porpoises are likely to avoid the area

during any of the project's construction activities, as demonstrated during European wind farm construction, the time of year in which most work would occur is when harbor porpoises are not in highest abundance, and any work that does occur would not result in the species' abandonment of the waters off of Massachusetts.

Given the magnitude and severity of the impacts discussed above, and in consideration of the required mitigation and other information presented, the specified activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated or authorized will have a negligible impact on the Gulf of Maine/Bay of Fundy stock of harbor porpoises.

#### *Phocids (Harbor Seals and Gray Seals)*

The harbor seal and gray seal are not listed under the ESA, and neither the western North Atlantic stock of gray seal nor the western North Atlantic stock of harbor seal are considered depleted or strategic under the MMPA. There are no known areas of specific biological importance in or around the LIA. As described in the Description of Marine Mammals in the Area of Specified Activities section, a UME has been designated for harbor seals and gray seals and is described further below. No serious injury or mortality is anticipated or authorized for this species.

For the 2 seal species, the IHA authorizes up to between 30 (harbor seals) and 241 (gray seals) takes, by harassment only. The maximum allowable take for harbor seals by Level A harassment and Level B harassment is 1 and 29, respectively (combined, this take (n=30) equates to approximately 0.05 percent of the stock abundance, if each take were considered to be of a different individual). No takes by Level A harassment are anticipated or authorized for gray seals. The maximum allowable take for gray seals by Level B harassment (241) equates to approximately 0.88 percent of the stock abundance, if each take were considered to be of a different individual). Though gray seals and harbor seals are considered migratory and no specific feeding areas have been defined for the area, while some of the takes likely represent exposures of different individuals on 1 day a year, it is likely that some subset of the individuals exposed could be taken a few times annually.

Harbor and gray seals occur in southern New England waters most often from December through April.

Seals are more likely to be close to shore, such that exposure to foundation installation would be expected to be at low levels. Known haulouts for seals occur along the shores of Massachusetts.

As described in the Potential Effects to Marine Mammals and Their Habitat section, construction of wind farms in Europe resulted in pinnipeds temporarily avoiding construction areas but returning within short time frames after construction was complete (Carroll *et al.*, 2010; Hamre *et al.*, 2011; Hastie *et al.*, 2015; Russell *et al.*, 2016; Brasseur *et al.*, 2012). Effects on pinnipeds that are taken by Level B harassment in the LIA would likely be limited to avoidance of the area reactions such as increased swimming speeds, increased surfacing time, or decreased foraging (if such activity were occurring). Most likely, individuals would simply move away from the sound source and be temporarily displaced from those areas (Lucke *et al.*, 2006; Edren *et al.*, 2010; Skeate *et al.*, 2012; Russell *et al.*, 2016). Given the low anticipated magnitude of impacts from any given exposure (*e.g.*, temporary avoidance), even repeated Level B harassment across a few days of some small subset of individuals, which could occur, is unlikely to result in impacts on the reproduction or survival of any individuals. Moreover, pinnipeds would benefit from the mitigation measures described in the Mitigation section.

As described above, noise from pile driving is mainly low frequency, and while any PTS and TTS that does occur would fall within the lower end of pinniped hearing ranges (50 Hz to 86 kHz), PTS and TTS would not occur at frequencies around 5 kHz where pinniped hearing is most susceptible to noise-induced hearing loss (Kastelein *et al.*, 2018). In summary, any PTS and TTS would be of small degree and not occur across the entire, or even most sensitive, hearing range. Hence, any impacts from PTS and TTS are likely to be of low severity and not interfere with behaviors critical to reproduction or survival.

Regarding the previously mentioned UMEs, elevated numbers of harbor seal and gray seal mortalities were first observed in July 2018 and occurred across Maine, New Hampshire, and Massachusetts until 2020. Based on tests conducted so far, the main pathogen found in the seals belonging to that UME was phocine distemper virus, although additional testing to identify other factors that may be involved in this UME are underway. In 2022, a pinniped UME occurred in Maine with some harbor and gray seals testing

positive for highly pathogenic avian influenza (HPAI) H5N1. Neither UME (alone or in combination) provides cause for concern regarding population-level impacts to any of these stocks. For harbor seals, the population abundance is over 61,000 and annual mortality/serious injury (M/SI) ( $n=339$ ) is well below PBR (1,729) (Hayes *et al.*, 2023). The population abundance for gray seals in the United States is over 27,000, with an estimated overall abundance, including seals in Canada, of approximately 366,400 (Hayes *et al.*, 2023). In addition, the abundance of gray seals is likely increasing in the U.S. Atlantic, as well as in Canada (Hayes *et al.*, 2023). Takes by harassment authorized incidental to Vineyard Wind 1's activities would not be expected to exacerbate or compound the effects of any UME.

Given the magnitude and severity of the impacts of the Vineyard Wind 1 Project discussed above, and in consideration of the required mitigation and other information presented, Vineyard Wind's activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated and authorized will have a negligible impact on harbor and gray seals.

