



MAYFLOWER WIND

## Appendix O. Marine Mammal and Sea Turtle Monitoring and Mitigation Plan

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# Final Marine Mammal and Sea Turtle Monitoring and Mitigation Plan

Prepared By



4103 S. Texas Ave., Suite 11  
Bryan, TX 77802

Submitted To



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## Acronyms and Abbreviations

APSO(s)	Acoustic Protected Species Observer(s)
BOEM	Bureau of Ocean Energy Management
COP	Construction and Operations Plan
cSEL	Cumulative Sound Exposure Level
CTV	Crew Transfer Vessel
DMA	Dynamic Management Area
EIS	Environmental Impact Statement
ESA	Endangered Species Act
IHA	Incidental Harassment Authorization
ITA	Incidental Take Authorization
km	kilometer
kts	knots
Lease Area	Lease OCS-A 0521
m	meter
Mayflower Wind	Mayflower Wind Energy LLC
MMP	Monitoring and Mitigation Plan
MMPA	Marine Mammal Protection Act
NARW	North Atlantic Right Whale
nm	nautical mile
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
O&M	Operation and Maintenance
OCS	Outer Continental Shelf
OSP	Offshore Substation Platform
PAM	Passive Acoustic Monitoring
PSO(s)	Protected Species Observer(s)
SMA	Seasonal Management Area
SSV	Sound Source Verification
WTG	Wind Turbine Generator

## **1. Introduction**

Mayflower Wind Energy LLC (Mayflower Wind) proposes an offshore wind renewable energy generation project (the Project) located in federal waters off the southern coast of Massachusetts in the Outer Continental Shelf (OCS) Lease Area OCS-A 0521 (Lease Area). The proposed Project will deliver electricity to the regionally administered transmission system via export cables with landing location(s) in Falmouth, Massachusetts and Brayton Point in Somerset, Massachusetts.

This Monitoring and Mitigation Plan (MMP) addresses Mayflower Wind's construction activities within the Lease Area and the associated Project offshore export cable corridors; herein the combined referred to as the Project Area. The vessel strike avoidance measures will also apply to Project vessels transiting between ports and the Project Area, as required by the lease. The MMP has been designed to reduce potential effects to marine mammals and sea turtles and ensure compliance with relevant permits and authorizations. Data collected during implementation of the plan will fulfill reporting obligations to the National Marine Fisheries Service (NMFS) and the Bureau of Ocean Energy Management (BOEM) and provide additional data for future operations planning.

Visual and acoustic monitoring will be conducted by Protected Species Observers (PSOs) and Acoustic Protected Species Observers (APSOs) aboard construction and/or support vessels. PSOs/APSOs will observe for and record the numbers and species of marine mammals and sea turtles present in the area and any observable reactions to the construction activities. Data collected by the observers during periods with and without pile driving activity will provide information on the numbers of marine mammal and sea turtles potentially affected and will facilitate real-time mitigation to prevent or reduce potential effects. When necessary, PSOs/APSOs will call for the implementation of mitigation measures as required by permits and authorizations issued to Mayflower Wind.

## **2. Summary of Construction and Operations and Maintenance Activities**

The Lease Area is located offshore of the southern coast of Massachusetts, approximately 26 nautical miles (nm) (49 kilometers (km)) south of Martha's Vineyard and 20 nm (37 km) south of Nantucket. Up to 147 wind turbine generators (WTGs) and five offshore substation platforms OSP(s) along with inter-array cables connecting the WTGs and OSP(s) will be installed within the Lease Area. WTG and OSP substructures may include monopiles, suction-bucket jackets, piled jackets, or gravity-based substructures. Operation and maintenance activities will occur thereafter to generate renewable power in a safe and environmentally protective manner, update equipment with new technologies, and maintain WTG reliability.

Sound produced by impact pile driving during construction has the potential to cause effects to marine mammals and sea turtles. For purposes of modeling underwater sound and assessing potential effects, both "realistic" and "maximum" scenarios were developed (Construction and Operations Plan [COP] Appendix U2, Underwater Acoustic Modeling of Construction Sound and Animal Exposure Estimation). Additionally, sound source modelling used hypothetical broadband attenuation levels of 6, 10, and 15 decibels for impact pile driving. The realistic scenario included the installation of 11 meter (m) diameter monopiles or 3-legged jacket foundations with 2.9-m pin piles for WTGs and 4-legged jacket foundations with 4.5-m diameter pin piles for OSP(s). The maximum scenario assumed installation of 16-m diameter monopiles for WTGs and jacket foundations with up to four, 4.5-m pin piles for WTGs and/or OSP(s). Acoustic modeling assumed the installation of either one (1) monopile per day or one (1)

piled jacket per day. The amount of sound generated during impact pile driving varies by the amount of energy required to drive the piles to the desired depth, such as pile and hammer size, penetration depth, and substrate composition. Pile penetration for the modeled scenarios include 60 m for the jacket foundations and 35 m for the monopile foundation. See COP Appendix U2, Underwater Acoustic Modeling of Construction Sound and Animal Exposure Estimation for further details on the underwater acoustic modeling scenarios and results.

