Request for an Incidental Harassment Authorization to Allow the Non-Lethal Take of Marine Mammals Incidental to Site Characterization Surveys for Vineyard Northeast

Submitted To

National Marine Fisheries Service
Office of Protected Resources
Silver Spring, MD

Submitted By

Vineyard Northeast LLC

Submitted

May 2022

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May 3, 2022

REVISION CONTROL

Revision	Date	Prepared	Checked
0	2021-12-17	LGL	CP/MR/GE
1	2022-02-14	LGL	CP/MR/GE
2	2022-03-30	LGL	CP/GE
3	2022-05-02	LGL	CP

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~	approximately
ADC	analogue-digital converter
AMAPPS	Atlantic Marine Assessment Program for Protected Species
BIA	Biologically Important Area
BOEM	Bureau of Ocean Energy Management
CETAP	Cetacean and Turtle Assessment Program
CPT	cone penetration test
dB	decibel
DMA	Dynamic Management Area
DP	dynamic positioning
e.g.	for example
EEZ	Exclusive Economic Zone
ESA	Endangered Species Act
G&G	geological and geophysical
hr	hour
HRG	high-resolution geophysical
ITA	Incidental Take Authorization
IR	infrared
IWC	International Whaling Commission
kHz	kilohertz
kJ	kilo-Joule
km	kilometer
LED	light-emitting diode
m	meter
MA	Massachusetts
MA WEA	Massachusetts Wind Energy Area
MBES	multibeam echo sounder
MMPA	Marine Mammal Protection Act
NARW	North Atlantic right whale
NEFSC	NOAA Northeast Fisheries Science Center
NLPSC	Northeast Large Pelagic Survey Collaborative
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric
NVD	night vision device
OCS	Outer Continental Shelf
OECC	offshore export cable corridor
OSP	optimum sustainable population
PAM	passive acoustic monitoring
PBR	Potential Biological Removal
PEIS	programmatic environmental impact statement
PSO	protected species observer
RI	Rhode Island
RI/MA WEAs	Rhode Island and Massachusetts Wind Energy Areas
re 1 μ Pa	referenced to one micro Pascal
RL	received level
RWSAS	Right Whale Sightings Advisory System
SBP	Sub-bottom Profiler
SEFSC	NOAA Southeast Fisheries Science Center
SEL	sound exposure level

SL	source level
SMA	Seasonal Management Area
SPL	sound pressure level
SPL_{rms}	root-mean-square sound pressure level
SPL_{cum}	cumulative sound pressure level
SSS	side-scan sonar
SZ	shutdown zone
UME	unusual mortality event
U.S.	United States
USBL	Ultra-short baseline
USFWS	United States Fish and Wildlife Service
UXO	unexploded ordnance
WTG	wind turbine generator

1 Description of Specified Activity

Vineyard Northeast LLC[1] (the Applicant) is proposing to conduct a high resolution site characterization (geophysical or 'HRG') campaign. The survey area includes lease OCS-A 0522 and lease OCS-A 0544 (owned by affiliated lessee Mid-Atlantic Offshore Wind LLC) and potential offshore export cable corridors (OECCs) (Figure 1). This request for Incidental Harassment Authorization (IHA), is submitted pursuant to Section 101(a)(5) of the Marine Mammal Protection Act (MMPA (2015) 16 U.S.C. §§1361-1383b, 1401-1406, 1411-1421h) and 50 Code of Federal Regulations (CFR) § 216 Subpart I, allowing for the incidental harassment of small numbers of marine mammals resulting from exposure to regulatory defined sound levels during HRG survey activities.

The regulations set forth in Section 101(a)(5) of the MMPA and 50 CFR § 216 Subpart I allow for the incidental taking of marine mammals by a specific activity if the activity is found to have a negligible impact on the species or stock(s) of marine mammals and will not result in immitigable adverse impact on the availability of the marine mammal species or stock(s) for certain subsistence uses. In order for the National Marine Fisheries Service (NMFS) to consider authorizing the taking by United States (U.S.) citizens of small numbers of marine mammals incidental to a specified activity (other than commercial fishing), or to make a finding that incidental take is unlikely to occur, a written request must be submitted to the NMFS Office of Protected Resources. The request is detailed in the following sections.

1.1 HRG Survey Details

Geological and geophysical (G&G) data are required by BOEM and Vineyard Northeast to characterize the sites proposed for future project use. Per BOEM guidelines (Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information Pursuant to 30 CFR Part 585, May 27, 2020), it is necessary to acquire HRG data over all areas where there is potential for seafloor-disturbing activities (construction, facilities, cable arrays, and transmission cables etc.). During the permitting and development phases of an offshore wind farm, the position of foundations, cable arrays, and transmission cables etc. may change. Surveys are planned to minimize the acquisition area to the extent practicable, but it remains necessary to ensure there is geophysical coverage over a sufficiently wide corridor to adequately describe the seabed/sub-surface and soil conditions. Vineyard Northeast proposes to conduct HRG survey activities within an area illustrated in Figure 1 (referred to as Potential Survey Area). The Potential Survey Area includes Leases 0522 and 0544 (hereinafter referred to as 'the Lease Areas'). Lease Area OCS-A 0522 is located approximately 24 kilometers (km) (13 nautical miles [nm]) from the southeast corner of Martha's Vineyard, while Lease Area OCS-A 0544 is located approximately 38 km from Long Island. The survey area also includes waters from northern Massachusetts to southern New Jersey, encompassing several potential OECC routes (Figure 1).

Water depths across the Potential Survey Area range from approximately 35 to 60 meters (m) (115 to 197 feet [ft]) in the Lease Areas to 2.5 m (8 ft) in shallow waters near potential landfall locations along the OECC routes. HRG equipment will be deployed from multiple vessels acquiring data concurrently within the HRG survey area (Figure 1). Site characterization activities within the Potential Survey Area are anticipated to begin in June 2022 and will last for up to one year.

[1] Vineyard Northeast LLC was formerly OCS-A 522 LLC.

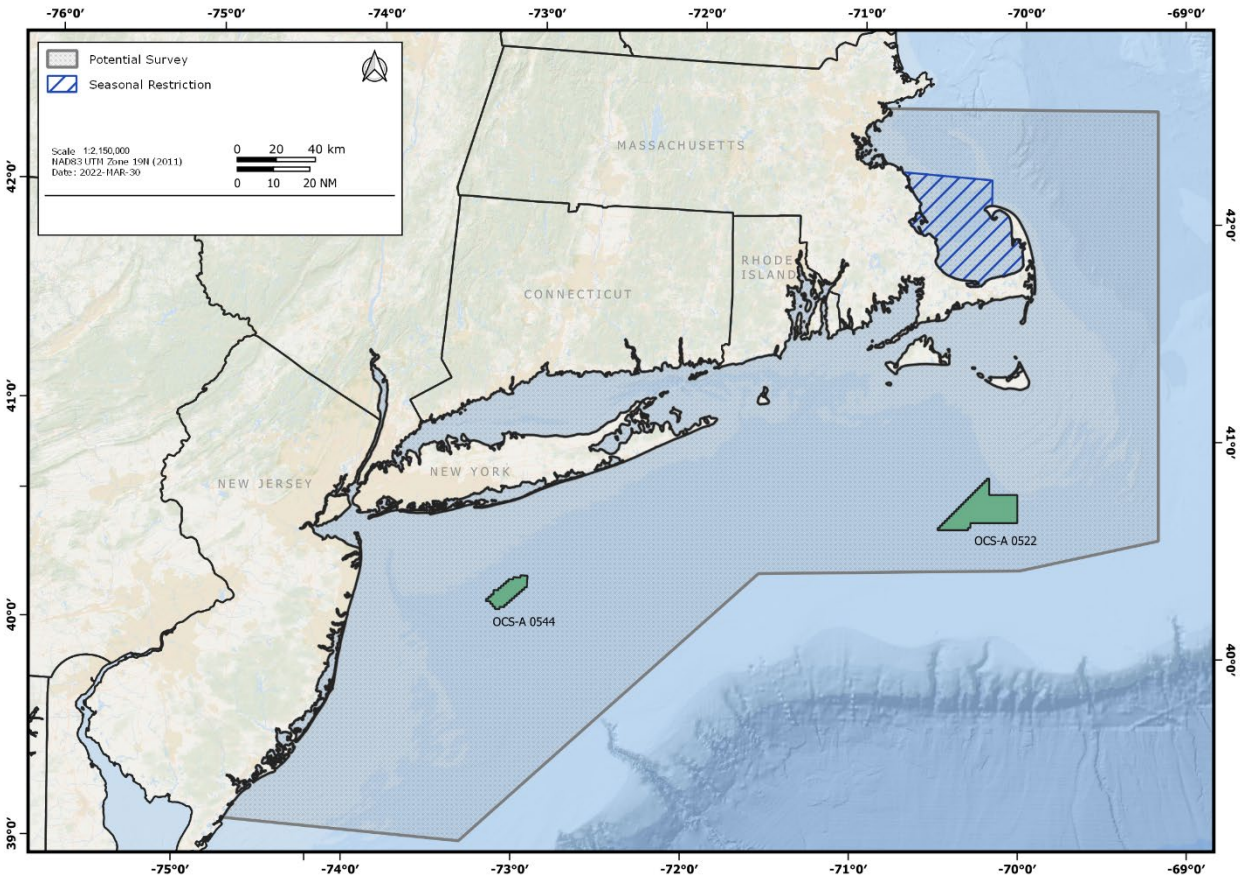

Figure 1. Potential HRG survey area. HRG surveys are proposed to occur within the boundaries shown.

The linear distance (survey tracklines) and number of active sound source days for the anticipated survey activity is summarized in Table 1. The number of active sound source days was calculated by dividing the total survey trackline lengths in each area by the approximate survey distance per day anticipated to be achieved.

Table 1. Potential Geophysical Survey effort from June 21, 2022, through June 20, 2023.

Location	Approximate Survey Trackline (km)	Approximate Survey Distance Per Day (km)	Active Sound Source Days
HRG Survey Area	69,520	80	869

1.2 HRG Survey Sound Sources

The National Oceanic and Atmospheric Administration (NOAA) have determined that specific HRG sources that operate at and below 180 kilohertz (kHz) have the potential to cause acoustic harassment to marine species, including marine mammals, and therefore require the establishment and monitoring of shutdown zones (SZ) (BOEM 2014).

HRG survey equipment that may be operated at or below 180 kHz includes:

- **Shallow Penetration Sub-bottom Profilers (CHIRP SBPs)** to map the near-surface stratigraphy (top 0 to 5 m [0 to 16 ft]) of sediment below seabed). A chirp system emits sonar pulses that increase in frequency from about 2 to 20 kHz over time. The pulse length frequency range can be adjusted to meet project variables. This system is typically mounted on the hull of the vessel or from a side pole.
- **Medium Penetration SBPs (Boomers)** to map deeper subsurface stratigraphy as needed. A boomer is a broadband sound source operating in the 3.5 Hz to 10 kHz frequency range. This system is commonly mounted on a sled and towed behind the vessel.
- **Medium Penetration SBPs (Sparkers)** to map deeper subsurface stratigraphy as needed. Sparkers create acoustic pulses from 50 Hz to 4 kHz omnidirectionally from the source that can penetrate several hundred meters into the seafloor. These are typically towed behind the vessel with adjacent hydrophone arrays to receive the return signals.

In 2021, NOAA completed consultation with BOEM and other action agencies[2], pursuant to section 7 of the Endangered Species Act (ESA), concerning the effects of certain site assessment and site characterization activities, including HRG, that are conducted to inform the siting of offshore wind energy development projects off the U.S. Atlantic Coast (NMFS 2021d). The agencies concluded that equipment other than sparkers, boomers and bubble guns, operate at sound levels resulting in no effect or produced very short isopleth distances to thresholds of disturbance for listed species. Although some isopleths modeled from equipment other than boomer/bubble guns and sparkers may reach threshold levels, the likelihood and consequence of this potential exposure would have discountable effects due to the very short distances of the potential effect. These sources that are considered unlikely to result in adverse effects and have no mitigation for the sound sources required include:

- Multibeam echosounders (hull-mounted or portable)
- Side-scan sonars
- Hull-mounted sub-bottom profilers (e.g., Knudsens)
- Fathometers for navigation
- Towed sub-bottom profilers/Chirp systems (e.g., Edgetech 424, Edgetech 512i)
- EK60/EK80 split-beam echosounders
- Ultra-short baseline (USBL) positioning equipment, e.g., for navigation of submersibles, ROVs, etc.
- All acoustic Doppler current profiling (ADCP) equipment
- All instrumentation on HOV/AUV/ROVs
- All instruments operated at 180 kHz or greater, including Non-Airgun HRG

The operational parameters (e.g., operating frequency, source level [SL], pulse duration, repetition rate) for each piece of equipment included in this assessment, as well as the output parameters (e.g.,

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[2] Other action agencies include the U.S. Army Corps of Engineers (USACE), the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and the National Marine Fisheries Service's (NMFS) Office of Protected Resources (OPR).

sound pressure level [SPL]), propagation distance, frequency content) are generally similar within each category. Therefore the overall magnitude of impact radii can often be predicted based on the equipment category (Crocker and Fratantonio 2016).

Vineyard Northeast proposes to use multiple vessels to acquire the HRG survey data. Up to four HRG vessels are currently proposed to operate concurrently within the large survey area. HRG survey activities will be conducted by vessels that can accomplish the survey goals in specific survey areas. Each vessel will maintain both the required course and a survey speed required to cover approximately 80 km (43 nm) per day during line acquisition, with consideration to weather delays, equipment maintenance, and crew availability. Vessel survey speed is anticipated to be approximately 4 knots (2.1 m/s).

HRG survey activities will occur in discrete segments corresponding to the following general areas:

- Lease Area OCS-A 0522 – Inclusive of potential wind turbine generator (WTG) locations, electrical service platform (ESP) location(s), and inter-array cable corridors;
- Lease Area OCS-A 0544 – Inclusive of potential wind turbine generator (WTG) locations, electrical service platform (ESP) location(s), and inter-array cable corridors; and;
- OECC routes – One or more potential OECC routes through Federal and State waters located within the Potential Survey Area from northern Massachusetts to southern New Jersey as shown in Figure 1.

The maximum survey area has been selected to provide operational flexibility and to cover the possibility of multiple landfall locations associated with the OECC. Track line spacing for HRG survey activities will align with BOEM Guidelines for Providing Archaeological and Historic Property Information pursuant to 30 CFR § Part 585 (March 2017) and for Providing Geophysical, Geotechnical, and Geohazard Information pursuant to 30 CFR § Part 585 (July 2015) (BOEM 2015). Surveys are planned to support standard geophysical, geotechnical, and geohazard investigations as well as potential unexploded ordnance (UXO) and benthic habitat studies.

To maximize efficiency and minimize the duration of HRG survey activities and the period of potential impact on marine fauna, Vineyard Northeast proposes to conduct HRG survey activities 24 hours per day, weather dependent, while acquiring data in the Lease Areas and along the potential OECC routes

2 Dates, Duration, and Specified Geographic Region

2.1 Dates, Duration of the Proposed HRG Surveys

HRG survey activities are anticipated to begin on June 21, 2022 and will last for up to one year. Survey operations are proposed to be conducted 24 hours per day to minimize the overall duration of survey activities and the associated period of potential impact on marine species. While the HRG survey activities are estimated to occur over the course of a full year, the actual survey duration will be shorter given the use of multiple vessels.

2.2 Specific Geographical Region of Activity

HRG survey activities are planned to occur in both Federal offshore waters (including Lease Areas OCS-A 0522 and 0544) and along potential OECCs in both Federal and State nearshore waters of

Massachusetts, Rhode Island, Connecticut, New York, and New Jersey. The proposed survey will be acquired within the area illustrated in Figure 1**.** Water depths in the Lease Areas range from about 35 to 60 m (115 to 197 ft). Water depths along the potential OECCs range from 2.5 m to >35 m (8 to >115 ft).

3 Species and Numbers of Marine Mammals

There are 39 marine mammal species and/or stocks in the Western North Atlantic OCS Region that are protected under the MMPA. This includes two different stocks of the common bottlenose dolphin (offshore and migratory coastal) as well as four different species of beaked whale that are often pooled together for estimating abundance. Table 5 lists the 28 marine mammal species and/or stocks that potentially could occur within the Potential Survey Area and surrounding waters, along with their listing status under the *Endangered Species Act* (ESA), their relative likelihood of occurrence, and their documented abundance in the region. Additional details of species abundances are provided in Section 4 below in the individual species descriptions.

The species in the region include six species of large baleen whale (mysticetes); 19 species and/or stocks of large and small toothed whales, dolphins, and porpoise (odontocetes); and three species of earless seals (phocid pinnipeds). It is unlikely that all 28 species and/or stocks would be present in the HRG survey area and surrounding waters during the site characterization survey because some of them are seasonal migrants and because their distributions vary among years based on factors such as oceanographic characteristics and prey availability. Seasonality and abundance reported in Table 5 and discussed below were mainly derived from the Northeast Large Pelagic Survey Collaborative (NLPSC) aerial surveys of the Rhode Island/Massachusetts Wind Energy Areas (RI/MA WEAs) during 2011–2015 (Kraus et al. 2016), Roberts et al. (Roberts et al. 2016; Roberts et al. 2017; Roberts et al. 2018; Roberts et al. 2021) habitat-based density models, and the Kenney and Vigness-Raposa (2010) marine mammal assessment for the Rhode Island Ocean Special Area Management Plan, as well as the NOAA Fisheries 2020 Stock Assessment Report (Hayes et al. 2020) and the NOAA Fisheries 2021 Draft Stock Assessment Report (Hayes et al. 2021b). Additional sighting data from Atlantic Marine Assessment Program for Protected Species (AMAPPS) shipboard and aerial surveys is also reported where relevant.

Of the 28 marine mammal species and/or stocks listed in Table 5, 12 are considered to be "rare" in the HRG survey area based on sighting and distribution data: dwarf and pygmy sperm whales (*Kogia sima* and *K. breviceps*), Cuvier's beaked whale (*Ziphius cavirostris*), four species of Mesoplodont beaked whales—Blainsville's (*Mesoplodon densirostris*), Gervais' (*M. europaeus*), Sowerby's (*M. bidens*), and True's (*M. mirus*)— killer whale (*Orcinus orca*), short-finned pilot whale (*Globicaphalus macrorhynchus*), Atlantic spotted dolphin (*Stenella frontalis*), striped dolphin (*Stenella coeruleoalba*), and harp seal (*Pagophilus groenlandicus*) (CeTAP 1982; Kenney and Vigness-Raposa 2010; Kraus et al. 2016; Roberts et al. 2016; Roberts et al. 2017; Roberts et al. 2018; Hayes et al. 2019b; USFWS 2019; Hayes et al. 2020; Roberts et al. 2021). Given the rarity of these species in the area and the relatively short distances to disturbance thresholds, the probability of these species being exposed to survey activities is quite low, and thus full species descriptions are not included in Section 4.