#### *Negligible Impact Determination*

No mortality or serious injury is anticipated to occur or authorized. As described in the analysis above, the impacts resulting from the project's activities cannot be reasonably expected to, and are not reasonably likely to, adversely affect any of the species or stocks through effects on annual rates of recruitment or survival. 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 mitigation and monitoring measures, NMFS preliminarily finds that the marine mammal take from the planned activities would have a negligible impact on all affected marine mammal species or stocks.

#### **Small Numbers**

As noted previously, only incidental take of small numbers of marine mammals may be authorized under sections 101(a)(5)(A) and (D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, NMFS compares

the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals. When the predicted number of individuals to be taken is fewer than one-third of the species or stock abundance, the take is considered to be of small numbers (86 FR 5322, January 19, 2021). Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

NMFS is authorizing incidental take by Level A harassment and/or Level B harassment of 14 species of marine mammals (with 14 managed stocks). The estimated number of instances of takes by combined Level A harassment and Level B harassment relative to the best available population abundance is less than one-third for all affected species and stocks (table 1). For 13 stocks, 1 percent or less of the stock abundance is authorized for take by harassment. Specific to the North Atlantic right whale, the estimated amount of take, which is by Level B harassment only (no Level A harassment is anticipated or authorized), is seven, or 2.07 percent of the stock abundance, assuming that each instance of take represents a different individual.

Based on the analysis contained herein of the planned activity (including the mitigation and monitoring measures) and the anticipated take of marine mammals, NMFS finds that small numbers of marine mammals would be taken relative to the population size of the affected species or stocks.

#### **Unmitigable Adverse Impact Analysis and Determination**

There are no relevant subsistence uses of the affected marine mammal stocks or species 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**

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq.*) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the issuance of

IHAs, NMFS consults internally whenever we propose to authorize take for endangered or threatened species, in this case with NOAA GARFO.

There are four marine mammal species under NMFS jurisdiction that are listed as endangered or threatened under the ESA that may be taken, by harassment, incidental to construction of the project: the North Atlantic right, sei, fin, and sperm whale. NMFS issued a Biological Opinion on September 11, 2020 and reissued the Biological Opinion on October 18, 2021, concluding that the issuance of the 2023 Vineyard Wind IHA is not likely to jeopardize the continued existence of threatened and endangered species under NMFS' jurisdiction and is not likely to result in the destruction or adverse modification of designated or proposed critical habitat. The Biological Opinion is available at <https://repository.library.noaa.gov/view/noaa/37556>.

The Permit and Conservation Division requested re-initiation of section 7 consultation with GARFO on the issuance of the Vineyard Wind 1 proposed IHA for Phase 2 of the Vineyard Wind 1 Offshore Wind Project on May 23, 2024. Reinitiation of consultation was triggered due to consideration of updated marine mammal density data which have become available since the 2023 IHA, analysis of SFV data collected during the Vineyard Wind 1 2023 construction campaign, and modified mitigation and monitoring measures. On August 2, 2024, NMFS GARFO issued a Biological Opinion that considered the effects of the remaining activities for the Vineyard Wind 1 Offshore Wind Project, including NMFS Permit and Conservation Division's proposed issuance of an IHA authorizing incidental take of four species of ESA-listed marine mammals, taking into account the reinitiation triggers listed above. NMFS GARFO concluded that the proposed actions were likely to adversely affect but were not likely to jeopardize the continued existence of the North Atlantic right whale, fin whale, sei whale, or sperm whale.

#### **National Environmental Policy Act**

To comply with the National Environmental Policy Act of 1969, as amended (NEPA; 42 U.S.C. 4321 *et seq.*) and NOAA Administrative Order (NAO) 216-6A, NMFS must review its proposed action (*i.e.*, the issuance of an IHA) with respect to potential impacts to marine mammals in the human environment. Consistent with the regulations published by the Council on Environmental Quality (CEQ) (40 CFR



1506.3(b)), NMFS as a cooperating agency, independently reviewed BOEM's 2021 Vineyard Wind 1 Offshore Wind Energy Project Final Environmental Impact Statement (EIS) and determined it to be sufficient to support the 2023 IHA. The Final EIS and Record of Decision are available at <https://www.fisheries.noaa.gov/action/incidental-take-authorization-vineyard-wind-1-llc-construction-vineyard-wind-offshore-wind>.

NMFS evaluated the subject IHA to Vineyard Wind 1, for completion of the foundation installation that was unable to be completed during the previous IHA (May 1, 2023 through April 30,

2024), to determine whether supplementation of the Final EIS was required. NMFS determined that changes reflected in this IHA are not substantial relevant to environmental concerns; and there are no substantial new circumstances or information about the significance of adverse effects that bear on the analysis in BOEM's 2021 Final EIS. Therefore, supplementation of the Vineyard Wind 1 Final EIS is not required for this subsequent IHA (40 CFR 1502.9(d)(1)).

#### **Authorization**

NMFS has issued an IHA to Vineyard Wind 1 for harassment of small numbers

of 14 marine mammal species incidental to impact pile driving of monopiles during the construction of the Vineyard Wind 1 Offshore Wind Farm Phase 2 offshore of Massachusetts, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated.

Dated: September 6, 2024.

**Kimberly Damon-Randall,**

*Director, Office of Protected Resources,  
National Marine Fisheries Service.*

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