Construction activities will likely be based out of more than one marshalling port; a long-term lease will be established with a port facility. Mayflower Wind's preference is to use a Massachusetts-based port for operation and maintenance (O&M) operations which could be a long-term lease of one of the marshalling ports. See COP Section 3.3.13, Port Facilities for additional details regarding ports under consideration. A variety of vessel types will be used throughout the duration of the Project. The construction phase of the Project will include cable laying, heavy lift vessel, and crew transfer vessels (CTVs), among others (See COP Section 3.3.14 – Vessels, Vehicle and Aircraft). During the operations phase, CTVs, research/survey vessels, and supply ships will be used most frequently. The majority of trips made during the construction phase will be by CTVs and barge and tug vessels. During the O&M phase, the majority of trips will be made by CTVs, with occasional use of larger supply vessels for maintenance tasks.

During construction it is expected that multiple vessels may operate at the same time with some vessels maintaining their position using Dynamic Positioning thrusters. During operations, fewer vessels will be active on the Project and there will be much less time with multiple vessels operating in close proximity to each other. Anthropogenic sounds from vessel traffic associated with the Project are likely to be similar in frequency characteristics and sound levels to existing commercial traffic in the region. This means marine mammals and sea turtles present in the area are likely to already be habituated to the associated underwater noise from vessel traffic. Vessel strike mortalities are quantified by NMFS as part of annual marine mammal stock assessments and vessel strike was identified as a key impact factor by BOEM in their programmatic Environmental Impact Statement (EIS) (BOEM, 2014). However, vessel strikes of marine life are a concern and monitoring and mitigation measures to reduce potential harmful interactions have been included in this plan.

The following sections provide more detailed information about the monitoring and mitigation measures that are a fundamental part of the planned Project activities. The measures are also summarized in Table 1 at the end of this document.

### **3. PSO and Acoustic PSO Training, Experience & Responsibilities**

#### ***3.1 Observer Qualifications and Training***

Mayflower Wind will contract qualified, trained PSOs to conduct marine mammal monitoring during pile driving activity for the Project. All PSOs and APSOs will have met NMFS and BOEM training and experience requirements as stipulated in the Mayflower Wind lease. If required by NMFS, PSO/APSO curriculum vitae will be submitted 7 days prior to the first day of pile driving activities.

A single PSO or APSO will be designated as the lead observer. The individual designated for this role will have prior experience conducting marine mammal monitoring. Construction supervisors and relevant personnel will meet with the PSO/APSO team prior to the start of pile driving activities to review

mitigation measures, communication protocols, and how implementation will be carried out. This material will be reviewed again when new personnel join the relevant personnel teams.

### ***3.2 Responsibilities and Authorities of Protected Species Observers***

PSO duties will include watching for and identifying marine mammals; recording their numbers, distances, and reactions to the installation vessels, support vessels, and pile driving activity, and documenting exposure to sound levels that may constitute harassment as defined by NMFS. While on duty, PSOs will not have any further responsibilities.

Any PSO/APSO on duty will have the authority to call for appropriate mitigation actions based on their observations or acoustic detections including delays to the start of operations or stoppages of ongoing operations, where and when feasible. To ensure that calls for the implementation of mitigation measures are conveyed without delay, a clear line and method of communication between the PSOs/APSOs and personnel responsible for pile driving or vessel operations will be established and maintained.

## **4. Visual Monitoring**

PSOs will be stationed aboard the construction and/or support vessels to conduct visual monitoring around pile driving activities. Observations will be used to implement mitigation measures and provide an estimate of potential effects to marine mammals and sea turtles.

### ***4.1 Number of PSOs***

PSOs will be stationed aboard the installation and/or nearby support vessels to meet the following criteria:

- At least two (2) PSOs on duty to monitor the clearance zones and nearby areas during all pre-clearance periods and active pile driving;
- At least one (1) PSO on duty during all other daylight periods to monitor the clearance zones and nearby areas;
- A maximum of four (4) consecutive hours on watch per PSO; and
- A maximum of 12 hours of watch time per 24-hour period per PSO.

The actual number of PSOs and the vessels on which they are stationed will be determined through the issuance of the Incidental Harassment Authorization (IHA).

### ***4.2 Visual Monitoring Methods***

PSOs will conduct observations from the best available safe vantage point on the construction or nearby support vessel to ensure visibility of the clearance zones. The observers will scan systematically with the unaided eye, standard handheld (7x) and/or high magnification (25x) binoculars to search continuously for marine mammals during all observation periods. Observers may also use a laser rangefinder or clinometer to test and improve their abilities for visually estimating distances to objects in the water. When a marine mammal or sea turtle is observed, PSOs will record all relevant information, regardless of the distance from the construction activity.



When a detection is made, the following information will be recorded:

- Species identification of the animal(s) (e.g., genus/species, lowest possible taxonomic level, or unidentified) - or the species composition of the group if it is a mixed-species group;
- If the animal(s) is not able to be identified to the species level, a description including as many distinguishing features as possible including length, shape, color, pattern, scars or makings, shape and size of dorsal fin, shape of head, and blow characteristics;
- Pace of the animal(s);
- Estimated number of animals (high/low/best);
- Estimated number of animals by cohort (adults, yearlings, juveniles, calves, group composition, etc.);
- Animal's closest point of approach and/or closest distance from the center point of the pile;
- Water depth;
- Time of sighting;
- Construction activity at time of sighting (e.g., ramp-up, active pile driving, delay, etc.);
- Description of any mitigation actions requested in response to the sighting (e.g., delay, shutdown, etc.) and time of any mitigation actions implemented;
- Watch status (sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform); and
- PSO who sighted the animal.