Other marine mammal species that have been documented to occur within the U.S. Atlantic Exclusive Economic Zone (EEZ) but are not expected to be present in the Potential Survey Area based on a scarcity of sightings and their known habitat preferences and distributions are: the West Indian manatee (*Trichechus manatus*), northern bottlenose whale (*Hyperoodon ampullatus*), pygmy killer whale (*Feresa attenuata*), false killer whale (*Pseudorca crassidens*), melon-headed whale (*Peponocephala electra*),

pantropical spotted dolphin (*Stenella attenuata*), Fraser's dolphin (*Lagenodelphis hosei*), rough-toothed dolphin (*Steno bredanensis*), clymene dolphin (*Stenella clymene*), spinner dolphin (*Stenella longirostris*), and hooded seal (*Cystophora cristata*) (CeTAP 1982; Kenney and Vigness-Raposa 2010; Kraus et al. 2016; Roberts et al. 2016; Roberts et al. 2017; Roberts et al. 2018; Hayes et al. 2019b; USFWS 2019; Hayes et al. 2020; Roberts et al. 2021). Potential takes of species and/or stocks considered rare or not likely to occur are addressed in Section 6.8.4.1 using observations from recent surveys in the area.

Table 2. Marine mammal species that could be present in the Potential Survey Area.

Common Name (Species Name) and Stock	ESA/MMPA Status[a]	Hearing Group[b]	Occurrence in Potential Survey Area[c]	Seasonality in Potential Survey Area[d]	Abundance[e] (NOAA Fisheries best available)
Mysticetes					
Blue whale (*Balaenoptera musculus*) Western North Atlantic Stock	Endangered/ Strategic	Low-frequency cetacean	Uncommon	Mainly winter, but rare year-round	402
Fin whale (*Balaenoptera physalus*) Western North Atlantic Stock	Endangered/ Strategic	Low-frequency cetacean	Common	Year-round, but mainly spring and summer	6,802
Humpback whale (*Megaptera novaeangliae*) Gulf of Maine Stock	Not Listed/Not Strategic	Low-frequency cetacean	Common	Year-round, but mainly spring and summer	1,396
Minke whale (*Balaenoptera acutorostrata*) Canadian East Coast Stock	Not Listed/Not Strategic	Low-frequency cetacean	Common	Spring, summer, and fall (March to September)	21,968
North Atlantic right whale (*Eubalaena glacialis*) Western North Atlantic Stock	Endangered/ Strategic	Low-frequency cetacean	Common	Winter and spring (December to May)	368
Sei whale (*Balaenoptera borealis*) Nova Scotia Stock	Endangered/ Strategic	Low-frequency cetacean	Common	Spring and summer (March to June)	6,292
Odontocetes					
Atlantic spotted dolphin (*Stenella frontalis*) Western North Atlantic Stock	Not Listed/Not Strategic	Mid-frequency cetacean	Rare	NA	39,921
Atlantic white-sided dolphin (*Lagenorhynchus acutus*) Western North Atlantic Stock	Not Listed/Not Strategic	Mid-frequency cetacean	Common	Year-round	93,233
Mesoplodont beaked whales (*Mesoplodon densitostris, M. europaeus, M. mirus, M. bidens*) Western North Atlantic Stock	MMPA Depleted and Strategic	Mid-frequency cetacean	Rare	NA	10,107[f]

Common Name (Species Name) and Stock	ESA/MMPA Status[a]	Hearing Group[b]	Occurrence in Potential Survey Area[c]	Seasonality in Potential Survey Area[d]	Abundance[e] (NOAA Fisheries best available)
Common bottlenose dolphin (*Tursiops truncates*) Western North Atlantic Offshore Stock	Not Listed/Not Strategic	Mid-frequency cetacean	Common	Year-round	62,851
Common bottlenose dolphin (*Tursiops truncates*) Western North Atlantic Northern Migratory Coastal Stock	MMPA Depleted and Strategic	Mid-frequency cetacean	Uncommon	Year-round	6,639
Cuvier's beaked whale (*Ziphius cavirostris*) Western North Atlantic Stock	Not Listed/Not Strategic	Mid-frequency cetacean	Rare	NA	5,744
Dwarf and pygmy sperm whale (*Kogia sima* and *K. breviceps*) Western North Atlantic Stock	Not Listed/Not Strategic	High-frequency cetacean	Rare	NA	7,750
Harbor porpoise (*Phocoena phocoena*) Gulf of Maine/Bay of Fundy Stock	Not Listed/Not Strategic	High-frequency cetacean	Common	Year-round, but less abundant in summer	95,543
Killer whale (*Orcinus orca*) Western North Atlantic Stock	MMPA Non-strategic	Mid-frequency cetacean	Rare	NA	Unknown
Pilot whale, long-finned (*Globicephalus melas*) Western North Atlantic Stock	Not Listed/Not Strategic	Mid-frequency cetacean	Uncommon	Year-round	39,215
Pilot whale, short-finned (*Globicaphalus macrorhynchus*) Western North Atlantic Stock	MMPA Depleted and Strategic	Mid-frequency cetacean	Rare	NA	28,924
Risso's dolphin (*Grampus griseus*) Western North Atlantic Stock	Not Listed/Not Strategic	Mid-frequency cetacean	Uncommon	Year-round	35,215
Common dolphin (*Delphinus delphis delphis*) Western North Atlantic Stock	Not Listed/Not Strategic	Mid-frequency cetacean	Common	Year-round, but more abundant in summer	172,974
Sperm whale (*Physeter macrocephalus*) North Atlantic Stock	Endangered/ Strategic	Mid-frequency cetacean	Uncommon	Mainly summer and fall	4,349

Common Name (Species Name) and Stock	ESA/MMPA Status[a]	Hearing Group[b]	Occurrence in Potential Survey Area[c]	Seasonality in Potential Survey Area[d]	Abundance[e] (NOAA Fisheries best available)
Striped dolphin (*Stenella coeruleoalba*) Western North Atlantic Stock	Not Listed/Not Strategic	Mid-frequency cetacean	Rare	NA	67,036
Pinnipeds					
Gray seal (*Halichoerus grypus*) Western North Atlantic Stock	Not Listed/Not Strategic	Phocid pinniped	Common	Year-round	27,300
Harbor seal (*Phoca vitulina*) Western North Atlantic Stock	Not Listed/Not Strategic	Phocid pinniped	Regular	Year-round, but rare in summer	61,336
Harp seal (*Pagophilus groenlandicus*) Western North Atlantic Stock	Not Listed/Not Strategic	Phocid pinniped	Rare	Winter and spring	7.6 M

NA = Not Applicable and/or insufficient data available to determine seasonal occurrence in the offshore project area.

[a] Listing status under the US Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA).

[b] Hearing group according to NOAA Fisheries technical guidance (NMFS 2018a). NOTE: Hearing groups names were recently revised by Southall et al. (2019a).

[c] Occurrence in the Potential Survey Area was mainly derived from Hayes et al. (2020), Kenney and Vigness-Raposa (2010), Kraus et al. (2016), and Roberts et al. (2016).

[d] Seasonality in the Potential Survey Area was mainly derived from Kraus et al. (2016) and Kenney and Vigness-Raposa (2010).

[e] "Best Available" population estimate is from the 2021 Draft Marine Mammal Stock Assessment Report (Hayes et al. 2021).

[f] Mesoplodont beaked whale abundance estimate accounts for all undifferentiated beaked whale species within the Western Atlantic (Hayes et al. 2019b).

4 Affected Species Status and Distribution

As discussed in Section 3 above, fifteen (15) species and/or stocks of marine mammals are known to occur either commonly or uncommonly (but with some regularity) within the Potential Survey Area and surrounding waters. The North Atlantic right whale (NARW), fin whale, sei whale, and sperm whale are all considered endangered under the ESA. These four species are also all considered strategic stocks under the *Marine Mammal Protection Act* (Hayes et al. 2020; NMFS 2021i). The common bottlenose dolphins occurring in the HRG Survey Area would likely belong to the Western North Atlantic Offshore Stock, which is not considered strategic. It is possible, however, that some could belong to the Western North Atlantic Northern Migratory Coastal Stock, which is considered depleted under the MMPA and therefore a strategic stock. The sections below provide additional details on the distribution, abundance, and status of the marine mammal species or stocks that could occur in the HRG Survey Area and surrounding waters.

4.1 Mysticetes

In addition to the species described below, in 2019, over the course of 80 total observation (vessel) days, there were 11 sightings of 14 individual unidentifiable whales recorded during the HRG survey conducted in OCS-A lease 0522 (Vineyard-Wind 2019).

4.1.1 Blue Whale (*Balaenoptera musculus musculus*)

The blue whale is the largest cetacean, although its size range overlaps with that of fin and sei whales. Most adults of this subspecies are 23 to 27 m (75 to 90 feet in length (Jefferson et al. 2008). Blue whales feed almost exclusively on krill (Kenney and Vigness-Raposa 2010).

Blue whales are considered low-frequency cetaceans in terms of their classification in the acoustic categories assigned by NMFS for the purposes of assessment of the potential for harassment or injury arising from exposure to anthropogenic noise sources, a group whose hearing is estimated to range from 7 Hz to 35 kHz (NMFS 2018b). Peak frequencies of blue whale vocalizations range from roughly 10 to 120 Hz; an analysis of calls recorded since the 1960s indicates that the tonal frequency of blue whale calls has decreased over the past several decades (McDonald et al. 2009).

4.1.1.1 Distribution

Blue whales are found in all oceans, including at least two distinct populations inhabiting the eastern and western North Atlantic Ocean (Sears et al. 2005). Although blue whales spend most of their time in deep open ocean waters, there are summertime feeding aggregations of western North Atlantic blue whales in the Gulf of St. Lawrence, where animals target krill swarms in accessible shallow waters (McQuinn et al. 2016). Data from animals tagged in the St. Lawrence estuary indicate that blue whales use other summer feeding grounds off of Nova Scotia and Newfoundland and also feed sporadically during the winter in the Mid-Atlantic Bight, occasionally venturing to waters along or shoreward of the continental shelf break (Lesage et al. 2017; Lesage et al. 2018). Tagging studies show blue whale movements from the Gulf of St. Lawrence to North Carolina, including both on- and off-shelf waters, extending into deeper waters around the New England Seamounts (Lesage et al. 2017; Davis et al. 2020). Acoustic detections of blue whales have occurred in deep waters north of the West Indies and east of the

U.S. EEZ, indicating that their southern range limit is unknown (Clark 1995; Nieukirk et al. 2004; Davis et al. 2020).

Recent deployment of passive acoustic devices in the New York Bight yielded detections of blue whales about 20 nm southeast of the entrance to New York Harbor during the months of January, February, and March (Muirhead et al. 2018). Blue whale vocalizations have been recorded off of the coast of Rhode Island as well during acoustic surveys (Kraus et al. 2016). However, these vocalizations could have originated at large distances from the receivers. More recently, during three years of monthly area surveys in the New York Bight from 2017–2020, Zoidis et al. (2021) reported 3 sightings of 5 individuals. Additional sightings of blue whales off the coast of Virginia were recorded including a vessel sighting of a juvenile in April 2018 (Engelhaupt et al. 2019), and a sighting of an adult whale off the coast of Virginia made in February 2019 during a systematic aerial survey (Cotter 2019). The aerial sighting was recorded in deep waters beyond the shelf break, but the vessel sighting was over the shelf near the 50-m isobath. Both sightings are considered extremely rare and constitute the southernmost sightings of blue whales off the U.S. east coast in the U.S. EEZ.

4.1.1.2 Abundance

The current minimum estimate of the western North Atlantic population, based on photo-identification efforts in the St. Lawrence estuary and the northwestern Gulf of St. Lawrence, is 402 animals (Sears and Calambokidis 2002; Ramp and Sears 2013; Hayes et al. 2020). This work led to a suggestion that between 400–600 individuals may be found in the western North Atlantic (Hayes et al. 2020).

4.1.1.3 Status

The blue whale is listed as Endangered under the ESA and the western North Atlantic stock of blue whales is considered Strategic and Depleted under the MMPA. Human induced threats to blue whales include entanglement in fishing gear, ship-strikes, pollution, and disruptions of pelagic food webs in response to changes in ocean temperatures and circulation processes (Hayes et al. 2020). There is no designated critical habitat for this species within the proposed survey area (Hayes et al. 2020).

4.1.2 Fin Whale (Balaenoptera physalus)

Fin whales are the second largest species of baleen whale in the Northern Hemisphere (NMFS 2021c), with a maximum length of about 22.8 m (75 ft). These whales have a sleek, streamlined body with a V-shaped head that makes them fast swimmers. This species has a distinctive coloration pattern: the dorsal and lateral sides of the body are black or dark brownish-gray, and the ventral surface is white. The lower jaw is dark on the left side and white on the right side. Fin whales feed on krill (*Euphausiacea*), small schooling fish (e.g., herring [*Clupea harengus*], capelin [*Mallotus villosus*], sand lance [*Ammodytidae* spp.]), and squid (*Teuthida* spp.) by lunging into schools of prey with their mouths open (Kenney and Vigness-Raposa 2010).

Fin whales produce characteristic vocalizations that can be distinguished during passive acoustic monitoring (PAM) surveys (BOEM 2013; Erbe et al. 2017). The most commonly observed calls are the "20-Hz signals," a short down sweep falling from 30 to 15 Hz over a 1-sec period. Fin whales can also produce higher frequency sounds up to 310 Hz, and SLs as high as 195 dB re 1 µPa @ 1 m SPL_{rms} have been reported, making it one of the most powerful biological sounds in the ocean (Erbe et al. 2017).

Anatomical modeling based on fin whale ear morphology suggests their greatest hearing sensitivity is between 20 Hz and 20 kHz (Cranford and Krysl 2015b; Southall et al. 2019a).

4.1.2.1 *Distribution*

The fin whale is widely distributed in all the world's oceans, but is most abundant in temperate and cold waters (Aguilar and Garcia-Vernet 2018). Fin whales are presumed to migrate seasonally between feeding and breeding grounds, but their migrations are less well defined than for other baleen whales. In the North Atlantic, some feeding areas have been identified but there are no known wintering areas (Aguilar and Garcia-Vernet 2018). Fin whales are found in the summer from Baffin Bay, Spitsbergen, and the Barents Sea south to North Carolina and the coast of Portugal (Rice 1998). Apparently not all individuals migrate, because in winter they have been sighted from Newfoundland to the Gulf of Mexico and the Caribbean Sea, and from the Faroes and Norway south to the Canary Islands (Rice 1998). Acoustic detections have also been made off New England from September through June (Morano et al. 2012). Fin whales off the eastern U.S., Nova Scotia, and the southeastern coast of Newfoundland are believed to constitute a single stock under the present International Whaling Commission (IWC) management scheme (Donovan 1991), which has been called the Western North Atlantic stock.

Fin whales transit between summer feeding grounds in the high latitudes and the wintering, calving, or mating habitats in low latitudes or offshore. However, acoustic records indicate that fin whale populations may be less migratory than other mysticetes whose populations make distinct annual migrations (Watkins et al. 2000). Fin whales typically feed in New England waters on fishes (e.g., sea lance, capelin, herring), krill, copepods, and squid in deeper waters near the edge of the continental shelf (90 to 180 m [295 to 591 ft]) but will migrate towards coastal areas following prey distribution. However, fin whales' habitat use has shifted in the southern Gulf of Maine, most likely due to changes in the abundance of sand lance and herring, both of which are prey for the fin whale (Vigness-Raposa et al. 2010). While fin whales typically feed in the Gulf of Maine and the waters surrounding New England, mating and calving (and general wintering) areas remain largely unknown (Hayes et al. 2020).

In the U.S. Atlantic EEZ, fin whales are the most commonly observed large whale, accounting for almost half of all large whales sighted over the continental shelf during aerial surveys from Cape Hatteras to Nova Scotia (CeTAP 1982). Western North Atlantic fin whales typically feed in the Gulf of Maine and the waters surrounding New England, but mating and calving (and general wintering) areas are largely unknown (Hain et al. 1992; Hayes et al. 2020). It is likely that fin whales occurring in the U.S. Atlantic EEZ undergo migrations into Canadian waters, open-ocean areas, and perhaps even subtropical or tropical regions. Hain et al. (1992) suggest that calving takes place during October to January in latitudes of the U.S. mid-Atlantic region.

Kraus et al. (2016) suggest that, compared to other baleen whale species, fin whales have a high multi-seasonal relative abundance in the Rhode Island/Massachusetts (RI/MA) and MA WEAs and surrounding areas. Fin whales were observed during spring and summer of the 2011–2015 NLPSC aerial survey. This species was observed primarily in the offshore (southern) regions of the RI/MA and MA WEAs during spring and was found closer to shore (northern areas) during the summer months (Kraus et al. 2016). Calves were observed three times and feeding was observed nine times during the Kraus et al. (2016) study. Although fin whales were largely absent from visual surveys in the RI/MA and MA WEAs in the fall and winter months (Kraus et al. 2016), acoustic data indicated that this species was present in the RI/MA and MA WEAs during all months of the year. Fin whales were acoustically detected in the

MA WEA on 87% of study days (889/1,020 days). Acoustic detection data indicated a lack of seasonal trends in fin whale abundance with slightly less detections from April to July (Kraus et al. 2016). Because the detection range for fin whale vocalizations is more than 200 km, detected signals may have originated from areas far outside of the RI/MA and MA WEAs; however, arrival patterns of many fin whale vocalizations indicated that received signals likely originated from within the Kraus et al. (2016) study area. Fin whales were observed in the MA WEA and nearby waters during spring and summer of the 2010–2017 AMAPPS surveys (NEFSC and SEFSC 2011–2018). In 2019, over the course of 80 total observation (vessel) days, there were eight sightings of 21 individual fin whales recorded during the HRG survey conducted in OCS-A lease 0522 (Vineyard-Wind 2019).

4.1.2.2 *Abundance*

Roberts et al. (2018) habitat-based density models provided abundance estimates of 3,005 individuals. The best abundance estimate available for the Western North Atlantic stock is 6,802 based on data from NOAA shipboard and aerial surveys and the 2016 NEFSC and Department of Fisheries and Oceans Canada (DFO) surveys (Hayes et al. 2020). A population trend analysis does not currently exist for this species because of insufficient data; however, based on photographic identification, the gross annual reproduction rate is 8% with a mean calving interval of 2.7 years (Agler et al. 1993; Hayes et al. 2020).

4.1.2.3 *Status*

The status of the Western North Atlantic stock of fin whales relative to its optimum sustainable population (OSP) in the U.S. Atlantic EEZ is unknown, but the North Atlantic population is listed as Endangered under the ESA and MA ESA, and NMFS considers this a strategic stock (Hayes et al. 2020). Potential Biological Removal (PBR) for the western North Atlantic fin whale is 11 (Hayes et al. 2020). Annual human-caused mortality and serious injury for the period between 2015 and 2019 was estimated to be 1.8 per year (Hayes et al. 2021). This estimate includes incidental fishery interactions (i.e., bycatch/ entanglement) and vessel collisions, but other threats to fin whales include contaminants in their habitat and potential climate-related shifts in distribution of prey species (Hayes et al. 2020).There are currently no critical habitat areas established for the fin whale under the ESA. The HRG Survey Area is flanked by two Biologically Important Areas (BIAs) for feeding for fin whales—the area to the northeast of Cape Cod is considered a BIA year-round, while the area off the tip of Long Island overlapping with the southwest area of the HRG survey area is a BIA from March to October (LaBrecque et al. 2015). Both of these BIAs are located within the Potential Survey Area.

4.1.3 Humpback Whale (Megaptera novaeangliae)

Humpback whale females are larger than males and can reach lengths of up to 18 m (60 ft) (NMFS 2021g). Humpback whale body coloration is primarily dark gray, but individuals have a variable amount of white on their pectoral fins, belly, and flukes. These distinct coloration patterns are used by scientists to identify individuals. These baleen whales feed on small prey often found in large concentrations, including krill and fish such as herring and sand lance (Kenney and Vigness-Raposa 2010). Humpback whales use unique behaviors, including bubble nets, bubble clouds, and flicking of their flukes and fins, to herd and capture prey (NMFS 1991).

During migration and breeding seasons, male humpback whales are often recorded producing vocalizations arranged into repetitive sequences termed "songs" that can last for hours or even days. These songs have been well studied to document changes over time and geographic differences. Generally, the frequencies produced during these songs range from 20 Hz to over 24 kHz. Most of the energy is focused between 50 and 1,000 Hz, and reported SLs range from 151 to 189 dB re 1 µPa @ 1 m SPL_{rms} (Erbe et al. 2017). Although songs are predominately produced while on breeding grounds, they have also been recorded on feeding grounds (Clark and Clapham 2004; Vu et al. 2012). Other calls produced by humpbacks, both male and female, include pulses, moans, and grunts used for foraging and communication. These calls are lower frequency (under 2 kHz) with SLs ranging from 162 to 190 dB re 1 µPa @ 1 m SPL_{rms} (Thompson et al. 1986; Erbe et al. 2017). Anatomical modeling based on humpback whale ear morphology indicate that their best hearing sensitivity is between 18 Hz and 15 kHz (Ketten et al. 2014; Southall et al. 2019a).

4.1.3.1 *Distribution*

Humpback whales are found in all ocean basins (Clapham 2018). This species is highly migratory, traveling between mid- to high-latitude waters where it feeds during spring through fall and lower latitude wintering grounds where it calves and generally does not feed. Routine migratory distances are thousands of kilometers (Kennedy et al. 2014). Although considered to be mainly a coastal species, humpback whales often traverse deep pelagic areas while migrating (Baker et al. 1998; Calambokidis et al. 2001; Garrigue et al. 2002). In the North Atlantic, six separate humpback whale sub-populations have been identified by their consistent maternally determined fidelity to different feeding areas (Clapham and Mayo 1987). These populations are found in the Gulf of Maine, Gulf of St. Lawrence, Newfoundland/Labrador, western Greenland, Iceland, and Norway (Hayes et al. 2020). Most humpback whales that inhabit the waters in the U.S. Atlantic EEZ belong to the Gulf of Maine stock. In the western North Atlantic, the Gulf of Maine humpback whale stock is recognized as a distinct feeding stock on the basis of strong site fidelity by individual whales to the region and more recent genetic analysis (Palsbøll et al. 2001; Vigness-Raposa et al. 2010; Hayes et al. 2020).

Humpback whales in the Gulf of Maine stock typically feed in the waters between the Gulf of Maine and Newfoundland during spring, summer, and fall, but have been observed feeding in other areas, such as off the coast of New York (Sieswerda et al. 2015). Some humpback whales from the Gulf of Maine migrate to the West Indies in the winter, where they mate and calve their young (Katona and Beard 1990; Palsbøll et al. 1997). However, not all humpback whales from the Gulf of Maine stock migrate to the West Indies every winter, because significant numbers of animals are observed in mid- and high-latitude regions at this time (Swingle et al. 1993). There have been several winter-time humpback sightings in coastal waters of the southeastern U.S., including 46 sightings in the New York-New Jersey Harbor Estuary documented between 2011 and 2016 (Brown et al. 2017).

Kraus et al. (2016) observed humpback whales in the RI/MA and MA WEAs and surrounding areas during all seasons of the 2011–2015 NLPSC aerial survey. Humpback whales were observed most often during the spring and summer months, with a peak from April to June. Calves were observed 10 times and feeding was observed 10 times (Kraus et al. (2016). That study also observed one instance of courtship behavior. Although humpback whales were only rarely seen during fall and winter surveys, acoustic data indicate that this species may be present within the MA WEA year-round, with the highest rates of acoustic detections in winter and spring (Kraus et al. 2016). Humpback whales were acoustically detected in the MA WEA on 56% of acoustic survey days (566/1,020 days). Acoustic detections do not

differentiate between individuals, so detections on multiple days could be the same or different individuals. The mean detection range for humpback whales using PAM was 30–36 km. Kraus et al. (2016) estimated that 63% of acoustic detections of humpback whales represented whales within their study area. Humpback whales were observed in the MA WEA and nearby waters during the spring and summer of the 2010–2017 AMAPPS surveys (NEFSC and SEFSC 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018).

4.1.3.2 *Abundance*

The most recent ocean basin-wide estimate of the North Atlantic humpback whale population is 11,570 (Palsbøll et al. 1997). The best available abundance estimate for the Gulf of Maine humpback whale stock is 1,396, which was based on a state-space model of the sighting histories of individual whales identified using photo-identification techniques (Hayes et al. 2020). Available data indicate that this stock is characterized by a positive trend, with an estimated increase in abundance of 2.8% per year (Hayes et al. 2019b, 2020).

4.1.3.3 *Status*

The entire humpback whale species was previously listed as endangered under the ESA. However, in September 2016, NOAA Fisheries identified 14 Distinct Population Segments (DPSs) of humpback whales and revised the ESA listing for this species (81 FR 62260 2016). Four DPSs were listed as endangered, one as threatened, and the remaining nine were deemed not warranted for listing. Humpback whales in the U.S. Atlantic EEZ belong to the West Indies DPS, which is considered not warranted for listing under the ESA (Hayes et al. 2020). The state of Massachusetts lists the humpback whale as Endangered under the MA ESA. This stock is considered non-strategic because the detected level of U.S. fishery-caused mortality and serious injury derived from the available records do not exceed the calculated PBR of 22, with a set recovery factor at 0.5 (Hayes et al. 2019b). Because the observed mortality is estimated to be only 20% of all mortality, total annual mortality may be 60-70 animals in this stock (Hayes et al. 2019b). If anthropogenic causes are responsible for as little as 31% of potential total mortality, this stock could be over PBR. While detected mortalities yield an estimated minimum fraction anthropogenic mortality at 0.85, additional research is being done before apportioning mortality to anthropogenic versus natural causes for undetected mortalities and making a potential change to the MMPA status of this stock.

Humpback whales in the Western North Atlantic have been experiencing an Unusual Mortality Event (UME) since January 2016 that appears to be related to a larger than usual number of vessel collisions (Hayes et al. 2020; NMFS 2022a). Of the whales examined, about half had evidence of human interaction (ship strike or entanglement). As of October 2021 this UME has resulted in 154 stranded humpback whales, with 31 of those occurring in Massachusetts (Hayes et al. 2020; NMFS 2022a). A BIA for humpback whales for feeding has been designated northeast of the HRG Survey Area from March through December (LaBrecque et al. 2015). The BIA occurs within the Potential Survey Area.

4.1.4 Minke Whale (Balaenoptera acutorostrata)

Minke whales are a baleen whale species reaching 10 m (35 ft) in length (NMFS 2021j). A prominent morphological feature of the minke whale is the large, pointed median ridge on top of the rostrum. The body is dark gray to black with a pale belly and frequently shows pale areas on the sides that

may extend onto the back. The flippers are smooth and taper to a point, and the middle third of each flipper has a conspicuous bright white band that can be distinguished during visual surveys (Kenney and Vigness-Raposa 2010). Its diet is comprised primarily of crustaceans, schooling fish, and copepods. Minke whales generally travel in small groups (one to three individuals), but larger groups have been observed on feeding grounds (NMFS 2021j).

In the North Atlantic, minke whales commonly produce pulse trains lasting 10 to 70 sec with a frequency range between 10 and 800 Hz. SLs for this call type have been reported between 159 and 176 dB re 1 μPa @ 1 m SPL_{rms} (Erbe et al. 2017). Some minke whales also produce a unique "boing" sound which is a train of rapid pulses often described as an initial pulse followed by an undulating tonal (Rankin and Barlow 2005; Erbe et al. 2017). The "boing" ranges from 1 to 5 kHz with an SL of approximately 150 dB re 1 μPa @ 1 m SPL_{rms} (Rankin and Barlow 2005; Erbe et al. 2017). Auditory sensitivity for this species based on anatomical modeling of minke whale ear morphology is best between 10 Hz and 34 kHz (Ketten et al. 2014; Southall et al. 2019a).

4.1.4.1 *Distribution*

Minke whales have a cosmopolitan distribution that spans ice-free latitudes (Stewart and Leatherwood 1985). They occur in both coastal and offshore waters (Perrin et al. 2018). Three species are recognized worldwide, with only the common minke whale occurring in the northern hemisphere. Minke whales are generally observed alone or in small groups of two or three individuals; larger aggregations may occur at higher latitudes (Katona et al. 1993; Perrin et al. 2018). There are four recognized populations in the Atlantic Ocean (Donovan 1991). Minke whales found in the U.S. Atlantic EEZ are considered part of the Canadian East Coast stock, which inhabits the area from the western half of the Davis Strait (45°W) to the Gulf of Mexico (Hayes et al. 2020).

The minke whale is common off the U.S. east coast over continental shelf waters, especially off New England during spring and summer (CeTAP 1982). It is the third most abundant large whale in the U.S. Atlantic EEZ. There is a seasonal component to its distribution in the Northwest Atlantic. This species is most abundant in New England waters during spring through fall while September through April it is most abundant in deep oceanic waters throughout the North Atlantic (Hayes et al. 2020). Risch et al. (2013) reported a decrease in minke whale calls north of 40°N in late fall with an increase in calls between 20° and 30°N in winter and north of 35°N during spring. Kraus et al. (2016) observed minke whales in the RI/MA and MA WEAs and surrounding areas primarily from May to June during the 2011–2015 NLPSC aerial surveys.

This species demonstrated a distinct seasonal habitat usage pattern that was consistent throughout the study. Minke whales were not observed between October and February, but acoustic data indicate the presence of this species in the winter months. Calves were observed twice, and feeding was also observed twice during the Kraus et al. (2016) study. Minke whales were acoustically detected in the MA WEA on 28% of project days (291/1,020 days). Minke whale acoustic presence data also exhibited a distinct seasonal pattern; acoustic presence was lowest in the months of December and January, steadily increased beginning in February, peaked in April, and exhibited a gradual decrease throughout the summer months (Kraus et al. 2016). Acoustic detection range for this species was small enough that over 99% of detections were limited to within the study area (Kraus et al. 2016). Minke whales were observed several times in the MA WEA and nearby waters during spring and summer of the 2010–2017 AMAPPS surveys (NEFSC and SEFSC 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018). In 2019, over the course of 80

total observation (vessel) days, there were six sightings of eight individual minke whales recorded during the HRG survey conducted in OCS-A lease 0522 (Vineyard-Wind 2019).

4.1.4.2 *Abundance*

The most recent population estimate for the Canadian East Coast stock is 21,968 minke whales, derived from surveys conducted by NOAA and the Department of Fisheries and Oceans Canada between Labrador and central Virginia (Hayes et al. 2020). There are no current population trends or net productivity rates for this species due to insufficient data.

4.1.4.3 *Status*

Minke whales are not listed as threatened or endangered under the ESA, and the Canadian East Coast Stock is not considered strategic under the MMPA. Minke whales in the Western North Atlantic have been experiencing a UME since January 2017 with some evidence of human interactions as well as infectious disease, but more study is required (NMFS 2022b). As of October 2021, a total of 118 strandings have been reported, with 41 of those occurring in Massachusetts ((NMFS 2022b). A BIA for minke whales for feeding has been designated east of the Potential Survey Area from March through November (LaBrecque et al. 2015). A portion of the BIA occurs within the Potential Survey Area.

4.1.5 North Atlantic Right Whale (Eubalaena glacialis)

NARWs are among the rarest of all marine mammal species in the Atlantic Ocean. They average approximately 15 m (50 ft) in length (NMFS 2021k). They have stocky, black bodies with no dorsal fin, and bumpy, coarse patches of skin on their heads called callosities. NARWs are skim feeders, swimming slowly at or below the surface with mouth open to capture prey, which consists entirely of zooplankton (Kenney 2018). Research suggests that NARWs must locate and exploit extremely dense patches of zooplankton to feed efficiently (Mayo and Marx 1990b). These dense zooplankton patches are a primary characteristic of the spring, summer, and fall NARW habitats (Kenney et al. 1995a). NARWs are usually observed in groups of less than 12 individuals, and most often as single individuals or pairs. Larger groups may be observed in feeding or breeding areas (Jefferson et al. 2008).

NARW vocalizations most frequently recorded include upsweeps rising from 30 to 450 Hz, often referred to as "upcalls," and broadband (30 to 8,400 Hz) pulses, or "gunshots," with SLs between 172 and 187 dB re 1 µPa @ 1 m SPL_{rms} (Erbe et al. 2017). However, recent studies have shown that mother-calf pairs reduce the amplitude of their calls on the calving grounds, possibly to avoid detection by predators (Parks et al. 2019). Modeling conducted using right whale ear morphology suggest that the best hearing sensitivity for this species is between 16 Hz and 25 kHz (Ketten et al. 2014; Southall et al. 2019a).

4.1.5.1 *Distribution*

The NARW is a migratory species that travels from high-latitude feeding waters to low-latitude calving and breeding grounds. The Western Atlantic stock of NARWs ranges primarily from calving grounds in coastal waters of the southeastern U.S.to feeding grounds in New England waters and the Canadian Bay of Fundy, Scotian Shelf, and Gulf of St. Lawrence (Hayes et al. 2020). These whales undertake a seasonal migration from their northeast feeding grounds (generally spring, summer, and fall habitats) south along the U.S. east coast to their calving grounds in the waters of the southeastern U.S. (Kenney and Vigness-Raposa 2010). However, this species has been observed feeding in winter in the

mid-Atlantic region and has been recorded off the coast of New Jersey in all months of the year (Whitt et al. 2013). Surveys demonstrate the existence of seven areas where NARWs congregate seasonally: the coastal waters of the southeastern U.S., Great South Channel, Jordan Basin, Georges Basin along the northeastern edge of Georges Bank, Cape Cod and Massachusetts Bays, the Bay of Fundy, and the Roseway Basin on the Scotian Shelf (Hayes et al. 2020).

Since 2010, NARWs have been declining in and around once key habitats in the Gulf of Maine and the Bay of Fundy (Davies et al. 2015; Davis et al. 2017a), while sightings have increased in other areas including Cape Cod Bay, Massachusetts Bay, the Mid-Atlantic Bight, and the Gulf of St. Lawrence (Whitt et al. 2013; Davis et al. 2017a; Mayo et al. 2018a; Davies and Brillant 2019; Ganley et al. 2019; Charif et al. 2020). An 8-year analysis of NARW sightings within SNE show that the NARW distribution has been shifting (Quintana-Rizzo et al. 2021). The study area of SNE (shores of Martha's Vineyard and Nantucket to and covering all the offshore wind lease sites of Massachusetts and Rhode Island) recorded sightings of NARWs in almost all months of the year with the highest sighting rates occurring during winter months into early spring (Quintana-Rizzo et al. 2021).

A climate-driven shift in the Gulf of Maine/western Scotian Shelf region occurred in 2010 and impacted the foraging environment, habitat use, and demography of the NARW population (Meyer-Gutbrod et al. 2021). In 2010, the number of NARWs returning to the traditional summertime foraging grounds in the eastern Gulf of Maine/Bay of Fundy region began to decline rapidly (Davies et al. 2019; Davies and Brillant 2019; Record et al. 2019). Despite considerable survey effort, the location of most of the population during the 2010-2014 foraging seasons are largely unknown; however, sporadic sightings and acoustic detections in Canadian waters suggest a dispersed distribution (Davies et al. 2019) and a significant increase in the presence of whales in the southern Gulf of St. Lawrence beginning in 2015 (Simard et al. 2019).

Davis et al. (2017b) recently pooled together detections from a large number of passive acoustic devices and documented broad-scale use of much more of the Atlantic Seaboard than previously believed. Further, there has been an apparent shift in habitat use patterns (Davis et al. 2017b), which includes an increased use of Cape Cod Bay (Mayo et al. 2018b) and decreased use of the Great South Channel. Movements within and between habitats are extensive (Hayes et al. 2019a), and there is a high interannual variability in NARW use of some habitats (Pendleton et al. 2009). New England waters are important feeding habitats for NARW who must locate and exploit extremely dense patches of zooplankton to feed efficiently (Mayo and Marx 1990a). These dense zooplankton patches are likely a primary characteristic of the spring, summer, and fall NARW habitats (Kenney et al. 1986; Kenney et al. 1995b). While feeding in the coastal waters off Massachusetts has been better studied than in other areas, NARW feeding has also been observed on the margins of Georges Bank, in the Great South Channel, in the Gulf of Maine, in the Bay of Fundy, and over the Scotian Shelf (Baumgartner et al. 2007). NMFS and Center for Coastal Studies aerial surveys during spring 1999 to 2006, found NARWs along the northern edge of Georges Bank, in the Great South Channel, in Georges Basin, and in various locations in the Gulf of Maine, including Cashes Ledge, Platts Bank, and Wilkinson Basin. Analysis of the sightings data has shown that utilization of these areas has a strong seasonal component (Pace and Merrick 2008; Pace et al. 2014). In recent years (2012–2015), surveys have detected fewer individuals in the Great South Channel and the Bay of Fundy, indicating a shift in habitat use patterns.

Kraus et al. (2016) observed NARWs in the RI/MA and MA WEAs and surrounding waters in winter and spring during the 2011–2015 NLPSC aerial surveys; there were no sightings of NARWs for

the months of May through November, and only four sightings were reported in December across all survey years. Over 436 hours of aerial surveys were conducted from October 2011 through June 2015, with 93% of the NARW sightings (56 out of 60) occurring in January through April. Eleven instances of courtship behavior were observed, but no calves. The greatest sightings per unit effort (SPUE) in the RI/MA and MA WEAs was in March. Roberts et al. (2021) predicted the highest density of NARWs in the MA WEA and adjacent water during April. Seventy-seven unique individual NARWs were observed in the RI/MA and MA WEAs over the duration of the NLPSC surveys (Kraus et al. 2016). NARWs were observed in the MA WEA and nearby waters during the winter, spring, and summer of the 2010–2017 AMAPPS surveys (NEFSC and SEFSC 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018).

Kraus et al. (2016) acoustically detected NARWs with PAM within the MA WEA on 43% of project days (443/1,020 days) and during all months of the year. Acoustic detections do not differentiate between individuals, so detections on multiple days could be the same or different individuals. NARWs exhibited notable seasonal variability in acoustic presence, with maximum occurrence in the winter and spring (January through March) and minimum occurrence in summer (July to September). The mean detection range for NARWs using PAM was 15–24 km, with a mean radius of 21 km for the PAM system within the study area. Sightings of this species in the HRG Survey Area are possible though NARWs are generally distributed farther north at the time of year when the proposed survey is scheduled to occur.