PSOs will also record the following information about construction activities and environmental conditions at the start and end of each observation watch, every 30 minutes during a watch, or whenever there is a substantial change in any of the variables being recorded:

- Ship's position;
- Speed of the vessel;
- Water depth;
- Sea state;
- Visibility distance;
- Sun glare; or
- Construction Activity status (pile setting, soft-start, piling, transiting, etc.).

As described further below, when a marine mammal is seen within or about to enter the clearance zone applicable to that species, the pile installation crew will be notified immediately so that the appropriate mitigation measured can be implemented.

Distances to observed animals will be estimated with binoculars containing a reticle to measure the vertical angle of the line of sight to the animal relative to the horizon.

#### ***4.3 Visual Monitoring at Night***

The PSOs on duty will monitor for marine mammals and other protected species using night-vision goggles with thermal clip-ons and a hand-held spotlight (one set plus a back-up set), such that PSOs can focus observations in any direction.

#### **4.4 Visual Monitoring During Vessel Transit**

A dedicated observer or vessel crew member(s) who has undergone vessel strike avoidance training will observe for marine mammals and sea turtles when vessels travel over 10 knots (kts) while moving within or between the Project Area and port(s). Observers will request changes to vessel operations to maintain minimum approach distances and avoid vessel strikes. Additional information is provided below in the *Vessel Strike Avoidance* section.

Vessels travelling within any NMFS designated Seasonal Management Area (SMA) or Dynamic Management Area (DMA)<sup>1</sup> will maintain observations by at least one PSO or trained vessel crew even when traveling below 10 kts in accordance with the SMA or DMA guidelines.

## **5. Acoustic Monitoring**

### **5.1 Number of APSOs**

APSOs conducting acoustic monitoring are required to complete specialized training specific to operations of Passive Acoustic Monitoring (PAM) systems. A sufficient number of APSOs will monitor the PAM system to meet the following criteria:

- At least one (1) APSO on duty during all pre-clearance periods and active pile driving;
- A maximum of four (4) consecutive hours on watch per APSO; and
- A maximum of 12 hours of watch time per 24-hour period per APSO.

### **5.2 Passive Acoustic Monitoring Methods**

Mayflower Wind will use a real-time PAM system to supplement visual monitoring during construction, or alternative as required by the IHA. The use of PAM (or alternative) will supplement visual observations during pre-clearance and pile driving periods and allow initiation of pile driving when visual PSOs cannot observe the entire clearance zone due to poor visibility, including darkness. The specifics of the PAM system will be determined in consultation with NMFS during the Marine Mammal Protection Act (MMPA) Incidental Take Authorization (ITA) process. The system will be designed to detect vocalizations from all marine mammals potentially present in the region, including low-frequency cetaceans like the North Atlantic right whale (NARW) and fin whale.

Any detection of a marine mammal made by APSOs will be communicated to visual PSOs including identification of the species or species group, distance, and bearing of the marine mammal.

If a marine mammal is detected by the PAM system, the following information will be recorded, where possible:

- An acoustic encounter identification number;
- The visual sighting identification number if the acoustic detection was linked with a visual sighting;
- Date and time when first and last heard;

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<sup>1</sup> DMAs may also be established by National Oceanic and Atmospheric Administration (NOAA) Fisheries based on visual sightings documenting the presence of three or more right whales within a discrete area. NOAA Fisheries announces DMAs through the Slow Zone program including announcements to mariners through its customary maritime communication media.

- Types and nature of sounds heard (e.g., clicks, whistles, creaks, burst pulses, continuous, sporadic, strength of signal, etc.);
- Species or taxonomic group;
- Spectrogram screenshot;
- Bearing of the animal to the vessel;
- Distance to the animal; and
- Any additional information recorded such as water depth and functional status of the hydrophone array.

### 5.3 Sound Source Verification

Sound source verification (SSV) involves the measurement of underwater sounds produced by pile driving at various distances from the piles. A detailed SSV plan will be developed during the MMPA ITA application process. The plan will likely include measurement of the largest of each pile type (monopiles and/or jacket piles) to be installed. It may also include measurement of one or more piles without the use of a noise attenuation system in order to quantify the effectiveness of the system(s). Measurement results will be used to empirically determine and modify, if necessary, distances to threshold criteria used for mitigation purposes (e.g. MMPA Level A and Level B thresholds) and estimation of effects in a post-construction monitoring report.

## 6. Clearance Zones

To assess and prevent potential auditory injury to marine mammals (MMPA Level A harassment), NMFS has issued technical guidance (NMFS 2018) that establishes dual criteria ( $L_{p,0-pk,flat}$  “peak” and  $L_{E,p,weighted,24h}$  cumulative sound exposure level or “cSEL”) for five different marine mammal hearing groups, four of which occur in the Lease Area. Scientific recommendations for revisions to these classifications were published by Southall et al. (2019) but have not yet been incorporated into the NMFS guidelines. Distances to the NMFS (2018) criteria are typically used to define “clearance zones” to avoid Level A takes of marine mammals from anthropogenic sound sources. Similarly, Finneran et al. (2017) presented threshold criteria including potential auditory injury to sea turtles.