Abundance

The Western North Atlantic population size has been declining since 2011 and is currently estimated at 368 individuals (Hayes et al. 2021b; (Pettis et al. 2021). There has been a decrease in mean survival rates since 2010 (Pettis et al. 2021), and birth rates have been highly variable (Hayes et al. 2021). It appears as though a decline in birth rates is currently occurring, possibly as a result of lower female survival rate (Pace et al. 2017; Meyer-Gutbrod et al. 2020), variability in nutrition (Fortune et al. 2013), or increased energy expenditures associated with non-lethal entanglements (Pettis et al. 2017; van der Hoop et al. 2017).

4.1.5.2 *Status*

The Western Atlantic Stock of NARWs is classified as a strategic stock under the MMPA and is listed as Endangered under the ESA and MA ESA (Hayes et al. 2020). NARWs are considered to be the most critically Endangered large whales in the world (Hayes et al. 2019b). The average annual human-related mortality/injury rate exceeds that of the calculated PBR of 0.7 (Hayes et al. 2021). Estimated human-caused mortality and serious injury between 2015 and 2019 was an average of 7.7 whales per year (Hayes et al. 2021). Pace et al. (2021) estimated the annual rate of total mortality for the period of 2014-2018 was 29.7, which is 3.4 times larger than the 8.15 total derived from reported mortality and serious injury for the same period (Hayes et al. 2021).

Historically, the population suffered severely from commercial overharvesting and has more recently been threatened by incidental fishery entanglement and vessel collisions (Knowlton and Kraus 2001; Johnson et al. 2005; Pace et al. 2017). There have been elevated numbers of mortalities reported since 2017 and continuing through 2021, with a total of 34 dead NARWs, which prompted NMFS to designate an UME for NARWs (NMFS 2022c). The total mortalities include 21 dead stranded whales in Canada and 13 in the U.S. The leading category for the cause of death for this UME is “human interaction”, specifically from entanglements or vessel strikes (NMFS 2022c). In addition to the documented mortalities, since 2017, 17 individuals have been documented with serious injury resulting

from entanglement and two have been reported with serious injury resulting from a vessel strike (NMFS 2022c).

To protect this species from ship strikes, NOAA Fisheries designated Seasonal Management Areas (SMAs) in U.S. waters in 2008 (73 FR 60173 2008). All vessels greater than 19.8 m (65 ft) in overall length must operate at speeds of 10 knots (5.1 meters per second [m/s]) or less within these areas during specific time periods. In addition, the rule provides for the establishment of Dynamic Management Areas (DMAs) when and where NARWs are sighted outside SMAs. DMAs are generally in effect for two weeks, and the 10 knots (5.1 m/s) or less speed restriction is voluntary while transiting through these areas. The Block Island Sound SMA overlaps with the southern portion of the MA WEA and is active between November 1 and April 30 each year. The Great South Channel SMA lies to the Northeast of the MA WEA and is active April 1 to July 31.

NOAA Fisheries has designated two critical habitat areas for the NARW under the ESA: the Gulf of Maine/Georges Bank region is located northeast of the HRG Survey Area, but parts of it overlap the Potential Survey Area, and the southeast calving grounds from North Carolina to Florida (NMFS 2016a). Two additional critical habitat areas in Canadian waters, Grand Manan Basin and Roseway Basin, were identified in Canada's final recovery strategy for the NARW (Brown et al. 2009).

The HRG Survey Area is encompassed by a NARW BIA for the northward migration from March to April and for the southward migration from November to December (LaBrecque et al. 2015). The NARW BIA for migration includes the RI/MA and MA WEAs and beyond to the continental slope, extending northward to offshore of Provincetown, MA and southward to halfway down the Florida coast (LaBrecque et al. 2015). One feeding BIA is located north of the HRG Survey Area at Cape Cod Bay and Massachusetts Bay and occurs from February to April, and another is located northeast of the HRG Survey Area in the Great South Channel, from April to June; both BIAs occur within the Proposed Survey Area.

4.1.6 Sei Whale (Balaenoptera borealis)

Sei Whales are a baleen whale that can reach lengths of about 12–18 m (40–60 ft) (NMFS 2021m). This species has a long, sleek body that is dark bluish gray to black in color and pale underneath (NMFS 2021m). Their diet is comprised primarily of plankton, schooling fish, and cephalopods. Sei whales generally travel in small groups (two to five individuals), but larger groups are observed on feeding grounds (NMFS 2021m).

Although uncertainties still exist with distinguishing sei whale vocalizations during PAM surveys, they are known to produce short duration (0.7 to 2.2 sec) upsweeps and downsweeps between 20 and 600 Hz. SLs for these calls can range from 147 to 183 dB re 1 µPa @ 1 m SPL_{rms} (Erbe et al. 2017). No auditory sensitivity data are available for this species (Southall et al. 2019a).

4.1.6.1 <u>*Distribution*</u>

The sei whale occurs worldwide, with a preference for oceanic waters (Horwood 2009); it is uncommon in shelf waters. Nonetheless, when prey is abundant, sei whales have been reported in more inshore locations, such as the Great South Channel and Stellwagen Bank (Payne and Heinemann 1990; Hayes et al. 2019a). Sei whales undertake extensive seasonal migrations, feeding at subpolar latitudes during the summer and calving at lower latitudes in the winter (Horwood 2018). Sei whales often travel alone while migrating, but on feeding grounds they can be observed in aggregations of 20-100 animals

(Horwood 2009). Two stocks of sei whales are recognized in the western North Atlantic: the Labrador Sea stock and the Nova Scotia stock. Sei whales occurring within the HRG Survey Area are considered part of the Nova Scotia stock, which includes continental shelf waters from the northeastern U.S. to areas south of Newfoundland (Hayes et al. 2020). The southern portions of the Nova Scotia stock's range includes the Gulf of Maine and Georges Bank during spring and summer (Hayes et al. 2020).

Sighting data suggest sei whale distribution is largely centered in the waters of New England and eastern Canada (Roberts et al. 2016; Hayes et al. 2020). There appears to be a strong seasonal component to sei whale distribution in U.S. waters. They are relatively widespread and most abundant in New England waters from spring to fall (April to July). PAM conducted along the Atlantic Continental Shelf and Slope in 2004-2014 detected sei whales calls from south of Cape Hatteras to Davis Strait with evidence of distinct seasonal and geographic patterns. Davis et al. (2020) detected peak call occurrence in northern latitudes during summer indicating feeding grounds ranging from southern New England through the Scotian Shelf. Sei whales were recorded in the southeast on Blake's Plateau in the winter months, but only on the offshore recorders indicating a more pelagic distribution in this region. Persistent year-round detections in southern New England and the New York Bight highlight that this as an important region for the species (Hayes et al. 2021).

Kraus et al. (2016) observed sei whales in the RI/MA and MA WEAs and surrounding areas only between the months of March and June during the 2011–2015 NLPSC aerial survey. The number of sei whale observations was less than half that of other baleen whale species in the two seasons in which sei whales were observed (spring and summer). This species demonstrated a distinct seasonal habitat use pattern that was consistent throughout the study. Calves were observed three times and feeding was observed four times during the Kraus et al. (2016) study. Sei whales were not observed in the MA WEA and nearby waters during the 2010–2017 AMAPPS surveys (NEFSC and SEFSC 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018). However, there were observations during the 2016 and 2017 summer surveys that were identified as being either a fin or sei whale. Sei whales are expected to be present in the HRG Survey Area and surrounding waters but much less common than the other baleen whale species.

4.1.6.2 *Abundance*

The best available abundance estimate for the Nova Scotia stock of sei whales from NMFS stock assessments is 6,292 individuals derived from recent surveys conducted between Halifax, Nova Scotia and Florida (Hayes et al. 2020).

4.1.6.3 *Status*

Sei whales are listed as Endangered under the ESA and MA ESA, and the Nova Scotia stock is considered strategic by NMFS (Hayes et al. 2020). Annual human-caused mortality and serious injury from 2015 to 2019 was estimated to be 0.8 per year (Hayes et al. 2021). The PBR for this stock is 6.2 (Hayes et al. 2020). Like fin whales, major threats to sei whales include fishery interactions, vessel collisions, contaminants, and climate-related shifts in prey species (Hayes et al. 2020). There is no designated critical habitat for this species in or near the Potential Survey Area. A BIA for feeding for sei whales occurs both to the north and to the east of the HRG Survey Area from May through November (LaBrecque et al. 2015). A portion of the BIA is located within the Potential Survey Area.

4.2 Odontocetes

In addition to the species described below, in 2019, over the course of 80 total observation (vessel) days, there was one sighting of 30 individual white-beaked dolphins and 21 sightings of 103 individual dolphins of unidentifiable species recorded during the HRG survey conducted in OCS-A lease 0522 (Vineyard-Wind 2019).

4.2.1 Atlantic White-Sided Dolphin (Lagenorhynchus acutus)

The Atlantic white-sided dolphin is robust and attains a body length of approximately 2.8 m (9 ft) (Jefferson et al. 2008). It is characterized by a strongly "keeled" tail stock and distinctive, white-sided color pattern (BOEM 2014). Atlantic white-sided dolphins form groups of varying sizes, ranging from a few individuals to over 500 (NMFS 2021a). They feed mostly on small schooling fishes, shrimps, and squids, and are often observed feeding in mixed-species groups with pilot whales and other dolphin species (Jefferson et al. 2008; Cipriano 2018).

Like most dolphin species, Atlantic white-sided dolphins produce clicks, buzzes, calls, and whistles. Their clicks are broadband sounds ranging from 30 to 40 kHz but can contain frequencies over 100 kHz and are often produced during foraging and for orientation within the water column. Buzzes and calls are not as well studied, and they may be used for socialization as well as foraging. Whistles are primarily for social communication and group cohesion. No hearing sensitivity data are currently available for this species (Southall et al. 2019a).

4.2.1.1 <u>*Distribution*</u>

Atlantic white-sided dolphins occur in cold temperate and subpolar waters of the North Atlantic in deep continental shelf and slope waters (Jefferson et al. 2008). They are often found concentrated in areas with high seafloor relief (Reeves et al. 2002). Though often found in shelf and slope waters, they can also be seen in coastal as well as deep oceanic waters (Cipriano 2018). Groups sizes can range from a few individuals to several hundred individuals. They can be seen feeding with large baleen whales or associating with other dolphin species (Cipriano 2018). The Western North Atlantic stock of Atlantic white-sided dolphins may consist of three separate populations: Gulf of Maine, Gulf of St. Lawrence, and Labrador Sea (Hayes et al. 2020). Animals observed off the eastern U.S. coast are part of the Gulf of Maine population, which is suggested as being separate from the nearby Gulf of St. Lawrence population based on distribution patterns and genetic analyses, but further research is necessary to support this.

The species occurs year-round between central West Greenland to North Carolina primarily in continental shelf waters to the 100-m depth contour (Hayes et al. 2020). There are seasonal shifts in the distribution of the Atlantic white-sided dolphins off the northeastern US coast, with low abundance in winter between Georges Basin and Jeffrey's Ledge and very high abundance in the Gulf of Maine during spring. During summer, Atlantic white-sided dolphins are most abundant between Cape Cod and the lower Bay of Funday. And during fall, the distribution of the species is similar to that in summer, with less overall abundance (DoN (U.S. Department of the Navy) 2005).

Kraus et al. (2016) suggest that Atlantic white-sided dolphins occur infrequently in the RI/MA and MA WEAs and surrounding areas. Effort-weighted average sighting rates for Atlantic white-sided dolphins could not be calculated because this species was only observed on eight occasions throughout the duration of the study (October 2011 through June 2015). No Atlantic white-sided dolphins were observed during the winter months, and this species was only sighted twice in the fall and three times in

the spring and summer. However, it is possible that the NLPSC survey may have underestimated the abundance of Atlantic white-sided dolphins because this survey was designed to target large cetaceans, and the majority of small cetaceans were not identified to species. Atlantic white-sided dolphins were also seen during the spring and summer in the MA WEA and nearby waters during the 2010–2017 AMAPPS surveys (NEFSC and SEFSC 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018). In 2019, over the course of 80 total observation (vessel) days, there were three sightings of 44 individual Atlantic white-sided dolphins recorded during the HRG survey conducted in OCS-A lease 0522 (Vineyard-Wind 2019).

4.2.1.2 *Abundance*

The best available abundance estimate is 93,233 based on surveys conducted between Labrador to Florida (Hayes et al. 2020).

4.2.1.3 *Status*

The Atlantic white-sided dolphin is not listed as threatened or endangered under the ESA, and the Western North Atlantic stock of Atlantic white-sided dolphins is not classified as strategic (Hayes et al. 2020). The PBR for this stock is 544 and the annual rate of human-caused mortality and serious injury from 2015 to 2019 was estimated to be 27 dolphins (Hayes et al. 2021). There is no designated critical habitat for this stock in the Potential Survey Area (Hayes et al. 2020).

4.2.2 Common Bottlenose Dolphin (Tursiops truncatus)

Bottlenose dolphins are one of the most well-known and widely distributed species of marine mammal, found in most warm temperate and tropical seas in coastal as well as offshore waters (Wells and Scott 2018). These dolphins reach 2–4 m (6–12.5 ft) in length (NMFS 2021b). The snout is stocky and set off from the head by a crease. They are typically light to dark grey in color with a white underside (Jefferson et al. 1993). Bottlenose dolphins are commonly found in groups of two to 15 individuals, though aggregations in the hundreds are occasionally observed (NMFS 2021b), and up to 1,000 individuals. They are considered generalist feeders and consume a wide variety of organisms, including fish, squid, and shrimp and other crustaceans (Jefferson et al. 2008).

4.2.2.1 *Distribution*

The common bottlenose dolphin is a cosmopolitan species that occurs in temperate and tropical waters worldwide. Two distinct morphotypes of bottlenose dolphin, coastal and offshore, occur along the eastern coast of the U.S. (Hersh and Duffield 1990; Mead and Potter 1995; Curry and Smith 1997; Rosel et al. 2009). The offshore morphotype inhabits outer continental slope and shelf edge regions from Georges Bank to the Florida Keys, and the coastal morphotype is continuously distributed along the Atlantic Coast from south of New York to the Florida Peninsula (Hayes et al. 2020)). Offshore common bottlenose dolphin sightings occur from Cape Hatteras to the eastern end of Georges Bank (Kenney 1990). The western North Atlantic offshore stock is distributed primarily along the OCS and continental slope, from Georges Bank to Cape Hatteras during spring and summer (CeTAP 1982). Bottlenose dolphins encountered in the Potential Survey Area would likely belong to the Western North Atlantic Offshore stock. However, with potential surveying off of New Jersey, it is possible that a few animals could be from the North Atlantic Northern Migratory Coastal stock.

Kraus et al. (2016) observed common bottlenose dolphins during all seasons within the RI/MA and MA WEAs in the 2011–2015 NLPSC aerial survey. This was the second most commonly observed small cetacean species and exhibited little seasonal variability in abundance. One sighting of common bottlenose dolphins in the Kraus et al. (2016) study included calves, and one sighting involved mating behavior. It is possible that the NLPSC survey may have underestimated the abundance of common bottlenose dolphins, because this survey was designed to target large cetaceans and the majority of small cetaceans were not identified to species (Kraus et al. 2016). Common bottlenose dolphins were observed in the MA WEA and nearby waters during spring, summer, and fall of the 2010–2017 AMAPPS surveys (NEFSC and SEFSC 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018). In 2019, over the course of 80 total observation (vessel) days, there were three sightings of 50 individual common bottlenose dolphins recorded during the HRG survey conducted in OCS-A lease 0522 (Vineyard-Wind 2019).

4.2.2.2 *Abundance*

The best available population estimate for the Western North Atlantic Offshore stock of bottlenose dolphins is 62,851, which is estimated from surveys covering waters from central Florida to the lower Bay of Fundy from summer 2016 (Hayes et al. 2020). The best available estimate for the North Atlantic Northern Migratory Coastal Stock is 6,639 (Hayes et al. 2020).

4.2.2.3 *Status*

Common bottlenose dolphins of the Western North Atlantic are not listed as threatened or endangered under the ESA. The Western North Atlantic Offshore stock is not considered strategic under the MMPA (Hayes et al. 2020). However, the Western North Atlantic Northern Migratory Coastal stock of common bottlenose dolphins is considered strategic by NOAA Fisheries because it is listed as depleted under the MMPA (Hayes et al. 2020). There is no designated critical habitat for either stock in the Potential Survey Area.

4.2.3 Harbor Porpoise (Phocoena phocoena)

This species is among the smallest of the toothed whales and is the only porpoise species found in Northeastern U.S. waters. A distinguishing physical characteristic is the dark stripe that extends from the flipper to the eye. The rest of its body has common porpoise features; a dark gray back, light gray sides, and small, rounded flippers (Jefferson et al. 1993). It reaches a maximum length of 1.8 m (6 ft) and feeds on a wide variety of small fish and cephalopods (Reeves and Read 2003; Kenney and Vigness-Raposa 2010). Most harbor porpoise groups are small, usually fewer than five and six individuals, although they aggregate into larger groups of 50 to hundreds for feeding or migration (Jefferson et al. 2008). They are usually seen in small groups of one to three; occasionally they form much larger groups (Bjørge and Tolley 2009).

Harbor porpoises produce high frequency clicks with a peak frequency between 129 and 145 kHz and an estimated SLs that ranges from 166 to 194 dB re 1 µPa @ 1 m SPLrms (Villadsgaard et al. 2007). Available data estimating auditory sensitivity for this species suggest that they are most receptive to noise between 300 Hz and 160 kHz (Southall et al. 2019a).

4.2.3.1 *Distribution*

The harbor porpoise inhabits cool temperate to subarctic waters of the North Atlantic and North Pacific, generally within shallow coastal waters of the continental shelf but occasionally traveling over deep offshore waters (Jefferson et al. 2008). In the summer, they tend to congregate in the northern Gulf of Maine, southern Bay of Fundy, and around the southern tip of Nova Scotia (Hayes et al. 2020). In the fall and spring, harbor porpoises are widely distributed from New Jersey to Maine (Hayes et al. 2020). In the winter, intermediate densities can be found from New Jersey to North Carolina, with lower densities from New York to New Brunswick, Canada (Kenney and Vigness-Raposa 2010). In cooler months, harbor porpoises have been observed from the coastline to deeper waters (>1,800 m), although the majority of sightings are over the continental shelf (Hayes et al. 2020). There are likely four populations in the western North Atlantic: Gulf of Maine/Bay of Fundy, Gulf of St. Lawrence, Newfoundland, and Greenland (Gaskin 1984; Gaskin 1992; Hayes et al. 2020). Individuals found in the Potential Survey Area would be almost exclusively from the Gulf of Maine/Bay of Fundy stock.

Kraus et al. (2016) indicate that harbor porpoises occur within the RI/MA and MA WEAs in fall, winter, and spring. Harbor porpoises were observed in groups ranging in size from three to 15 individuals and were primarily observed in the Kraus et al. (2016) study area from November through May, with very few sightings during June through September. It is possible that the NLPSC survey may have underestimated the abundance of harbor porpoise, because this survey was designed to target large cetaceans and the majority of small cetaceans were not identified to species (Kraus et al. 2016). Harbor porpoises were observed in the MA WEA and nearby waters during spring and fall of the 2010–2017 AMAPPS surveys (NEFSC and SEFSC 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018).

4.2.3.2 *Abundance*

The best available abundance estimate for the Gulf of Maine/Bay of Fundy stock occurring in the Potential Survey Area is 95,543 based on combined survey data from NOAA and the Department of Fisheries and Oceans Canada between the Gulf of St. Lawrence/Bay of Fundy/Scotian Shelf and Central Virginia (Hayes et al. 2020).

4.2.3.3 *Status*

The harbor porpoise is not listed as threatened or endangered under the ESA and is not listed under the MA ESA. The Gulf of Maine/Bay of Fundy Stock of harbor porpoises is not considered strategic under the MMPA (Hayes et al. 2020). The PBR for this stock is 851, and the estimated human-caused annual mortality and serious injury from 2015 to 2019 was 164 harbor porpoises per year (Hayes et al. 2021).

4.2.4 Pilot Whales (Globicephala spp.)

Two species of pilot whale occur within the Western North Atlantic: the long-finned pilot whale and the short-finned pilot whale. In general, short-finned pilot whales tend to have a tropical and subtropical distribution whereas long-finned pilot whales prefer colder temperate waters (Olson 2018). The two species are difficult to differentiate at sea and cannot be reliably distinguished during most surveys (Rone et al. 2012; Hayes et al. 2020). Both short-finned and long-finned pilot whales are similar in coloration and body shape. Pilot whales have bulbous heads, are dark gray, brown, or black in color, and can reach approximately 7.3 m (25 ft) in length (NMFS 2021h). However, long-finned pilot whales

can be distinguished by their long flippers, which are 18 to 27% of the body length with a pointed tip and angled leading edge (Jefferson et al. 1993). Pilot whales are wide-ranging and globally abundant and form large schools averaging 20-90 individuals comprised of socially stable pods of 10-20 whales (Olson 2018). The two pilot whale species within the U.S. Atlantic EEZ are categorized into Western North Atlantic stocks.

Like dolphin species, long-finned pilot whales can produce whistles and burst-pulses used for foraging and communication. Whistles typically range in frequency from 1 to 11 kHz while burst-pulses cover a broader frequency range from 100 Hz to 22 kHz (Erbe et al. 2017). Auditory evoked potential (AEP) measurements conducted by Pacini et al. (2010) indicate that the hearing sensitivity for this species ranges from <4 kHz to 89 kHz.

4.2.4.1 *Distribution*

In U.S. Atlantic waters, pilot whales are distributed principally along the continental shelf edge off the northeastern U.S. coast in winter and early spring (CeTAP 1982; Payne and Heinemann 1993; Abend and Smith 1999; Hamazaki 2002). In late spring, pilot whales move onto Georges Bank, into the Gulf of Maine, and into more northern waters, where they remain through late fall (CeTAP 1982; Payne and Heinemann 1993). Long-finned and short-finned pilot whales overlap spatially along the mid-Atlantic shelf break between New Jersey and the southern flank of Georges Bank (Payne and Heinemann 1993; Hayes et al. 2020). Long-finned pilot whales have occasionally been observed stranded as far south as South Carolina, and short-finned pilot whale have stranded as far north as Massachusetts (Hayes et al. 2019b). The latitudinal ranges of the two species therefore remain uncertain. However, south of Cape Hatteras, most pilot whale sightings are expected to be short-finned pilot whales, while north of approximately 42°N, most pilot whale sightings are expected to be long-finned pilot whales (Hayes et al. 2019b). Based on the distributions described in Hayes et al. (2019b), pilot whale sightings in the Potential Survey Area would most likely be long-finned pilot whales.

Kraus et al. (2016) observed pilot whales infrequently in the RI/MA and MA WEAs and surrounding areas during the 2011–2015 NLPSC aerial survey. No pilot whales were observed during the fall or winter, and these species were only observed 11 times in the spring and three times in the summer. Two of these sightings included calves. It is possible that the NLPSC survey may have underestimated the abundance of pilot whales, as this survey was designed to target large cetaceans and most small cetaceans were not identified to species (Kraus et al. 2016). No pilot whales were observed in the MA WEA and nearby waters during the 2010–2017 AMAPPS surveys from 2010¬2017 (NEFSC and SEFSC 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018).

4.2.4.2 *Abundance*

Roberts et al. (2017) habitat-based density models provide an abundance estimate of 27,597 pilot whales in the U.S. Atlantic EEZ. This estimate includes both long-finned and short-finned pilot whales. The best available estimate of long-finned pilot whales in the Western North Atlantic is 39,215 based on surveys between Labrador and Central Virginia (Hayes et al. 2020). For short-finned pilot whales, the best available estimate is 28,924 based on surveys between Labrador and Central Virginia (Hayes et al. 2020).

4.2.4.3 *Status*

Long-finned pilot whales are not listed under the ESA; however, both long-finned and short-finned pilot whales are considered strategic under the MMPA (Hayes et al. 2019b). Long-finned pilot whales have a propensity to mass strand in U.S. waters, although the role of human activity in these strandings remains unknown (Hayes et al. 2020). The PBR for this stock is 306, and the annual human-caused mortality and serious injury was estimated to be 9 whales between 2015 and 2019 (Hayes et al. 2021). There is no designated critical habitat for this stock in the Potential Survey Area.

4.2.5 Risso's Dolphin (Grampus griseus)

Risso's dolphin attains a body length of approximately 2.6–4 m (8.5–13 ft) (NMFS 2021l). Unlike most other dolphins, Risso's dolphins have blunt heads without distinct beaks. Coloration for this species ranges from dark to light grey. Adult Risso's dolphins are typically covered in white scratches and spots that can be used to identify the species in field surveys (Jefferson et al. 1993). The Risso's dolphin forms groups ranging from 10 to 30 individuals and primarily feed on squid, but also fish such as anchovies (*Engraulidae*), krill, and other cephalopods (NMFS 2021l).

Whistles for this species have frequencies ranging from around 4 kHz to over 22 kHz with estimated SLs between 163 and 210 dB re 1 µPa @ 1 m SPL_{rms} (Erbe et al. 2017). Studies using both behavioral and AEP methods have been conducted for this species, which show greatest auditory sensitivity between <4 kHz to >100 kHz (Nachtigal et al. 1995; Nachtigal et al. 2005).

4.2.5.1 *Distribution*

Risso's dolphins are located worldwide in both tropical and temperate waters (Jefferson et al. 2008; Jefferson et al. 2014). Risso's dolphins in the U.S. Atlantic EEZ are part of the Western North Atlantic stock (Hayes et al. 2020). This species apparently prefers steep sections of the continental shelf edge and deep offshore waters 100–1000 m deep (Hartman 2018). They are known to frequent seamounts and escarpments (Kruse et al. 1999).

The Western North Atlantic stock of Risso's dolphins inhabits waters from Florida to eastern Newfoundland (Leatherwood et al. 1976; Baird and Stacey 1991). During spring, summer, and fall, Risso's dolphins are distributed along the continental shelf edge from Cape Hatteras northward to Georges Bank (CeTAP 1982; Payne et al. 1984). During the winter, the distribution extends outward into oceanic waters (Payne et al. 1984); however, very little is known about the movement and migration patterns.

Kraus et al. (2016) results from the 2011–2015 NLPSC aerial survey suggest that Risso's dolphins occur infrequently in the RI/MA and MA WEAs and surrounding areas. No Risso's dolphins were observed during summer, fall, or winter, and this species was only observed twice in the spring. It is possible that the NLPSC survey may have underestimated the abundance of Risso's dolphins, as this survey was designed to target large cetaceans and the majority of small cetaceans were not identified to species. Risso's dolphins were observed in the MA WEA and nearby waters during spring and summer of the 2010–2017 AMAPPS surveys (NEFSC and SEFSC 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018).

4.2.5.2 *Abundance*

The best available abundance estimate for Risso's dolphins in the Western North Atlantic stock is 35,215, which is the sum of estimates from the 2016 NEFSC and Department of Fisheries and Oceans Canada (DFO) surveys, extending from Newfoundland to Labrador (Hayes et al. 2021).

4.2.5.3 *Status*

Risso's dolphins are not listed as threatened or endangered under the ESA (Hayes et al. 2020). The PBR for this stock is 301, and the annual human-caused mortality and injury for 2015 to 2019 was estimated to be 34 (Hayes et al. 2021). This stock is not classified as strategic under the MMPA because mortality does not exceed the calculated PBR. There is no designated critical habitat for this stock in the Potential Survey Area.

4.2.6 Short-beaked Common Dolphin (Delphinus delphis delphis)

Short-beaked common dolphins are one of the most widely distributed cetaceans and occurs in temperate, subtropical, and tropical regions (Jefferson et al. 2008). Short-beaked common dolphins can reach 2.7 m (9 ft) in length and have a distinct color pattern with a white ventral patch, yellow or tan flank, and dark gray dorsal "cape" (NMFS 2021n). This species feeds on schooling fish and squid found near the surface at night (NMFS 2021n). They have been known to feed on fish escaping from fishermen's nets or fish that are discarded from boats (NMFS 1993). This highly social and energetic species usually travels in large pods consisting of 50 to >1,000 individuals (Cañadas and Hammond 2008). The common dolphin can frequently be seen performing acrobatics and interacting with large vessels and other marine mammals.

Common dolphin clicks are broadband sounds between 17 and 45 kHz with peak energy between 23 and 67 kHz. Burst-pulse sounds are typically between 2 and 14 kHz, while the key frequencies of common dolphin whistles are between 3 and 24 kHz (Erbe et al. 2017). No hearing sensitivity data are available for this species (Southall et al. 2019a).

4.2.6.1 *Distribution*

Short-beaked common dolphins in the U.S. Atlantic EEZ belong to the Western North Atlantic stock (Hayes et al. 2018). Short-beaked common dolphins are a highly seasonal, migratory species. Within the U.S. Atlantic EEZ, short-beaked common dolphins general occur from Cape Hatteras, North Carolina to the Scotian Shelf (Hayes et al. 2019b). This species is highly seasonal and migratory. In the U.S. Atlantic EEZ, they are distributed along the continental shelf between the 200- and 2,000-m isobaths (650–6,561.6 ft) and are associated with Gulf Stream features (CeTAP 1982; Selzer and Payne 1988; Hamazaki 2002; Hayes et al. 2019b). Short-beaked common dolphins occur from Cape Hatteras northeast to Georges Bank (35° to 42°N) during mid-January to May and move as far north as the Scotian Shelf from mid-summer to fall (Payne and Selzer 1989; Hayes et al. 2020). Migration onto the Scotian Shelf and continental shelf off Newfoundland occurs when water temperatures exceed 11°C (51.8°F) (Sergeant et al. 1970; Gowans and Whitehead 1995). Breeding usually takes place between the months of June and September, and females have an estimated calving interval of two to three years (Hayes et al. 2018).

Kraus et al. (2016) suggested that short-beaked common dolphins occur year-round in the RI/MA and MA WEAs and surrounding areas based on data from the 2011–2015 NLPSC aerial survey. They were the most frequently observed small cetacean species within the Kraus et al. (2016) study area. Short-

beaked common dolphins were observed in the RI/MA and MA WEAs in all seasons but were most frequently observed during the summer months; observations of this species peaked between June and August. Two sightings of short-beaked common dolphins in the Kraus et al. (2016) study included calves, two sightings involved feeding behavior, and three sightings involved mating behavior. Sighting data indicate that short-beaked common dolphin distribution tended to be farther offshore during the winter months than during spring, summer, and fall. It is possible that the NLPSC survey may have underestimated the abundance of short-beaked common dolphins, because this survey was designed to target large cetaceans and the majority of small cetaceans were not identified to species (Kraus et al. 2016). Short-beaked common dolphins were observed in the MA WEA and nearby waters during all seasons of the 2010–2017 AMAPPS surveys (NEFSC and SEFSC 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018). In 2019, over the course of 80 total observation (vessel) days, there were seven sightings of 165 individual common dolphins recorded during the HRG survey conducted in OCS-A lease 0522 (Vineyard-Wind 2019).

4.2.6.2 *Abundance*

The current best abundance estimate for the entire Western North Atlantic stock is 172,974 based on recent surveys conducted between Newfoundland and Florida (Hayes et al. 2020).

4.2.6.3 *Status*

The short-beaked common dolphin is not listed as threatened or endangered under the ESA and the Western North Atlantic stock of short-beaked common dolphins is not considered strategic under the MMPA (Hayes et al. 2020). The annual estimated human-caused mortality and serious injury for 2015 to 2019 was 390.4, which included fishery-interactions and research takes (Hayes et al. 2021). There is no designated critical habitat for this stock in the Potential Survey Area.

4.2.7 Sperm Whale (Physeter macrocephalus)

The sperm whale is the largest of the toothed whales, with males reaching lengths of 16 m and the much smaller females reaching lengths of 11 m (Whitehead 2009). Sperm whales have extremely large heads, which account for 25–35% of the total length of the animal. This species tends to be uniformly dark gray in color, though lighter spots may be present on the ventral surface. Sperm whales frequently dive to depths of 600 m (1,970 ft) in search of their prey, which includes large squid and fishes, including sharks (Whitehead 2009). This species can remain submerged for over an hour and reach depths as great as 1,000 m (3,280 ft). Sperm whales form stable social groups and exhibit a geographic social structure; females and juveniles form mixed groups and primarily reside in tropical and subtropical waters, whereas males are more solitary and wide-ranging and occur at higher latitudes (Whitehead 2002; Whitehead 2003).

Unlike mysticete whales that produce various types of calls used solely for communication, sperm whales produce clicks that are used for echolocation and foraging as well as communication (Erbe et al. 2017). Sperm whale clicks have been grouped into five classes based on the click rate or number of clicks per second; these include “squeals,” “creaks,” “usual clicks,” “slow clicks,” and “codas.” In general, these clicks are broadband sounds ranging from 100 Hz to 30 kHz with peak energy centered around 15 kHz. Depending on the class, SLs for sperm whale calls range between approximately 166 and 236 dB re 1 μPa

@ 1 m SPL_{rms} (Erbe et al. 2017). Hearing sensitivity data for this species are currently unavailable (Southall et al. 2019a).

4.2.7.1 *Distribution*

This species is widely distributed, occurring from the edge of the polar pack ice to the Equator in both hemispheres. The North Atlantic stock is distributed mainly along the continental shelf-edge, over the continental slope, and mid-ocean regions, where they prefer water depths of 600 m or more and are less common in waters <300 m deep (Waring et al. 2015; Hayes et al. 2020). Though sperm whales mainly reside in deep-water habitats along the shelf edge and in mid-ocean regions, this species has been observed in relatively high numbers in the shallow continental shelf areas of southern New England (Scott and Sadove 1997). In the U.S. Atlantic EEZ waters, sperm whales appear to exhibit seasonal movement patterns (CeTAP 1982; Scott and Sadove 1997). During the winter, they are concentrated to the east and north of Cape Hatteras. This distribution shifts northward in spring, when sperm whales are most abundant in the central portion of the mid-Atlantic bight to the southern region of Georges Bank. In summer, this distribution continues to move northward, including the area east and north of Georges Bank and the continental shelf to the south of New England. In fall months, sperm whales are most abundant on the continental shelf to the south of New England and remain abundant along the continental shelf edge in the mid-Atlantic bight.

Kraus et al. (2016) observed sperm whales four times in the RI/MA and MA WEAs and surrounding areas in the summer and fall during the 2011–2015 NLPSC aerial survey. Sperm whales, traveling singly or in groups of three or four, were observed three times in August and September of 2012, and once in June of 2015. Sperm whales were observed only once in the MA WEA and nearby waters during the 2010–2017 AMAPPS surveys, during a summer shipboard survey in 2016 (NEFSC and SEFSC 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018).

4.2.7.2 *Abundance*

The IWC recognizes only one stock of sperm whales for the North Atlantic, and Reeves and Whitehead (1997) and Dufault et al. (1999) suggest that sperm whale populations lack clear geographic structure. Roberts et al. (2017) habitat-based density models provide an abundance estimate of 4,199 sperm whales in the U.S. Atlantic EEZ; hat estimate includes 223 animals in shelf waters and 3,976 in slope and abyssal waters. The best and most recent abundance estimate based on 2016 surveys conducted between the lower Bay of Fundy and Florida is 4,349 (Hayes et al. 2020).

4.2.7.3 *Status*

The Western North Atlantic stock is considered strategic under the MMPA due to its listing as Endangered under the ESA (Hayes et al. 2020; IUCN 2020). Between 2013 and 2017, 12 sperm whale strandings were documented along the U.S. East Coast, but none of the strandings showed evidence of human interactions (Hayes et al. 2020). The current PBR for this stock is 3.9 (Hayes et al. 2020). There is no designated critical habitat for this population in the Proposed Survey Area.

4.3 Pinnipeds

Two species of pinnipeds are likely to occur in the Atlantic Ocean near the HRG Survey Area: the harbor seal and gray seal. Both pinniped species are more likely to occur in the region during winter and early spring, but could be seen at other times of the year.

4.3.1 Gray Seal (Halichoerus grypus)

Gray seals are the second most common pinniped in the U.S. Atlantic EEZ. This species inhabits temperate and sub-arctic waters and hauls out on beaches and rocky ledges of islands (Jefferson et al. 2008). Gray seals are large, reaching 2–3 m (7.5–10 ft) in length, and have a silver-gray coat with scattered dark spots (NMFS 2021e). These seals are generally gregarious at haul outs (Jefferson et al. 2008). Though they spend most of their time in coastal waters, gray seals can dive as deep as 4120 m (1,352 ft) and frequently forage on the outer shelf (Hammill et al. 2001; Jefferson et al. 2008). These opportunistic feeders primarily consume fish, crustaceans, squid, and octopus (Bonner et al. 1971; Reeves 1992; Jefferson et al. 2008). They often co-occur with harbor seals because their habitat and feeding preferences overlap (NMFS 2021e).

Two types of underwater vocalizations have been recorded for male and female gray seals; clicks and hums. Clicks are produced in a rapid series resulting in a buzzing noise with a frequency range between 500 Hz and 12 kHz. Hums, which is described as being similar to that of a dog crying in its sleep, are lower frequency calls, with most of the energy <1 kHz (Schusterman et al. 1970). AEP studies indicate that hearing sensitivity for this species is greatest between 140 Hz and 100 kHz (Southall et al. 2019a).

4.3.1.1 *Distribution*

The Northwest Atlantic population of gray seals ranges from New Jersey to Labrador (Hayes et al. 2019b) and is centered at Sable Island, Nova Scotia (Davies 1957; Mansfield 1966; Richardson and Rough 1993; Hammill et al. 2001). However, there are stranding records as far south as Cape Hatteras, North Carolina (Gilbert et al. 2005). There are three breeding concentrations in eastern Canada: Sable Island, the Gulf of St. Lawrence, and along the east coast of Nova Scotia (Lavigueur and Hammill 1993). In U.S. waters, gray seals currently pup at four main established colonies from late December to mid-February: Muskeget and Monomoy Islands in Massachusetts, and Green and Seal Islands in Maine (Hayes et al. 2019b). Following the breeding season, gray seals may spend several weeks ashore in the late spring and early summer while undergoing a yearly molt. The distributions of individuals from different breeding colonies overlap outside the breeding season.