Acoustic modeling (COP Appendix U2, Underwater Acoustic Modeling of Construction Sound and Animal Exposure Estimation) was conducted to determine distances from the center of the pile to NMFS Level A harassment thresholds (both peak and cSEL) and sea turtle injury thresholds for installation for realistic and maximum scenarios. The largest distances were estimated for low-frequency cetaceans based on the cSEL criterion. The calculation of distances to cSEL criteria assumes that an individual marine mammal would remain within that distance for the entire duration of pile driving during a 24-hour period. Most marine mammals, including mysticete whales in the low-frequency hearing category, tend to avoid anthropogenic sounds at high levels and areas of heavy vessel traffic (Miller et al. 2005; Southall et al. 2007; McDonald et al. 2012; Culloch et al. 2016). Thus, it is very unlikely that an individual mysticete whale would remain within those distances throughout the duration of the pile(s) being driven. Because of the low probability of a long-term exposure event and for practical implementation reasons, we anticipate the Clearance Zones will be similar to those listed below, with the final distances to be determined during the MMPA ITA application process:

- North Atlantic Right Whale: 1 km;

- Mysticete whales (low-frequency cetaceans): 0.5 km;
- Harbor porpoise (high-frequency cetaceans): 0.12 km;
- All other marine mammals (mid-frequency cetaceans and pinnipeds): 0.05 km; and
- Sea Turtles: 0.05 km.

## **7. Pre-start Clearance**

PSOs and APSOs will monitor for marine mammals and sea turtles for a minimum of 30 minutes prior to the beginning of each pile driving event and continue at all times during pile driving. If a marine mammal or sea turtle is observed either visually or acoustically within or about to enter the applicable clearance zone during this pre-start period, pile driving will not begin until the animal(s) is confirmed to have exited the relevant clearance zone, or until an additional time period has elapsed with no further sightings of the animal. The additional time period will be 15 minutes for odontocetes and pinnipeds, and 30 minutes for mysticetes and sea turtles. Acoustic detections made by APSOs will be immediately communicated to visual PSOs so that visual confirmation of the location of the animal(s) can be attempted. Acoustic detections that are not able to be localized using the PAM system or by visual observers will be treated as occurring within the clearance zone if the APSO determines in their best professional judgement that the animal(s) is likely within the clearance zone based on signal strength and characteristics or other information available through the PAM system.

## **8. Soft-start**

Soft-start measures are intended to allow for a gradual increase in sound levels before the full pile driving hammer energy is reached. This provides a “warning” to marine mammals and sea turtles in the area and allows time for them to move away, avoiding any potential injury or impairment of their hearing abilities. Soft-start measures will be used at the beginning of each pile driving event, to the extent practicable, or any time pile driving has stopped for longer than 30 minutes.

If a marine mammal is detected within or about to enter the clearance zone (either visually or acoustically) during the soft-start procedure, pile driving will be delayed unless it is determined by the lead installation engineer that doing so would jeopardize the installation outcome or risk human or vessel safety. The duration of a delay in the soft-start procedure would be determined using the same procedure described above for detections within the clearance zone occurring during the pre-start clearance period.

## **9. Shutdowns**

A shutdown is the immediate cessation of active pile driving operations. If a marine mammal or sea turtle is detected within or about to enter the applicable clearance zone for that species, PSOs or APSOs will request a shutdown of pile driving. This shutdown would stop pile driving if the lead installation engineer determines that doing so would not jeopardize the installation outcome or risk human or vessel safety. It is possible that at certain times during installation, depending on the state of the individual pile driving equipment and process, that a complete shutdown could risk human or vessel safety or irreversibly jeopardize the installation process resulting in an unusable foundation not installed to the

target penetration depth. If a shutdown is not feasible, a reduction in the hammer energy of the greatest extent possible will be assessed and implemented.

After a shutdown has been completed, pile driving will restart using the same procedure described above for detections within the clearance zone occurring during the pre-start clearance period.

## 10. Potential Additional Measures to Protect North Atlantic Right Whales

By concentrating construction activities when NARW are less likely to be present within the region (including the Lease Area), the amount of activity to occur when more NARW are likely to be present can be reduced, thereby reducing the total potential impacts to NARW. To accomplish this, Mayflower Wind will propose additional monitoring and mitigation measures to support the start (or continuation) of pile driving at night or in poor visibility conditions during the period when NARW are less likely to be present.

The most recent monthly predictions of NARW presence in U.S. waters (Roberts et al. 2020) show that during the months of July through October, on average less than one (1) NARW is likely to be present within 50 km of the Lease Area (Figure 1). During June and November, approximately three (3) and nine (9) individuals, respectively, are predicted to be present within that same distance. At other times of the year (December through May), the Roberts et al. (2020) model predicts an average of 29 to 87 NARW may be present within 50 km of the Lease Area. Thus, the fewest NARW are likely to be present during the period from June through November.

In order to concentrate construction activities during the June through November period, the initiation and/or continuation of pile driving during darkness or periods of reduced visibility would be supported by additional monitoring and mitigation measures designed to confirm species presence is in line with seasonal predictions. Specific monitoring tools and plans will be developed as a part of the MMPA ITA process, but may include the use of advanced infrared systems, real-time PAM, autonomous underwater vehicles, autonomous aerial vehicles, or other advanced technologies.