Kraus et al. (2016) observed gray seals in the RI/MA and MA WEAs and surrounding areas during the 2011–2015 NLPSC aerial survey; as this survey was designed to target large cetaceans, locations and numbers of seal observations were not included in the study report. Gray seals were regularly observed in the MA WEA and nearby waters during all seasons of the 2010–2017 AMAPPS surveys (NEFSC and SEFSC 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018). Gray seals tagged near Cape Cod during Phase I of AMAPPS showed strong site fidelity to Cape Cod throughout the summer and fall then movement south and east toward Nantucket beginning in mid-December (Palka et al. 2017). One pup tagged in January spent most of the month that the tag was active in the MA WEA. In 2019, over the course of 80 total observation (vessel) days, there was one sighting of one individual gray seal recorded during the HRG survey conducted in OCS-A lease 0522 (Vineyard-Wind 2019).

4.3.1.2 *Abundance*

The best available current abundance estimate for gray seals in Canada is 424,300; for U.S. waters, the best population estimate is 27,300 (Hayes et al. 2021). Moxley et al. (2017) used Google Earth imagery to provide an estimate of between 30,000 and 50,000 gray seals in southeast Massachusetts from haul-out sites on Cape Cod, Nantucket, Martha's Vineyard, and smaller islands, sandbars, and shoals in the area.

4.3.1.3 *Status*

This species is not listed under the ESA and is non-strategic under the MMPA because anthropogenic mortality does not exceed PBR (Hayes et al. 2020). The PBR for this population is 1,458, and the annual human-caused mortality and serious injury between 2015 and 2019 was estimated to be 4,453 in both the U.S. and Canada (Hayes et al. 2021). Between July 1, 2018–March 13, 2020, aUME was declared for harbor seal and gray seals with mortalities occurring across Maine, New Hampshire, and Massachusetts; a total of 3,152 strandings were documented with 1,010 occurring in Massachusetts (NMFS 2020). Evidence suggests phocine distemper virus as the cause of the strandings. There is no designated critical habitat for this species in the Potential Survey Area.

4.3.2 Harbor Seal (Phoca vitulina vitulina)

The harbor seal has a wide distribution throughout coastal waters between 30ºN and ~80ºN (Teilmann and Galatius 2018). It is the most common pinniped in the U.S. Atlantic EEZ (Katona et al. 1993). The harbor seal is one of the smaller pinnipeds, and adults are often light to dark grey or brown with a paler belly and dark spots covering the head and body (Jefferson et al. 1993; Kenney and Vigness-Raposa 2010). This species is approximately 2 m (6 ft) in length (NMFS 2021f). Harbor seals complete both shallow and deep dives during hunting, depending on the availability of prey (Tollit et al. 1997). Harbor seals consumes a variety of prey, including fish, shellfish, and crustaceans (Bigg 1981; Reeves 1992; Burns 2002; Jefferson et al. 2008). Harbor seals commonly occur in coastal waters, and are regularly found in bays, estuaries, and rivers (Jefferson et al. 2008). Most harbor seals haul out on land daily, although they can spend several days at sea feeding (Jefferson et al. 2008).

4.3.2.1 *Distribution*

In the western Atlantic, harbor seal distribution ranges from the eastern Canadian Arctic and Greenland south to New Jersey (Teilmann and Galatius 2018). Harbor seals are year-round inhabitants of the coastal waters of eastern Canada and Maine, and they occur seasonally along the southern New England to New Jersey coasts from September through late May (Schneider and Payne 1983; Katona et al. 1993; Barlas 1999; Schroeder 2000). A northward movement from southern New England to Maine and eastern Canada occurs prior to the pupping season, which takes place from mid-May through June along the Maine coast (Richardson 1976; Wilson 1978; Whitman and Payne 1990; Kenney 1994). Harbor seals occur seasonally along the coast during winter months from southern New England to New Jersey, typically from September through late May (Kenney and Vigness-Raposa 2010; Hayes et al. 2020). In recent years, this species has been seen regularly as far south as North Carolina, and regular seasonal haul-out sites of up to 40-60 animals have been documented on the eastern shore of Virginia and the Chesapeake Bay (Jones and Rees 2020). During the summer, most harbor seals can be found north of New York, within the coastal waters of central and northern Maine, as well as the Bay of Fundy (DoN

(U.S. Department of the Navy) 2005; Hayes et al. 2020). Genetic variability from different geographic populations has led to five subspecies being recognized. Peak breeding and pupping times range from February to early September, and breeding occurs in open water (Temte 1994).

Kraus et al. (2016) observed harbor seals in the RI/MA and MA WEAs and surrounding areas during the 2011–2015 NLPSC aerial survey, but this survey was designed to target large cetaceans so locations and numbers of seal observations were not included in the study report. Harbor seals have five major haul-out sites in and near the RI/MA and MA WEAs: Monomoy Island, the northwestern side of Nantucket Island, Nomans Land, the north side of Gosnold Island, and the southeastern side of Naushon Island (Payne and Selzer 1989). Payne and Selzer (1989) conducted aerial surveys and found that for haul-out sites in Massachusetts and New Hampshire, Monomoy Island had approximately twice as many seals as any of the 13 other sites in the study (maximum count of 1,672 in March of 1986). Harbor seals were observed in the MA WEA and nearby waters during spring, summer, and fall of the 2010–2017 AMAPPS survey (NEFSC and SEFSC 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018). Thus, harbor seals could occur in the HRG Survey Area and adjacent waters at any time of the year. In 2019, over the course of 80 total observation (vessel) days, there was one sighting of one individual harbor seal recorded during the HRG survey conducted in OCS-A lease 0522 (Vineyard-Wind 2019).

4.3.2.2 *Abundance*

Although the stock structure of the Western North Atlantic population is unknown, it is thought that harbor seals found along the eastern U.S. and Canadian coasts represent one population (Western North Atlantic Stock) (Andersen and Olsen 2010). The best estimate of abundance for harbor seals in the Western North Atlantic Stock is 61,366, with global population estimates reaching 610,000 to 640,000 (Bjørge et al. 2010; Hayes et al. 2020). Estimates of abundance are based on surveys conducted during the pupping season, when most of the population is assumed to be congregated along the Maine coast. Abundance estimates do not reflect the portion of the stock that might pup in Canadian waters (Hayes et al. 2021). Population trends from 1993 to 2018 were estimated for non-pups and pups using a Bayesian hierarchical model to account for missing data both within and between survey years. The estimated mean change in non-pup harbor seal abundance per year was positive from 2001 to 2004, but close to zero or negative between 2005 and 2018 (Hayes et al. 2021). After 2005, mean change in pup abundance was steady or declining until 2018, but these changes were not significant (Hayes et al. 2021).

4.3.2.3 *Status*

The Western North Atlantic Stock of harbor seals is not listed under the ESA; this species is considered non-strategic because anthropogenic mortality does not exceed PBR (Hayes et al. 2020). The PBR for this population is 1,729, and the annual human-caused mortality and serious injury from 2015 to 2019 was estimated to be 399 seals per year (Hayes et al. 2021). This mortality and serious injury was attributed to fishery interactions, non-fishery related human interactions, and research activities (Hayes et al. 2020). In 2018, a UME was declared for harbor seal and gray seals with mortalities occurring across Maine, New Hampshire, and Massachusetts; a total of 3,152 strandings occurred between July 1, 2018 – March 13, 2020 with 1,010 occurring in Massachusetts (NMFS 2020). Evidence suggests phocine distemper virus as the cause of the strandings. There is no designated critical habitat for this species in the Potential Survey Area.

5 Type of Incidental taking Authorization Requested

Vineyard Northeast is requesting an IHA pursuant to section 101(a)(5)(D) of the MMPA for incidental take by Level B harassment of small numbers of marine mammals during the site characterization survey activities described in Sections 1 and 2 (Figure 1).

Consistent with the conclusions of the BOEM Atlantic OCS G&G Programmatic EIS (BOEM 2014), and the section 7 ESA consultation (NOAA 2021d) no permanent hearing loss or physiological damage (such as permanent threshold shift [PTS]) or injury is expected to occur in marine mammals exposed to sound from the listed HRG survey equipment or vessels. The calculations for Level A (and Level B) exposures assume that HRG surveys conducted during the survey window will use the source producing the largest acoustic isopleths. This assumption is conservative and provides a cautious approach to predicting active survey operations and their potential impact on marine mammal species. No Level A "take" by serious injury is reasonably expected to occur given the nature of the specified activities and with mitigation that includes shutdown zones greater than the maximum calculated Level A ranges.

Site characterization surveys have the potential to take marine mammals by "Level B" harassment as a result of sound energy introduced to the marine environment. In the absence of mitigation measures, sounds that may "harass" marine mammals include pulsed sounds generated by the HRG survey equipment including the sub-bottom profiler and sparker. The potential effects will depend on the species of marine mammal, the behavior of the animal at the time of reception of the stimulus, as well as the received level (RL) of the sound. Disturbance reactions are likely to vary among some of the marine mammals in the general vicinity of the sound source.

6 Take Estimates for Marine Mammals

All anticipated takes would be "takes by harassment", involving temporary changes in behavior (i.e., Level B harassment). That is, acoustic exposure could result in temporary displacement of marine mammals from within ensonified zones or other temporary changes in behavioral state. The mitigation measures to be applied will reduce the already very low probability of Level A exposures to the point of being discountable. The planned geophysical surveys are not expected to "take" more than small numbers of marine mammals and will have a negligible effect on the affected species or stocks. In the sections below, we describe methods to estimate "take by harassment" and present estimates of the numbers of marine mammals that might be exposed to regulatory-defined levels of sound during the planned activities.

6.1 Basis for Estimating Potential "Take"

The amount of potential "take by harassment" is evaluated two different ways in this section. First, potential acoustic exposures are calculated by multiplying the expected densities of marine mammals in the survey area by the area of water likely to be ensonified by geophysical survey equipment above the applicable NMFS defined thresholds. The area of water exposed to sounds above threshold levels is based on previously reported measurement and modeling data for the same or similar geophysical survey equipment planned for use by Vineyard Northeast and the extent and duration of the planned surveys, as described below (Koessler and Li 2022). The estimated numbers are based on the densities (individuals per unit area) of marine mammals expected to occur in the survey area in the absence of survey activities.

Thus, the resulting exposure estimates are likely overestimates of the numbers of animals exposed to a specified level of sound because some marine mammals tend to move away from anthropogenic sounds before the sound level reaches the criterion level.

Secondly, the mean group size of each species was calculated from available sightings data in the region and compared to the results of the previous calculations. Density-based exposure estimates were selected as the "Requested Take", with some adjustments based on the calculated mean group size.

6.2 Marine Mammal Hearing Groups

Current data and predictions show that marine mammal species differ in their hearing capabilities, in absolute hearing sensitivity as well as frequency band of hearing (Richardson et al. 1995; Wartzok and Ketten 1999; Southall et al. 2007b; Au and Hastings 2008). While hearing measurements are available for a small number of species based on captive animal studies, direct measurements of many odontocetes and all mysticetes do not exist. As a result, hearing ranges for many odontocetes are grouped with similar species, and predictions for mysticetes are based on other methods, including: anatomical studies and modeling (Houser et al. 2001; Parks et al. 2007; Tubelli et al. 2012; Cranford and Krysl 2015a), vocalizations (see reviews in Richardson et al. 1995; Wartzok and Ketten 1999; Au and Hastings 2008), taxonomy, and behavioral responses to sound (Dahlheim and Ljungblad 1990; see review in Reichmuth et al. 2007). In 2007, Southall et al. proposed that marine mammals be divided into hearing groups. This division was updated in 2016 and 2018 by NOAA Fisheries using more recent best available science (NMFS 2018).

Southall et al. (2019b) published an updated set of Level A sound exposure criteria (i.e., for onset of TTS and PTS in marine mammals). While the authors propose a new nomenclature and classification for the marine mammal functional hearing groups, the proposed thresholds and weighting functions do not differ in effect from those proposed by NMFS (2018). The new hearing groups proposed by Southall et al. (2019) have not yet been adopted by NOAA. The NOAA (2018) hearing groups presented in Table 3 are used in this analysis.

Table 3. Marine mammal hearing groups (Sills et al. 2014; NMFS 2018).

Hearing group	Generalized Hearing Range[a]
Low-frequency (LF) cetaceans (mysticetes or baleen whales)	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans (odontocetes: delphinids, beaked whales)	150 Hz to 160 kHz
High-frequency (HF) cetaceans (other odontocetes)	275 Hz to 160 kHz
Phocid pinnipeds in water (PW)	50 Hz to 86 kHz

[a] The generalized hearing range is for all species within a group. Individual hearing will vary.

6.3 Marine Mammal Auditory Weighting Functions

The potential for anthropogenic sounds to impact marine mammals is largely dependent on whether the sound occurs at frequencies that an animal can hear well unless the sound pressure level is so high that it can cause physical tissue damage regardless of frequency (Section 7). Auditory (frequency) weighting functions reflect an animal's ability to hear a sound. Sound spectra are weighted at particular frequencies in a manner that reflects an animal's sensitivity to those frequencies (Nedwell and Turnpenny 1998; Nedwell et al. 2007). Auditory weighting functions have been proposed for marine mammals, specifically

associated with thresholds for onset of TTS and PTS; they are expressed in metrics that consider what is known about marine mammal hearing (e.g., SEL) (Southall et al. 2007b; Erbe et al. 2016a; Finneran 2016). Marine mammal auditory weighting functions for all hearing groups (Table 3) published by Finneran (2016) are included in the NMFS (2018) Technical Guidance document for use in conjunction with corresponding SEL PTS (Level A) onset acoustic criteria.

The application of marine mammal auditory weighting functions emphasizes the importance of making measurements and characterizing sound sources in terms of their overlap with biologically-important frequencies (e.g., frequencies used for environmental awareness, communication or the detection of predators or prey), and not only the frequencies of interest or concern for the completion of the sound-producing activity (i.e., context of sound source; NMFS 2018).

6.4 Level A Harassment Exposure Criteria

Injury to the hearing apparatus of a marine mammal may result from a fatiguing stimulus measured in terms of SEL, which considers the sound level and duration of the exposure signal. Intense sounds may also damage the hearing apparatus independent of duration, so an additional metric of PK is needed to assess acoustic exposure injury risk. PTS is considered injurious but there are no published data on the sound levels that cause PTS in marine mammals. There are data that indicate the received sound levels at which TTS occurs, so PTS onset is typically extrapolated from TTS onset level and an assumed growth function (Southall et al. 2007b). NOAA Fisheries (2018) criteria incorporate the best available science to estimate PTS onset in marine mammals from sound energy accumulated over 24 hours (SEL), or very loud, instantaneous, peak sound pressure levels. These dual threshold criteria of SEL and PK (Table 4) are used to calculate marine mammal exposures. If a non-impulsive sound has the potential to exceed the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.

Table 4. Summary of relevant PTS onset acoustic thresholds (received level; dB) for marine mammal hearing groups (NMFS 2018).

	Impulsive		Non-impulsive
Hearing group	Unweighted L_{pk} (dB re 1 μPa)	Weighted $L_{E,24h}$ (dB re 1 μPa^2·s)	Weighted $L_{E,24h}$ (dB re 1 μPa^2·s)
Low-frequency (LF) cetaceans	219	183	199
Mid-frequency (MF) cetaceans	230	185	198
High-frequency (HF) cetaceans	202	155	173
Phocid seals in water (PW)	218	185	201

6.5 Level B Harassment Exposure Criteria

Numerous studies on marine mammal behavioral responses to sound exposure have not resulted in consensus in the scientific community regarding the appropriate metric for assessing behavioral reactions. However, it is recognized that the context in which the sound is received affects the nature and extent of responses to a stimulus (Southall et al. 2007b; Ellison and Frankel 2012). Because of the complexity and variability of marine mammal behavioral responses to acoustic exposure, NMFS has not yet released

technical guidance on behavior thresholds for use in calculating animal exposures. For impulsive sounds, NMFS is currently using an unweighted SPL of 160 dB re 1 µPa as behavioral response threshold for all cetacean species (NMFS and NOAA 2005). This criterion was derived from the High Energy Seismic Survey (HESS) Review Process (1999) report which, in turn, was based on the responses of migrating mysticete whales to airgun sounds (Malme et al. 1983, 1984). The HESS team recognized that behavioral responses to sound may occur at lower levels, but substantial responses were only likely to occur above a SPL of 140 dB re 1 µPa. An extensive review of behavioral responses to sound was undertaken by Southall et al. (2007b, their Appendix B). Southall et al. (2007b) found varying responses for most marine mammals between a SPL of 140 and 180 dB re 1 µPa, consistent with the HESS (1999) report, but lack of convergence in the data prevented them from suggesting explicit dose-response functions. Absence of controls, precise measurements, appropriate metrics, and context dependency of responses (including the activity state of the animal) all contribute to variability.

Wood et al. (2012) proposed a graded probability of response for impulsive sounds using a frequency-weighted (i.e., M-weighted; Southall et al. 2007b) SPL metric. The authors also designated behavioral response categories for sensitive species, including harbor porpoise and beaked whales, and for migrating mysticetes.

NOAA Fisheries currently considers marine mammals exposed above 160 dB re 1 µPa to have experienced Level B behavioral harassment, therefore this threshold is used in this analysis.

6.6 Area Potentially Exposed to Sounds above Threshold Levels

The sound a source produces is characterized in time, spectral content, and space. As sound travels away from a source, it is shaped by interactions with the environment in which it propagates. For this reason, the sound field produced by a source is specific to the source and the location. Understanding the potential for sound exposure to impact animals requires an understanding of the sound field to which they could be exposed. Ranges to exposure thresholds are often reported and useful for informing monitoring and mitigation zones.

The final equipment used during the proposed HRG survey activities will vary depending on the final survey design, vessel availability, and survey contractor selection. A selection of HRG equipment was used in this assessment to estimate potential horizontal impact distances to regulatory-defined Level A and B harassment thresholds. A list of HRG sound sources that may be used during the HRG surveys that were assessed for potential acoustic impacts is provided in Table 5. All the source parameters used to calculate horizontal impact distances are also provided in Table 5 and further detailed in Appendix A.

Operational parameters (e.g., SL, beam width, repetition rate, etc.) will vary during a survey depending on location and geophysical objectives, and therefore operational knowledge is required to select appropriate parameters and source levels to estimate the distances to regulatory thresholds. Where there is uncertainly, a precautionary and conservative approach is taken. A detailed explanation of the sources of parameter information is provided in Appendix A. In summary, the following hierarchy was used to select input into horizontal impact distance calculations, as directed by NMFS:

- For equipment that was measured in Crocker and Fratantonio (2016), the reported SL for the most likely operational parameters was selected;

- For equipment not measured in Crocker and Fratantonio (2016) and where manufacturer specifications were available but only partially contained the required calculation inputs, a closest proxy source was selected from the measurements in Crocker and Fratantonio (2016);
- For equipment that was not measured in Crocker and Fratantonio (2016) and where a proxy source could not be found in Crocker and Fratantonio (2016), manufacturer specifications, or personal communications with manufacturers or equipment operators were used. Manufacturer specifications typically represent the maximum output of any source and do not always represent the most likely operational settings.