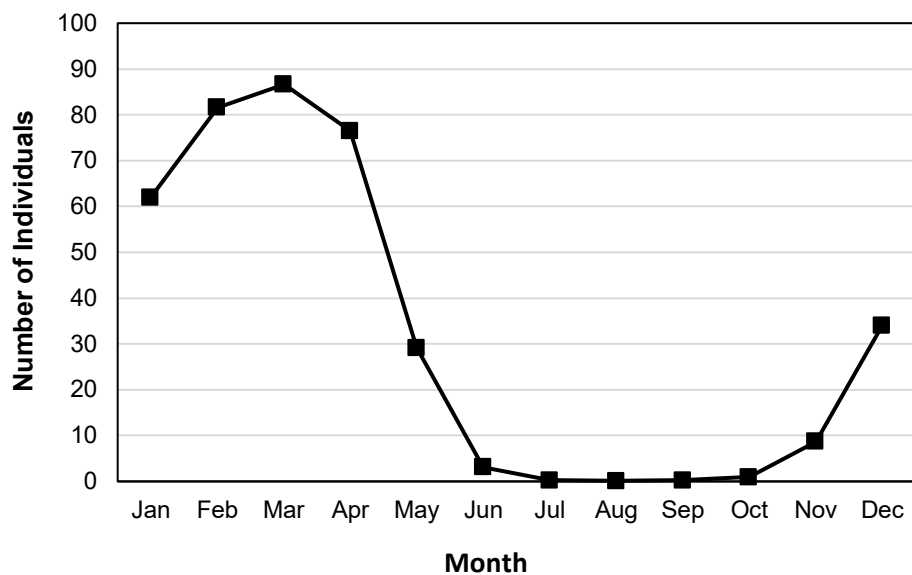


Figure 1. Monthly mean number of individual North Atlantic right whales predicted to be present within 50 km of the Lease Area based on Roberts et al. (2020) data.

## 11. Vessel Strike Avoidance

Vessels working in the Project Area and during transit to and from local ports will follow the vessel strike avoidance measures outlined below. The measures are based on those present in BOEM commercial lease OCS-A 0521 for vessels conducting activities in support of Site Assessment Plan and COP submittal. Exceptions to these measures will apply in cases where following these requirements would put the safety of the vessel or crew at risk. Construction and operations activities will involve the use of CTVs to safely and efficiently move personnel to/from and within the Project Area. To accomplish this in a practical and efficient manner, CTVs will at times need to travel at speeds >10 kts, as noted below.

A visual observer aboard each vessel will be responsible for monitoring the vessel strike avoidance zone around the vessel with species and season specific avoidance distances specified below. Visual observers may be third-party observers, such as certified PSOs, or trained crew members. Crew members will be trained to identify marine mammals and discern NARW from other large whales and to implement the necessary avoidance measures and reporting requirements described below. Reference materials will be available aboard all Project vessels for the identification of sea turtles and marine mammals. The expectation and process for reporting sightings to the designated vessel contact (such as the PSO, trained vessel crew, or the vessel captain) will be clearly communicated and posted in highly visible locations aboard the vessel.

Vessel strike avoidance measures will include:

- Maintaining a vigilant watch for all marine mammals and changing course, slowing down or stopping vessels to avoid striking protected species;
- Reducing the speed of all vessels, except CTVs, to  $\leq 10$  kts between November 1 through May 30;
- From November 1 through May 30, CTVs may travel at over 10 kts. However, if a NARW is detected via visual observation within or approaching the transit route, all CTVs will travel at 10 kts or less for the remainder of that day;
- Monitoring the NMFS North Atlantic Right Whale reporting systems from November 1 through May 30 and whenever a DMA is established in the operational area;
- Operating vessels, except CTVs, will travel at speeds  $\leq 10$  kts in any DMA;
- Reducing vessel speeds to  $\leq 10$  kts when mother/calf pairs, pods, or large assemblages of marine mammals are observed;
- Complying with speed restrictions in NARW management areas including SMAs and DMAs, except as noted above for CTVs
- Maintaining >500 m distance from any sighted NARW or an unidentified large marine mammal. If the vessel comes within 500 m of a NARW:
  - If underway, any vessel will steer a course away from any NARW at 10 kts or less until the 500 m minimum separation distance has been established.
  - If a NARW comes within 100 m, then the vessel will reduce speed and shift the engines into neutral, if safe to do so. The vessel will not engage engines until the NARW has moved beyond 100 m in which case any vessel will steer a course

away from the animal at 10 kts or less until the 500 m minimum separation distance has been established.

- If the vessel is stationary, the vessel will not engage engines until the NARW has moved beyond 100 m in which case any vessel will steer a course away from the animal at 10 kts or less until the 500 m minimum separation distance has been established.
- Maintaining >100 m from all Endangered Species Act (ESA)-listed whales or humpback whales. If the vessel comes within 100 m of a whale:
  - If underway, the vessel must attempt to remain parallel to the animal's course, reduce speed and shift the engine to neutral, and must not engage the engines until the whale (e.g., large whale and/or ESA-listed whales besides NARW) has moved beyond 100 m.
  - If stationary, the vessel must not engage engines until the whale has moved beyond 100 m.
- If underway, vessels must not divert to approach any small cetacean, seal, sea turtle, or giant manta ray;
- Maintaining >50 m from all other marine mammals, with the exception of delphinids and pinnipeds that approach the vessel, in which case the vessel operator must avoid excessive speed or abrupt changes in direction; and
- Report sightings of all dead or injured marine mammals or sea turtles within 24 hours.

## **12. Reporting**

A final technical report will be submitted to NMFS within 90 days following the expiration of the IHA. The report will include reporting requirements established by NMFS in the IHA, such as a summary of the observation effort and sightings made, estimates of the number of marine mammals that may have been taken during the activity, and descriptions of any mitigation measures taken. Reporting of mitigation measures will include a description of any pile driving delays or shutdowns requested by observers as well as the documentation prepared by the lead engineer if a shutdown was not possible due to safety concerns or risks to the installation outcome. Additionally, the methods and results of acoustic monitoring, including the SSV measurements and real-time PAM, will be included in the report. Once received by NMFS, any questions or comments will be provided to Mayflower Wind within 30 days. The report is considered final if no comments are received from NMFS within 30 days.

## **13. Reporting of Dead or Injured Marine Mammals**

Reporting of dead or injured marine mammals observed during construction activities, and actions taken immediately after an observation, will vary depending on the likely cause of the incident.

In the event that a marine mammal is taken in a prohibited manner by construction activities, that activity will be stopped immediately. Such takes include an injury, serious injury or mortality. Once the activity(s) are shut down, the incident will be reported to both the NMFS Office of Protected Resources and the NMFS New England Stranding Network Coordinator in accordance with the IHA. The report will include:

- Time, date, and location (latitude and longitude) of the incident;
- Description of the incident;
- Status of all sound sources used in the 24 hours preceding the incident;
- Environmental conditions (e.g., wind speed and direction, sea state, cloud cover, visibility, and water depth);
- Description of marine mammal observation in 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- The fate of the animal(s); and
- Photographs or video footage of the animal (if equipment is available).

Stopped activities will not resume until NMFS has completed a review of the circumstances of the prohibited take and NMFS has notified Mayflower Wind that it is appropriate to resume activities. Together, NMFS and Mayflower Wind will determine necessary steps to minimize the possibility of further prohibited take and ensure MMPA compliance. NMFS will then notify Mayflower Wind when appropriate to resume the activity via letter, email, or phone call.

In the event that Mayflower Wind discovers an injured or dead marine mammal, and the lead PSO determines that the cause of injury or death is unknown and occurred relatively recently, the event will be reported immediately. Reporting will be the same as described above; however, Mayflower Wind's construction activities will continue while NMFS reviews the circumstances of the incident and works with Mayflower Wind to determine whether modifications to the activities are appropriate.

In the event that Mayflower Wind discovers an injured or dead marine mammal, and the lead PSO determines that the injury or death is not associated with or related to the activities authorized in the IHA (previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), construction activities will continue and the sighting will be reported within 24 hours. Report content will be the same as described above.



Table 1. Summary of Monitoring and Mitigation Measures

Category	Description
<b>3. PSO and Acoustic PSO (PAM Operator) Training, Experience and Responsibilities</b>	
Observer qualifications and training	<ul style="list-style-type: none"> <li>- PSOs and Acoustic PSOs (APSO / PAM Operators) will have met NMFS and BOEM training and experience requirements.</li> <li>- PSOs and APSOs will be employed by a third-party observer provider.</li> <li>- Briefings between construction supervisors and crews and the PSO/APSO team will be held prior to the start of all pile driving activities as well as when new personnel join the vessel(s).</li> <li>- At least one PSO on duty at all times will have prior experience working as a PSO.</li> <li>- APSOs responsible for determining if an acoustic detection originated from a NARW will be trained in identification of mysticete vocalizations.</li> </ul>
Responsibilities and authorities of PSOs	<ul style="list-style-type: none"> <li>- PSOs will have no other responsibilities while on watch.</li> <li>- Any PSO or APSO on duty will have the authority to delay the start of operations or to call for a shutdown based on their observations or acoustic detection.</li> <li>- A clear line and method of communication between the PSOs/APSOs and pile driving crew will be established and maintained to ensure mitigation measures are conveyed without delay.</li> </ul>
<b>4. VISUAL MONITORING</b>	
Number of PSOs	<ul style="list-style-type: none"> <li>- A sufficient number of PSOs will be stationed aboard the installation and/or nearby support vessels to meet the following criteria:               <ul style="list-style-type: none"> <li>- At least two PSOs on duty during all pre-clearance periods and active pile driving;</li> <li>- At least one PSO on duty during all other daylight periods;</li> <li>- A maximum of four consecutive hours on watch per PSO; and</li> <li>- A maximum of 12 hours on watch during a 24-hour period.</li> </ul> </li> </ul>