Table 5 identifies the proposed survey equipment expected to operate at and below 180 kHz, and lists the relevant acoustic parameters considered in the acoustic assessment of these sources. Equipment that will be operated at frequencies higher than 180 kHz (e.g., multibeam echosounders and side scan sonars) are not included in this application as they operate at frequencies outside of the hearing range of marine mammals. The final make and model of the listed HRG equipment is dependent on availability and will be determined during survey preparations and contract negotiations with a yet-to-be-determined survey contractor, however, equipment utilized will be the same or similar as that proposed in Table 5.

The primary operating frequency, and other relevant acoustic parameters (e.g., power level, pulse duration and repetition, beamwidth, etc.) are often made available by the HRG equipment manufacturer and provided in publicly available manufacturer specifications. This generally represents the most conservative settings of the equipment, while configuration of the equipment is specific to the proposed survey.

6.6.1 Level A

Table 6 lists the geophysical survey sources and the horizontal impact distances to the Level A criteria. Deep seismic profilers were assessed with the impulsive source criteria; all other sources were assessed with the non-impulsive criteria (see Appendix A for more details). Given the short distances to the Level A thresholds and the mitigation measures to be implemented during the survey (Section 11), acoustic exposures to regulatory-defined sound levels associated with injury are not anticipated, and therefore no Level A take is requested.

Table 5. List of representative HRG survey sound sources considered in this assessment that produce underwater sound at frequencies equal to or less than 180 kHz, and their acoustic characteristics. Details on calculation of out-of-beam levels can be found in Appendix A.

Equipment	System	Frequency (kHz)	Beam width (°)	Pulse duration (ms)	Repetition rate (Hz)	In-beam		Correction (dB)	Out-of-beam	
						Source level (dB re 1 µPa m)	Peak source level (dB re 1 µPa m)		Source level (dB re 1 µPa m)	Peak source level (dB re 1 µPa m)
Shallow subbottom profiler	EdgeTech Chirp 216	2–16	65	2	3.75	178	182	-8.1	169.9	173.9
Deep seismic profiler	Applied Acoustics AA251 Boomer	0.2–15	180	0.8	2	205	212	0.0	205.0	212.0
	GeoMarine Geo Spark 2000 (400 tip)	0.05–3	180	3.4	1	203	213	0.0	203.0	213.0

Table 6. Horizontal distance to Level A impact threshold from representative HRG survey sounds sources.

Equipment	System	Level A horizontal impact distance (m) to PK threshold					Level A horizontal impact distance (m) to SEL threshold					Impulsive source
		LFC	MFC	HFC	PPW	OPW	LFC	MFC	HFC	PPW	OPW	(Y/N)
Shallow subbottom profiler	EdgeTech Chirp 216	NA	NA	NA	NA	NA	<1	<1	<1	<1	<1	N
Deep seismic profiler	Applied Acoustics AA251 Boomer	—	—	3	—	—	<1	<1	53	<1	<1	Y
	GeoMarine Geo Spark 2000 (400 tip)	—	—	4	—	—	<1	<1	<1	<1	<1	Y

A dash (—) indicates that a source level is less than threshold level.
NA – Distances to the PK thresholds are not shown for the non-impulsive sources because they were assessed based on the non-impulsive source criteria which does not include PK thresholds.

6.6.2 Level B

Table 7 presents the geophysical survey sources and the horizontal impact distances to Level B thresholds reported with source levels computed over the duration of the pulse. As described in Appendix A, the calculations assume the sparker and boomer sources are omnidirectional and therefore the distance to threshold was calculated based on horizontally propagating energy (see Appendix A for more details). This assumption, which is made because the beam pattern is unknown, results in generally precautionary estimates of received levels, and in particular is likely to overestimate both PK and SPL.

As per NMFS guidance, the horizontal impact distance used to calculate the Zone of Influence (ZOI) and estimated exposures does not include a hearing integration period. The source levels computed over the pulse length are used in the ZOI and exposure calculations.

The largest estimated distance to the Level B threshold is 178 m from a boomer. This distance was multiplied by two times the average daily survey distance (80 km) and the area of a circle with radius 178 m was added to the result to calculate the daily ZOI (28.6 km^2). The daily ZOI was then multiplied by the total number of expected survey days (869) to estimate the total ZOI for the planned surveys (24,836 km^2).

Table 7. Estimated horizontal distances to Level B threshold criteria (160 dB SPL).

Equipment	System	Frequency (kHz)	Beam width (°)	Source level (dB re 1 µPa m)	Level B horizontal impact distance (m)
Shallow subbottom profiler	EdgeTech Chirp 216	2–16	65	178	4.3
Deep seismic profiler	Applied Acoustics AA251 Boomer	0.2–15	180	205	177.8
	GeoMarine Geo Spark 2000 (400 tip)	0.05–3	180	203	141.3

6.7 Marine Mammal Densities

Density estimates for all species within the survey area were derived from habitat-based density modeling results reported by Roberts et al. (2016; 2017; 2018; 2021). Those data provide abundance estimates for species or species guilds within 10 km x 10 km grid cells (100 km^2), or in the case of NARW densities within 5 km x 5 km grid cells, on a monthly or annual basis, depending on the species. Using a GIS (ESRI 2017), the Potential Survey Area and the NARW Seasonal Management Area polygons shown in Figure 1 were used to select grid cells from the Roberts et al. (2016; 2017; 2018; 2021) data that contain the most recent monthly or annual estimates for each species for the months of May through December. For the months of January through April, only the Potential Survey Area polygon was used to select density grid cells since it excludes waters within Cape Cod Bay where no surveys will occur from January 1 through May 15. The average monthly abundance for each species was calculated as the mean value of all grid cells within the survey area and then converted to density (individuals/1 km^2) by dividing by 100 km^2 (Table 8). Finally, an average annual density was calculated by taking the mean across all 12 months for each species.

The estimated monthly density of seals provided in Roberts et al. (2018) includes all seal species present in the region as a single guild. To split the resulting "seal" density-based exposure estimate by species, we multiplied the estimate by the proportion of the combined abundance attributable to each species. Specifically, we summed the SAR N_{best} abundance estimates (Hayes et al. 2021) for the two species (gray seal = 27,300, harbor seal = 61,336; total = 88,636) and divided the total by the estimate for each species to get the proportion of the total for each species (gray seal = 0.308; harbor seal = 0.692). The total estimated exposure from the "seal" density provide by Roberts et al. (2018) was then multiplied by these proportions to get the species specific exposure estimates.

6.8 Exposure Estimates

Given the short distances to the Level A thresholds (Table 6) and the mitigation measures to be implemented during the survey (Section 11), Level A exposures are not anticipated, and therefore Level A take is not requested.

The potential number of Level B exposures for each species was first calculated by multiplying the annual average density shown in Table 8 by the total area that may be ensonified above the level B threshold during the surveys (24,836 km^2). This results in the density-based exposure estimate shown in Section 6.8.1. To adjust exposure estimates for species with low presence in the region, mean group sizes were calculated from sightings data for the region (Section 6.8.2).

6.8.1 Exposure Estimates Based on Density

The annual average density shown in Table 8 was multiplied by the total area that may be ensonified above the level B threshold during the surveys (24, 836 km^2). The results are shown in the Table 9. This is mathematically equivalent to dividing the total area that may be ensonified equally across the 12 months, multiplying the monthly densities for each species by the monthly ensonified area to get monthly estimated exposures, and then summing across all months to get an annual estimate.

Table 8. Average monthly and annual average marine mammal densities for the proposed HRG survey area (Roberts et al. 2016; Roberts et al. 2017; Roberts et al. 2018; Roberts et al. 2021). Densities for the months of May through December include areas within the seasonal management area in Cape Cod Bay, while densities for the months of January through April do not include Cape Cod Bay.

	Monthly Average Densities (Individuals/km^2)												Annual Mean
Species	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Density (Ind/km^2)**
Mysticetes													
Blue Whale*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Fin Whale*	0.0019	0.0018	0.0020	0.0032	0.0041	0.0046	0.0044	0.0042	0.0040	0.0029	0.0019	0.0019	0.0031
Humpback Whale	0.0004	0.0003	0.0005	0.0021	0.0036	0.0039	0.0021	0.0015	0.0024	0.0026	0.0019	0.0010	0.0019
Minke Whale	0.0006	0.0007	0.0007	0.0024	0.0047	0.0038	0.0019	0.0014	0.0016	0.0016	0.0003	0.0004	0.0017
North Atlantic Right Whale*	0.0027	0.0031	0.0039	0.0049	0.0021	0.0003	0.0001	0.0000	0.0000	0.0001	0.0003	0.0014	0.0016
Sei Whale*	0.0000	0.0000	0.0001	0.0004	0.0008	0.0004	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	0.0002
Odontocetes													
Atlantic Spotted Dolphin	0.0000	0.0000	0.0001	0.0002	0.0003	0.0007	0.0016	0.0018	0.0016	0.0015	0.0014	0.0002	0.0008
Atlantic White-Sided Dolphin	0.0286	0.0201	0.0202	0.0404	0.0880	0.0844	0.0502	0.0340	0.0359	0.0418	0.0532	0.0461	0.0452
Bottlenose Dolphin	0.0111	0.0048	0.0028	0.0104	0.0174	0.0422	0.0624	0.0677	0.0537	0.0360	0.0240	0.0155	0.0290
Common Dolphin	0.1452	0.0603	0.0319	0.0411	0.0205	0.0217	0.0153	0.0180	0.0301	0.0447	0.0393	0.0920	0.0467
Harbor Porpoise	0.0450	0.0639	0.0893	0.0706	0.0487	0.0607	0.0632	0.0864	0.0921	0.1068	0.0979	0.1575	0.0818
Pilot Whales	0.0061	0.0061	0.0061	0.0061	0.0419	0.0093	0.0074	0.0082	0.0077	0.0115	0.0274	0.0578	0.0163
Risso's Dolphin	0.0004	0.0003	0.0001	0.0001	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0040
Sperm Whale*	0.0000	0.0000	0.0000	0.0001	0.0003	0.0004	0.0010	0.0017	0.0009	0.0004	0.0004	0.0006	0.0005
Pinnipeds													
Seals (Harbor and Gray)	0.0823	0.0908	0.0788	0.1244	0.1093	0.0409	0.0104	0.0067	0.0087	0.0212	0.0175	0.0646	0.0546

* Denotes species listed under the Endangered Species Act

Table 9. Estimated Level B exposures based on annual average marine mammal densities in the survey area.

Species	Annual Mean Density (Ind/km^2)	Density Based Exposures
Mysticetes		
Blue Whale*	0.0000	0.2
Fin Whale*	0.0031	54.0
Humpback Whale	0.0019	32.5
Minke Whale	0.0017	29.0
North Atlantic Right Whale*	0.0016	27.7
Sei Whale*	0.0002	3.4
Odontocetes		
Atlantic Spotted Dolphin	0.0008	13.6
Atlantic White-Sided Dolphin	0.0452	791.1
Bottlenose Dolphin	0.0290	507.1
Common Dolphin	0.0467	816.4
Harbor Porpoise	0.0818	1431.3
Pilot Whales	0.0163	285.1
Risso's Dolphin	0.0040	70.5
Sperm Whale*	0.0005	8.4
Pinnipeds		
Gray Seal	0.0168	294.2
Harbor Seal	0.0378	661.1

6.8.2 Exposure Estimates Based on Average Group Size

For other less-common species, the predicted densities from Roberts et al. (2016; 2017; 2018) are very low and the resulting density-based estimate is less than a single animal or a typical group size for the species. In such cases, the density-based exposure estimate is increased to the mean group size for the species to account for a chance encounter during an activity. Mean group sizes for each species were calculated from recent aerial and/or vessel-based surveys as shown in Table 10.

Table 10. Mean group sizes of marine mammal species used for comparison to density-based exposure estimates.

Species	Individuals	Sightings	Mean Group Size	Source
Mysticetes				
Blue Whale*	3	3	1.0	Palka et al. (2017)
Fin Whale*	155	86	1.8	Kraus et al. (2016)
Humpback Whale	160	82	2.0	Kraus et al. (2016)
Minke Whale	103	83	1.2	Kraus et al. (2016)
North Atlantic Right Whale*	145	60	2.4	Kraus et al. (2016)
Sei Whale*	41	25	1.6	Kraus et al. (2016)
Odontocetes				
Atlantic Spotted Dolphin	1334	46	29.0	Palka et al. (2017)
Atlantic White-Sided Dolphin	223	8	27.9	Kraus et al. (2016)
Bottlenose Dolphin	259	33	7.8	Kraus et al. (2016)
Common Dolphin	2896	83	34.9	Kraus et al. (2016)
Harbor Porpoise	121	45	2.7	Kraus et al. (2016)
Pilot Whales	117	14	8.4	Kraus et al. (2016)
Risso's Dolphin	1215	224	5.4	Palka et al. (2017)
Sperm Whale*	208	138	1.5	Palka et al. (2017)
Pinnipeds				
Seals (Harbor and Gray)	201	144	1.4	Palka et al. (2017)

* Denotes species listed under the Endangered Species Act

6.8.3 Requested Take

The larger of the two estimates from the approaches described above: density-based exposure estimates or mean group size was selected as the requested take as shown in Table 11. In cases where the calculations resulted in a non-integer, the result was rounded up to the nearest whole number for the take request. Additionally, based on observational data collected during prior HRG surveys in this area, the density of common dolphins predicted by the Roberts et al. (2018) model does not appear to adequately reflect the number of dolphins that may be encountered during the planned surveys. Data collected by Protected Species Observers (PSOs) on survey vessels operating in 2020–2021 showed an average of approximately 16 common dolphins may be observed within 200 m of a vessel (the approximate Level B distance) per survey day. Multiplying the anticipated 869 survey days by 16 common dolphins per day results in a potential estimated take of 13,904 common dolphins so this has been used as the requested take of common dolphins shown in Table 11.

The requested number of Level B takes as a percentage of the "best available" abundance estimates provided in the NMFS Stock Assessment Reports (Hayes et al. 2021b) are also provided in Table 11. For the "seal" guild in the Roberts et al (2018) densities, the exposure estimate was split by species using the relative abundance for the two species as described in Section 6.7 to produce the species-specific requested take.

Bottlenose dolphins encountered in most of the survey area would likely belong to the Western North Atlantic Offshore stock. However, approximately 21% of the survey area is located south of New

York Harbor where members of the North Atlantic Northern Migratory Coastal stock may be present. Therefore, 21% of the requested bottlenose dolphin take (151 individuals) may be from the North Atlantic Northern Migratory Coastal stock while the remaining 79% (569 individuals) would likely be from the Western North Atlantic Offshore stock.

The distributions of long-finned and short-finned pilot whales are described in Hayes et al. (2020, 2021) as likely overlapping in the southern portion of the survey area off New Jersey. However, a review of sightings data available on the OBIS data portal (https://seamap.env.duke.edu/) that were positively identified to either species showed only long-finned pilot whale sightings occurring in the survey area and the vast majority of short-finned pilot whale sightings well to the south of the survey area. For that reason, all pilot whale takes being requested are for long-finned pilot whales.

For North Atlantic right whales, the implementation of a 500 m acoustic shutdown zone and the 500 m vessel separation distance identified in the vessel strike avoidance measures means that the likelihood of an exposure to received sound levels greater than 160 dB SPL_{rms} is very low. As a precautionary measure, Level B takes are requested for the survey.

Table 11. Number of Level B takes requested and percentages of each species or stock abundance.

Species	Density Based Exposures	Mean Group Size	Requested Take	Abundance NMFS[a]	Percent of NMFS[a] Stock Abundance
Mysticetes					
Blue Whale*	0.2	1.0	1	402	0.2
Fin Whale*	76.7	1.8	77	6,802	1.1
Humpback Whale	46.2	2.0	47	1,396	3.4
Minke Whale	41.2	1.2	42	21,968	0.2
North Atlantic Right Whale*	39.4	2.4	40	368	10.9
Sei Whale*	4.8	1.6	5	6,292	0.1
Odontocetes					
Atlantic Spotted Dolphin	19.3	29.0	29	39,921	0.1
Atlantic White-Sided Dolphin	1123.3	27.9	1,124	93,233	1.2
Bottlenose Dolphin - *Offshore Stock*	568.8	7.8	569	62,851	0.9
Bottlenose Dolphin - *Migratory Coastal Stock*	151.2	7.8	151	6,639	2.3
Common Dolphin	1159.3	34.9	13,904	172,974	8.0
Harbor Porpoise	2032.4	2.7	2,033	95,543	2.1
Pilot Whales	404.8	8.4	405	68,139	0.6
Risso's Dolphin	100.1	5.4	101	35,215	0.3
Sperm Whale*	11.9	1.5	12	4,349	0.3
Pinnipeds					
Gray Seal	417.8	0.4	418	27,300	1.5
Harbor Seal	938.7	1.0	939	61,336	1.5

* Denotes species listed under the Endangered Species Act.
[a] Source – (Hayes et al. 2021)

6.8.3.1 Rare Species

Species considered to be rare or not expected to occur in the area were not included in the previous exposure estimates because the densities would be too low to provide meaningful density-based exposures. Nonetheless, species considered to be rare are occasionally encountered. For example, white-beaked dolphins were recorded in both 2019 and 2020 during HRG surveys in this area (Vineyard-Wind 2019, 2020) with the sighting of white-beaked dolphins in 2019 consisting of 30 animals. Other rare species encountered in the survey area during previous HRG surveys include false killer whale in 2019 (5 individuals) and 2021 (1 individual) (Vineyard-Wind 2019, 2021) and orca (killer whale) in 2022 (2 individuals; data not yet submitted). When species not listed in an IHA are encountered and may be taken, it is necessary to cease survey operations to avoid unauthorized take. To avoid this potential disruption to survey operations, Vineyard Northeast is requesting take for these three species based on the largest number of individuals observed within one year: 30 white-beaked dolphins, 5 false killer whales, and 2 orca.

7 Anticipated Impact of the Activity

The ability to hear and transmit sound (echolocation and vocalization) is vital for marine mammals to perform basic life functions. Marine mammals use sound to gather and understand information about their current environment, including detection of prey and predators. They also use sound to communicate with one another. The distances to which a sound travels through the water and remains audible depends on existing environmental conditions and propagation characteristics (e.g., sea floor topography, stratification, and ambient noise levels) and characteristics of the sound (SLs and frequency; (Richardson et al. 1995)). Impacts on marine mammals can vary among species based on their sensitivity to sound, life stage, orientation to the sound and depth in the water column, and their ability to hear different frequencies. The effects of sounds from HRG surveys could include either masking of natural sounds, behavioral disturbance, and hearing impairment (Richardson et al. 1995; Nowacek et al. 2007; Southall et al. 2007a). The level of impact on marine mammals will vary depending on species, the distance between the marine mammal and the activity, the intensity and duration of the activity, and environmental conditions affecting sound propagation.