Category	Description
Visual monitoring methods	<ul style="list-style-type: none"> <li>- Observations will be conducted from the best safe vantage point(s) on the construction or nearby support vessel to ensure visibility of the clearance zones.</li> <li>- When conducting observations during pile driving, PSOs will scan systematically with the unaided eye, high-magnification (25x) binoculars, and/or standard handheld (7x) binoculars to search continuously for marine mammals during all observational periods.</li> <li>- When monitoring at night, PSOs will monitor for marine mammals and other protected species using night-vision goggles with thermal clip-ons and a hand-held spotlight.</li> <li>- PSOs will watch for and record all marine mammal sightings regardless of the distance from the observer and/or sound source.</li> <li>- Distances to observed animals will be estimated with range finders, reticule binoculars, or clinometers when possible and based on the best estimate of the PSO when necessary.</li> <li>- PSOs will record watch effort and environmental conditions on a routine basis.</li> </ul>
Visual monitoring during vessel transit	<ul style="list-style-type: none"> <li>- PSOs and/or trained vessel crew will observe for marine mammals and sea turtles at all times when vessels are transiting to/from and within the Project Area and port.</li> <li>- PSOs and/or vessel crew will request ship-strike avoidance measures if necessary (see below).</li> </ul>
<b>5. ACOUSTIC MONITORING</b>	
Number of APSOs	<ul style="list-style-type: none"> <li>- At least one APSO during all pre-clearance periods and active pile driving.</li> <li>- A maximum of four consecutive hours on watch per APSO.</li> <li>- A maximum of 12 hours of watch time per 24-hour period per APSO.</li> </ul>

Category	Description
Passive acoustic monitoring methods	<ul style="list-style-type: none"> <li>- A real-time PAM system will be used to supplement visual monitoring during pre-piling clearance and throughout pile driving.</li> <li>- Use of PAM will allow initiation of pile driving when visual observation of the entire clearance zone is not possible due to poor visibility, including darkness.</li> <li>- A detailed description of the real-time PAM system will be developed during the Marine Mammal Protection Act Incidental Take Authorization process.</li> <li>- The PAM system may not be located on the pile installation vessel to reduce masking of marine mammals sounds.</li> <li>- The APSOs will immediately communicate all acoustic detections of marine mammals to PSOs performing visual observations including any determination regarding species identification, distance, and bearing of the marine mammal.</li> </ul>
Sound Source Verification	<ul style="list-style-type: none"> <li>- A detailed plan for Sound Source Verification will be developed during the Marine Mammal Protection Act Incidental Take Authorization process.</li> <li>- Components of the plan will likely include:               <ul style="list-style-type: none"> <li>- Measurement of the largest of each pile type (monopiles and/or jacket piles) to be installed with and without noise attenuating systems to quantify the effectiveness of the system(s).</li> </ul> </li> <li>- Measurements will be taken at distances designed to verify modeled distances to Level A and Level B thresholds and/or other mitigation action distances.</li> <li>- Measurement results will be used to modify, if necessary, distances to Level A and Level B thresholds and estimate effects in a post-construction monitoring report.</li> </ul>
<b>6. CLEARANCE ZONES</b>	
Clearance Zones for protected species	<ul style="list-style-type: none"> <li>- Because of the low probability of a long-term exposure event and for practical implementation reasons, it is anticipated that the Clearance Zones will be similar to those listed below, with the final distances to be determined during the MMPA ITA application process:               <ul style="list-style-type: none"> <li>- North Atlantic Right Whale: 1 km;</li> <li>- Mysticete whales (low-frequency cetaceans): 0.5 km;</li> <li>- Harbor porpoise (high-frequency cetaceans): 0.12 km;</li> <li>- All other marine mammals (mid-frequency cetaceans and pinnipeds): 0.05 km; and</li> <li>- Sea Turtles: 0.05 km.</li> </ul> </li> </ul>

Category	Description
<b>7. PRE-START CLEARANCE</b>	
Pre-start clearance	<ul style="list-style-type: none"> <li>- Prior to the beginning of each pile driving event, PSOs and APSOs will monitor for marine mammals and sea turtles for a minimum of 30 minutes and continue at all times during pile driving.</li> <li>- If a marine mammal is detected within or approaching the clearance zone (via visual observation or PAM) during the pre-clearance period, pile driving will not begin until the animal(s) is confirmed to have exited the relevant clearance zone, or until an additional time period has elapsed with no further sighting of the animal.</li> <li>- Additional time period will be 15 minutes for odontocetes and pinnipeds and 30 minutes for mysticetes and sea turtles.</li> </ul>
<b>8. SOFT-START</b>	
Soft-Start	<ul style="list-style-type: none"> <li>- Soft-start procedures will be followed, to the extent practicable, at the beginning of each pile driving event or any time pile driving has stopped for longer than 30 minutes.</li> <li>- If a marine mammal is detected within or about to enter the clearance zone during the soft-start procedure, pile driving will be delayed and measures will be followed as stated in Section 7.</li> </ul>
<b>9. SHUTDOWNS</b>	
Shutdowns	<ul style="list-style-type: none"> <li>- PSOs or APSOs will request a shutdown of pile driving if a marine mammal or sea turtle is detected within or about to enter the applicable clearance zone for that species (see Section 4).</li> <li>- If a shutdown is not feasible at that time in the installation process because of a risk to human or vessel safety or the risk of jeopardizing the installation process, a reduction in the hammer energy of the greatest extent possible will be considered and implemented.</li> <li>- Following shutdown, pile driving will restart using the same procedure described above during pre-start clearance.</li> </ul>

Category	Description
<b>10. POTENTIAL ADDITIONAL MEASURES TO PROTECT NORTH ATLANTIC RIGHT WHALES</b>	
	<ul style="list-style-type: none"> <li>- By concentrating construction activities when NARW are less likely to be present within the region (June 1 through November 30), including the Lease Area, the amount of activity to occur when more NARW are likely to be present can be reduced, thereby reducing the total potential impacts to NARW.</li> <li>- To accomplish this, Mayflower Wind will propose additional monitoring and mitigation measures to support the start (or continuation) of pile driving at night or in poor visibility conditions during the period when NARW are less likely to be present.</li> <li>- Specific monitoring tools and plans will be developed as a part of the MMPA ITA process, but may include the use of advanced infrared systems, real-time PAM, autonomous underwater vehicles, autonomous aerial vehicles, or other advanced technologies.</li> </ul>
<b>11. VESSEL STRIKE AVOIDANCE</b>	
General measures	<ul style="list-style-type: none"> <li>- A minimum of one PSO or trained vessel crew will be present on all vessels when transiting.</li> <li>- Observers will maintain a vigilant watch for all marine mammals and slow down or stop vessels to avoid striking protected species.</li> <li>- Monitoring the NMFS NARW reporting systems from November 1 through May 30 and whenever a DMA is established in the operational area.</li> </ul>
Separation distances	<ul style="list-style-type: none"> <li>- Maintaining &gt;500 m distance from any sighted NARW or an unidentified large marine mammal.</li> <li>- Maintaining &gt;100 m from all ESA-listed whales or humpback whales.</li> <li>- Maintaining &gt;50 m from all other marine mammals, with the exception of delphinids and pinnipeds that approach the vessel, in which case the vessel operator must avoid excessive speed or abrupt changes in direction.</li> </ul>

Category	Description
<p>Actions given observed marine mammal</p>	<ul style="list-style-type: none"> <li>- If underway, vessels will steer a course away from any NARW at 10 kts or less until the 500 m minimum separation distance has been established:               <ul style="list-style-type: none"> <li>- If a NARW comes within 100 m, then the vessel will reduce speed and shift the engines into neutral, if safe to do so. The vessel will not engage engines until the NARW has moved beyond 100 m in which case any vessel will steer a course away from the animal at 10 kts or less until the 500 m minimum separation distance has been established.</li> <li>- If the vessel is stationary, the vessel will not engage engines until the NARW has moved beyond 100 m in which case any vessel will steer a course away from the animal at 10 kts or less until the 500 m minimum separation distance has been established.</li> </ul> </li> <li>- If a vessel comes within 100 m of a non-NARW whale:               <ul style="list-style-type: none"> <li>- If underway, the vessel must attempt to remain parallel to the animal’s course, reduce speed and shift the engine to neutral, and must not engage the engines until the whale (e.g., large whale and/or ESA-listed whales besides NARW) has moved beyond 100 m.</li> <li>- If stationary, the vessel must not engage engines until the whale has moved beyond 100 m.</li> <li>- If underway, vessels must not divert to approach any small cetacean, seal, sea turtle, or giant manta ray.</li> </ul> </li> <li>- Report sightings of all dead or injured marine mammals or sea turtles within 24 hours (see below).</li> </ul>
<p>Speed Reduction</p>	<ul style="list-style-type: none"> <li>- Reducing speed of all vessels, except CTVs, to <math>\leq 10</math> kts between November 1 through May 30.</li> <li>- From November 1 through May 30, CTVs may travel at over 10 kts. However, if a NARW is detected via visual observation within or approaching the transit route, all CTVs will travel at 10 kts or less for the remainder of that day.</li> <li>- Operating vessels, except CTVs, will travel at speeds <math>\leq 10</math> kts in any DMA.</li> <li>- Reducing vessel speeds to <math>\leq 10</math> kts when mother/calf pairs, pods, or large assemblages of marine mammals are observed.</li> <li>- Complying with speed restrictions (<math>\leq 10</math> kts) in NARW management areas including SMAs and active DMAs, except as noted above for CTVs.</li> </ul>

Category	Description
<b>13. REPORTING OF DEAD OR INJURED MARINE MAMMALS</b>	
Actions given a marine mammal is taken in a prohibited manner by construction activities	<ul style="list-style-type: none"> <li>- The activity(ies) resulting in the injury/death will be stopped immediately.</li> <li>- The incident will be reported to the NMFS Office of Protected Resources and the NMFS New England Stranding Network Coordinator.</li> <li>- The report will include all available information required by the IHA or the NMFS stranding report form.</li> <li>- Mayflower Wind will not resume the activity which resulted in the injury until NMFS is able to review the circumstances of the prohibited take and authorize resumption of the activity(ies).</li> </ul>
Actions given an unknown and recent observed dead or injured marine mammal	<ul style="list-style-type: none"> <li>- Mayflower Wind will immediately report the incident to the NMFS Office of Protected Resources and the NMFS New England Stranding Network Coordinator.</li> <li>- The report will include the same information identified for a take by construction activity.</li> <li>- Activities will continue while NMFS reviews the circumstances of the incident and works with Mayflower Wind to determine whether modifications to the activities are appropriate.</li> </ul>
Actions given observation of a dead or injured marine mammal not associated with or related to construction activities	<ul style="list-style-type: none"> <li>- Mayflower Wind will report the incident to the NMFS Office of Protected Resources and the NMFS New England Stranding Network Coordinator, within 24 hours of the discovery.</li> <li>- Mayflower Wind will include any documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network including photographs and video footage if available.</li> <li>- Construction activity may continue.</li> </ul>

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