7.1 Masking

Masking is the obscuring of sounds of interest by interfering sounds, generally at similar frequencies. Introduced underwater sound will, through masking, reduce the effective listening area and/or communication distance of a marine mammal species if the frequency of the source is close to that used as a signal by the marine mammal, and if the anthropogenic sound is present for a significant fraction of the time (Richardson et al. 1995; Clark et al. 2009; Jensen et al. 2009; Gervaise et al. 2012; Hatch et al. 2012; Rice et al. 2014; Erbe et al. 2016b; Tennessen and Parks 2016; Guan and Miner 2020). Conversely, if little or no overlap occurs between the introduced sound and the frequencies used by the species, communication is not expected to be disrupted. Also, if the introduced sound is present only infrequently, communication is not expected to be disrupted much, if at all. In addition to the frequency and duration of the masking sound, the strength, temporal pattern, and location of the introduced sound also play a role in the extent of the masking (Branstetter et al. 2013; Finneran and Branstetter 2013; Branstetter et al. 2016; Sills et al. 2017). Loss of listening area or communication space could impact foraging success or result in the inability to locate conspecifics. The biological repercussions of these

potential outcomes are largely unknown but given the operating frequencies and source levels of the HRG equipment, significant impacts from masking are not expected.

Some of the HRG survey equipment proposed for use during the site characterization surveys produces sounds with frequency ranges similar to those of marine mammal hearing and vocalizations and thus could result in masking of some biologically important sounds. The impulsive nature of these sounds, limited duration of the survey activities, and short distances over which they would be audible suggest that any masking experience by marine mammals would be highly localized and short term.

7.2 Behavioral Disturbance

Behavioral disturbance includes a variety of effects, ranging from subtle to conspicuous changes in behavior, movement, and respiration patterns as well as displacement (Southall et al. 2007a). In some cases, behavioral responses to sound may result in a reduction of the overall exposure to that sound (Finneran et al. 2015; Wensveen et al. 2015).

Detailed data on reactions of marine mammals to anthropogenic sounds are limited to relatively few species and situations (see reviews by (Richardson et al. 1995; Gordon et al. 2004; Nowacek et al. 2007; Southall et al. 2007a). Behavioral reactions of marine mammals to sound are difficult to predict in the absence of site- and context-specific data. Reactions to sound, if any, depend on species, state of maturity, experience, current activity, reproductive state, time of day, exposure level, spectral content and directionality of the sound, and many other factors (Richardson et al. 1995; Wartzok et al. 2004; Southall et al. 2007a; Weilgart 2007b; Ellison et al. 2012). If a marine mammal reacts to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the stock or population (New et al. 2013a). However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (Lusseau and Bejder 2007; Weilgart 2007a; New et al. 2013b; Nowacek et al. 2015; Forney et al. 2017).

Given the many uncertainties in predicting the quantity and types of impacts of sound on marine mammals, it is common practice to estimate how many animals would be present within a particular distance of human activities and/or exposed to a particular level of anthropogenic sound (see Section 6). In most cases, this approach likely overestimates the numbers of marine mammals that would be affected in some biologically important manner. One of the reasons for this is that the selected distances/isopleths are based on limited studies indicating that some animals exhibited short-term reactions at this distance or sound level, whereas the calculation assumes that all animals exposed to this level would react in a biologically significant manner.

The most likely behavioral change exhibited by marine mammals as a result of HRG survey activities would be displacement or moving away from the sound. Hastie et al. (2014) reported behavioral responses by gray seals to echosounders with frequencies of 200 and 375 kHz. Short-finned pilot whales increased their heading variance in response to an EK60 echosounder with a resonant frequency of 38 kHz (Quick et al. 2017), and significantly fewer beaked whale vocalizations were detected while an EK60 echosounder was active vs. passive (Cholewiak et al. 2017). It is presumed that displacement, if it were to occur, would be limited to the area surrounding the sound source that is ensonified to above the Level B thresholds of 160 dB SPL_{rms} for impulsive sounds, and would only last for the duration that the sound source is active, with animals resuming regular behavior once the sound source ceases.

7.3 Hearing Impairment

To experience any potential hearing impairment from HRG sources, marine mammals would have to occur in very close proximity (within 58 m for high-frequency cetaceans and less than 1 m for all other marine mammals, Table 6) to the survey equipment. This is because the relatively high frequency sounds produced by the survey equipment attenuate rapidly in water. With the implementation of planned monitoring and mitigation measures like pre-start watches and shutdown zones (Table 12), hearing impairment caused by HRG sources is extremely unlikely to occur.

8 Anticipated Impacts on Subsistence Uses

The Vineyard Northeast HRG Survey campaign will take place off the NE coast of the United States in the Atlantic Ocean. There are no traditional subsistence hunting areas in the region, and thus no subsistence uses of marine mammals are expected to be impacted by this action.

9 Anticipated Impacts on Habitat

The altered acoustic environment resulting from sounds produced during HRG survey activities would be short term, localized, and would not permanently alter marine mammal acoustic habitat.

Collection of vibracore, seabed CPT, and borehole samples during geotechnical surveys would disturb benthic habitat where samples are taken and could impact water quality via sediment resuspension and dispersion. These impacts would be short term and localized to the immediate vicinity around sample sites within a large area of similar habitat. Permanent impacts to marine mammal habitat are not anticipated.

10 Anticipated Effects of Habitat Impacts on Marine Mammals

The altered acoustic environment in the vicinity of HRG survey activities could result in masking of sounds important to marine mammals or displacement of individuals from a highly localized area around the survey activities. Masking would only occur within relatively short distances (e.g., maximum radial distance of 178 m) while survey activities are underway and thus would be temporary and localized to the vicinity of the survey activities. It is expected that any displacement of marine mammals from the survey area would also be temporary and localized. Displaced individuals would be able to access areas of similar habitat near the area impacted by the survey activity.

11 Mitigation Measures to Protect Marine Mammals and Their Habitat

Mitigation measures implemented during the HRG survey for sources operating at or below 180 kHz, specifically boomers, sparkers and CHIRP subbottom profilers, can decrease the potential impacts to marine mammals from sound exposure by reducing the ZOI and therefore the likelihood of sound exposure. Vineyard Northeast will comply with all applicable monitoring and mitigation regulations and any lease or permit conditions relevant to the survey campaign. Vineyard Northeast is proposing the mitigation measures, provided in the table below, to reduce the potential for negative impacts to marine mammals during survey acquisition; however, the final mitigation plan will be determined in consultation with NMFS. The selection of appropriate mitigation techniques will consider

safety, effectiveness for the Project, and practical application of individual measures, as well as all measures in-concert.

The estimated distances to the Level A and B thresholds (see Table 6 and 7) for the proposed HRG survey equipment are well within the proposed shutdown zones. Table 12 details the suite of planned monitoring activities and mitigation measures. While protection of marine mammals is a top priority, environmental and human health and safety is the very highest priority while working in the offshore environment; therefore, exceptions to mitigation may be made under certain circumstances.

Table 12. Monitoring and mitigation measures planned for the HRG survey activities.

Monitoring and mitigation measure	Description
Seasonal Restrictions[a]	▪ HRG survey activities will take place in the Cape Code Bay SMA and Off Race Point SMA (see Figure 1) only during the months of August and September to ensure sufficient buffer between the SMA restriction (January to May 15) and known seasonal occurrence of the NARW north and northeast of Cape Cod (fall, winter, and spring). ▪ The monitoring team will consult NOAA Fisheries North Atlantic right whale reporting systems for any observed right whales, and established SMAs, DMAs or Slow Zones throughout survey operations.
Clearance Zone	▪ Clearance zones (CZs) will be monitored around the center of the acoustic sources (CHIRP SBPs, boomers and sparkers) for marine mammals. ▪ CZs will be monitored for all listed species for 30 minutes to ensure that no marine mammals are present before any CHIRP SBPs, boomer or sparker sources are initiated. ▪ The following CZs will be implemented during operations of CHIRP SBPs, boomer or sparker sources: o 500 m (656 ft) for all listed species o 100 m (328 ft) for other marine mammals ▪ The CZ must be visible to the naked eye or using appropriate visual technology during the entire clearance period before commencing operations of CHIRP SBPs, boomers and sparkers. ▪ If any marine mammal is observed within the CZ during the 30-minute clearance period, ramp-up will not begin until the animal(s) is/are observed exiting the CZ, or until an additional time period has elapsed with no further sightings (i.e., 15 minutes for small odontocetes and 30 minutes for all other species).
Ramp-up for HRG sources	▪ Ramp-up will not be initiated during periods of inclement conditions or if the CZ cannot be adequately monitored by PSOs using appropriate visual technology for a 30 minute30-minute period. ▪ A ramp-up begins with the powering up of the smallest acoustic HRG equipment at its lowest power output. When technically feasible the power is then gradually turned up and other acoustic sources added such that the source level increases gradually. ▪ PSOs will stand-watch for a minimum of 30 minutes to ensure the CZs are clear of marine mammals prior to commencement of ramp-up procedures. If a marine mammal is observed, ramp-up may not begin until the marine mammal has exitedexited the CZ or until the following additional time periods have elapsed with no further sightings: – 30 minutes for NARW and other non-delphinid cetaceans; and ▪ 15 minutes for delphinid cetaceans and pinnipeds.
Shutdown zone	▪ Shutdown zones (SZs) will be monitored around the center of the sources for marine mammals. ▪ The following SZs will be implemented during all HRG survey activities: – 500 m (656 ft) for North Atlantic right whales; – 100 m (328 ft) for all other marine mammal species; and – No SZ for certain delphinids.
Shutdowns	▪ An immediate shut down of HRG survey equipment specified in the IHA permit will be required if a marine mammal is detected at or within its respective SZ. ▪ The vessel operator must comply immediately with any call for shutdown by the PSO. ▪ Any disagreement between the PSO and vessel operator should be discussed only after shutdown has occurred.

Monitoring and mitigation measure	Description
	▪ HRG survey equipment may be allowed to continue operating if dolphins voluntarily approach the vessel (e.g., to bow ride) when the sound sources are at full operating power. ▪ If a species approaches or enters the Level B harassment zone, shutdowns will occur if a marine mammal authorization has not been granted, or, an authorized species' takes have already been met. ▪ If HRG survey equipment is shutdown longer than 30 minutes while PSOs have been monitoring, clearance followed by ramp-up activities will commence. ▪ If another marine mammal enters a SZ during the shutdown period, the HRG equipment may not restart until that animal is confirmed outside the respective exclusion or until the appropriate time has passed from the last sighting of the marine mammal. ▪ After shutdown, ramp-up can be initiated once the SZ are visually clear for the respective clearance timing. ▪ Shutdown is not required for small delphinids from genera *Delphinus, Lagenorhynchus, Stenella*, and *Tursiops* that are detected voluntarily approaching the vessel or towed equipment. ▪ If a PSO is unsure about the identification of a small delphinid, PSOs must use their professional judgement to decide as to whether shutdown should occur.
Pauses in HRG sources	▪ If the acoustic source is shut down for reasons other than mitigation (e.g., mechanical difficulty) for less than 30 minutes, it may be re-activated again without ramp-up only if PSOs have maintained constant observation and no detections of any marine mammal have occurred within the respective SZ. ▪ Any shutdown exceeding 30 minutes must be followed by full ramp-up procedures.
Protected Species Observers (PSOs)	▪ Visual monitoring within the established SZ will be performed by NMFS- approved PSOs. ▪ With prior approval from NMFS, Non-third-party observers may be used on a case-by-case basis (such as when vessel capacity is limited in shallow waters) for limited, specific duties in support of approved, independent PSOs. ▪ One PSO per shift will maintain watch during daylight hours when the sources are active. ▪ HRG survey activities with CHIRP SBPs, boomers, or sparkers operating at <180 kHz will have two PSOs monitoring at night and during periods of poor visibility. ▪ PSOs will be responsible for visually monitoring and identifying marine mammals approaching or entering the established zones during HRG survey activities. – It will be the responsibility of the lead PSO on duty to communicate the presence of marine mammals as well as to communicate and enforce the action(s) that are necessary to ensure mitigation and monitoring requirements are implemented as appropriate. – PSOs will be equipped with reticule binoculars and other suitable equipment observer to adequately perceive and monitor protected marine species and to estimate distances to marine mammals within the SZ. ▪ PSOs will use the most appropriate available technology (e.g., night vision technology and IR cameras) during nighttime surveys when the sources operating at <180 kHz are active. ▪ PSOs may not perform any other duty while on watch. ▪ PSO will coordinate to ensure 360-degree visual coverage around the vessel from an appropriate vantage point without interfering with navigation or operation of the vessel. ▪ A shift schedule for PSOs that may not exceed four consecutive watch hours; must have a minimum two-hour break between watches; and may not exceed combined watch schedule of more than 12 hours in a 24-hour period. ▪ PSOs will record all sightings and positions of marine mammals. Position data will be recorded using a hand-held or vessel GPS system ▪ Prior to initiation of survey work, all crew members will undergo environmental training, a component of which will focus on the procedures for sighting and protection of marine mammals.

Monitoring and mitigation measure	Description
Vessel strike avoidance	▪ All vessel operators and crews will maintain a vigilant watch for marine mammals at all times, and slow down or stop their vessel to avoid striking protected species, except under extraordinary circumstances when complying with this requirement would jeopardize the safety of the vessel or crew. ▪ Monitoring for vessel strike avoidance zone may be performed by PSOs or crew members, however, any crew members responsible for monitoring will be trained to broadly identify protected species and marine mammals, such as the North Atlantic right whale or other whale species. ▪ The likelihood of encountering ESA-listed species is very low in the shallow water areas where non-third-party trained PSOs (vessel crew) would also serve as vessel strike avoidance observers. ▪ All vessel operators will reduce vessel speed to 10 knots (5.1 m/s) or less when mother/calf pairs, pods, or larger assemblages of marine mammals are observed near an underway vessel. ▪ All vessel operators will comply with 10 knots (5.1 m/s) speed restrictions in any DMA. ▪ Vineyard Northeast will monitor NMFS NARW reporting systems from November 1st through July 31th and whenever a DMA is established within any areas vessels operate. ▪ When marine mammals are sighted while a vessel is underway, the vessel shall take action to avoid violating the relevant separation distance (e.g., attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area, reduce speed and shift the engine to neutral). This does not apply to any vessel towing gear or any vessel that is navigationally constrained. **North Atlantic right whales and ESA-listed marine mammals:** ▪ Vineyard Northeast will ensure all vessels maintain a separation distance of 500 m (1,640 ft) or greater from any sighted NARW and other ESA-listed marine mammals. ▪ Vineyard Northeast will ensure that the following avoidance measures are taken if a vessel comes within 500 m (1,640 ft) of any NARW. – If underway, any vessel will steer a course away from any NARW at 10 knots (5.1 m/s) or less until the 500 m (1,640 ft) minimum separation distance has been established, unless: – If a NARW is sighted within 100 m (328 ft) to an underway vessel, the vessel operator must immediately reduce speed and promptly shift the engine to neutral. The vessel operator must not engage the engines until the NARW has moved beyond 100 m (328 ft), at which point the vessel will steer a course away from any NARW at 10 knots (5.1 m/s) or less until the 500 m (1,640 ft) minimum separation distance has been established. – If a vessel is stationary, the vessel will not engage engines until the NARW has moved beyond 100 m (328 ft), at which point the vessel will steer a course away from any NARW at 10 knots (5.1 m/s) or less until the 500 m (1,640 ft) minimum separation distance has been established. **Non-ESA-listed whales:** ▪ Vineyard Northeast will ensure that all vessels maintain a separation distance of 100 m (328 ft) or greater from any sighted non-delphinid cetacean. ▪ The following avoidance measures are taken if a vessel comes within 100 m (328 ft) of any non-delphinid cetacean: – If underway, the vessel must reduce speed and shift the engine to neutral and must not engage the engines until the whale has moved beyond 100 m (328 ft). – If stationary, the vessel must not engage engines until the whale has moved beyond 100 m (328 ft). **Delphinid cetaceans and pinnipeds:** ▪ Vineyard Northeast will ensure that: – All vessel underway will not divert to approach any cetaceans or seals. – When feasible, all vessels will maintain a separation distance of 50 m (164 ft) or greater from any sighted delphinid cetacean.

Monitoring and mitigation measure	Description
	– All vessels underway will remain parallel to a sighted delphinid cetacean's or pinniped's course whenever possible and avoid excessive speed or sudden changes in direction. If a delphinid(s) is visually detected approaching the vessel or towed survey equipment (e.g. to bow ride), the PSOs and crew will use professional judgement in making course and/or speed adjustments – All vessels underway reduce vessel speed to 10 knots or less when pods (including mother/calf pairs) or large assemblages of delphinid cetaceans are observed. ▪ If a whale is observed that cannot be confirmed to species, the vessel operator must assume that it is an ESA-listed species and take appropriate action. ▪ The requirements listed in this section do not apply if compliance would create imminent and serious threat to a person or vessel.
Reporting	▪ Vineyard Northeast will report sightings of injured or dead marine mammals to NMFS, including the NMFS Northeast Region's Stranding Hotline (866-755-6622 or current), within 24 hours of sighting, regardless of whether the injury/death was caused by the vessel. As requested by NMFS, if the survey vessel was responsible for the injury or death, Vineyard Northeast will ensure that the vessel assists with any salvage effort.

[a] This restriction minimizes the amount of HRG survey activity that occurs when NARW is likely to be in the HRG survey area and thus limits sound exposure for this species. Roberts et al. (2020) Density data and survey data (both visual and acoustic) from Kraus et al. (2016) suggest that the highest density of NARWs in the WEA occurs annually in March. Over 93% of the sightings in the Kraus et al. (2016) study occurred from January through April, with no NARWs sighted from May through August

12 Mitigation Measures to Protect Subsistence Uses

Not applicable. The proposed HRG survey will be located off the US northeast coast in the Atlantic Ocean, and no activities will take place in or near a traditional Arctic subsistence hunting area. Therefore, there are no relevant subsistence uses of marine mammals implicated by this action.

13 Monitoring and Reporting

Planned monitoring activities are described in Section 11 along with the associated mitigation measures. A marine mammal sighting and detection report will be provided to NMFS as required by authorization stipulations.

Reporting NARW Sightings. Sightings of any NARW will be reported to the Right Whale Sightings Advisory System (RWSAS) as soon as it is practical to do so.

Reporting Injured or Dead Species. Vineyard Northeast will ensure that sightings of any injured or dead marine mammals are reported to NMFS and the Greater Atlantic (Northeast) Region Marine Mammal and Sea Turtle Stranding and Entanglement Hotline (866-755-NOAA [6622] or current) within 24 hours of a sighting, regardless of whether the injury or death is caused by a Project vessel. In addition, if the injury or death was caused by a collision with a survey-related vessel, the notification will include the date and location (latitude/longitude) of the strike, the name of the vessel involved, and the species identification or a description of the animal, if possible.

Report of Activities and Observations. Vineyard Northeast will provide NMFS with a report within 90 calendar days following the completion of survey activities, including a summary of the survey activities and an estimate of the number of marine mammals taken during these survey activities.

Report Information. Data on all protected-species observations will be recorded using accepted standards of marine mammal data collection by PSOs. The information will include dates, times, and locations of survey operations; time of operation; location and weather; details of marine mammal sightings (e.g., species, numbers, behavior); and details of any observed take (e.g., behavioral disturbances or injury/mortality).

14 Suggested Means of Coordination

In addition to the monitoring and reporting measures discussed in this application and as described in Section 11 and 13, marine species sightings data that is collected during all HRG survey activities by Vineyard Northeast PSO monitors will be shared with NOAA Fisheries, thereby contributing to the knowledge on these protected species, which may provide insights for future projects.

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APPENDIX A: