Dominion Energy Coastal Virginia Offshore Wind Commercial Project

Construction Mitigation and Monitoring Plan

Prepared for:

600 East Canal Street
Richmond, VA 23219

Prepared by:

Tetra Tech, Inc.
4101 Cox Road, Suite 120
Glen Allen, VA 23060

www.tetratech.com

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Record of Agency Consultation	
Date	**Action**
26-May-23	DE submitted Mitigation and Monitoring Plan outline and development schedule
22-Jun-23	BOEM/BSEE concurred with Mitigation and Monitoring Plan outline
27-Jun-23	NOAA Fisheries concurred with Mitigation and Monitoring Plan outline
31-Jul-23	DE submitted Appendix A - Vessel Strike Avoidance Plan for agency review (TIMSweb ID: 341057573)
31-Jul-23	DE submitted Appendix B - Environmental Training for agency review (TIMSweb ID: 341057573)
30-Oct-23	BOEM/BSEE returned comments on Appendix A and B
03-Nov-23	DE submitted full CMMP (Appendices A - G) for agency review and concurrence (TIMSweb ID: 364044816)
21 Nov 2023	DE submitted CMMP Appendices A - G to NOAA Fisheries GARFO for review and concurrence
06-Jan-24	NOAA Fisheries, BOEM, BSEE comments received on Appendix A and B
26-Jan-24	DE submitted revised Appendix A for review and concurrence (TIMSweb ID: 341057573)
05-Feb-24	NOAA Fisheries, BOEM, BSEE comments received on Appendix A
09-Feb-24	DE submitted revised Appendix A for review and concurrence (TIMSweb ID: 341057573)
15-Feb-24	DE received conditional concurrence on Appendix A from NOAA Fisheries GARFO, concurrence from NOAA Fisheries OPR, BOEM, and USACE
16-Feb-24	DE submitted revised Appendix A for review and concurrence from BSEE (TIMSweb ID: 341057573)
16-Feb-24	DE received concurrence on Appendix A from BSEE
29-Feb-24	DE submitted CMMP and Appendices C - G for agency review and concurrence (TIMSweb ID: 341057573)
27-Mar-24	BOEM comments received on CMMP and Appendices D and E
05-Apr-24	NOAA Fisheries comments received on Appendices D and E, BSEE indicated they have no further comments
11-Apr-24	NOAA Fisheries comments received on CMMP and Appendices C, F, and G
19-Apr-24	DE submitted CMMP and Appendices C - G for agency review and concurrence (TIMSweb ID: 341057573)
25-Apr-24	BOEM comments received on CMMP and Appendices C - G
27-Apr-24	NOAA Fisheries comments received on CMMP and Appendices C - G
29-Apr-24	DE submitted CMMP and Appendices C - G for agency review and concurrence (TIMSweb ID: 341057573)
03-May-24	Agency concurrence received on CMMP and Appendices C - G

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ACRONYMS AND ABBREVIATIONS

BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CFR	Code of Federal Regulations
CMMP, the Plan	Construction Mitigation and Monitoring Plan
COP	Construction and Operations Plan
CTV	crew transfer vessel
dB	decibel
DBBC	Double big bubble curtain
DMA	Dynamic Management Area
Dominion Energy	Virginia Electric and Power Company, doing business as Dominion Energy Virginia
DVO	Dedicated Visual Observer
ECM	Environmental Compliance Monitor
ESA	Endangered Species Act
FR	*Federal Register*
ft	feet
GARFO	Greater Atlantic Regional Fisheries Office
HF	high-frequency
HRG	high-resolution geophysical
Hz	hertz
IR	infrared
ISO	International Organization for Standardization
km	kilometer
km/h	kilometer per hour
kHz	kilohertz
Lease Area	Lease No. OCS-A 0483
LF	low-frequency
LOA	Letter of Authorization
m	meter
MCC	Monitoring and Coordination Center
MF	mid-frequency
MMPA	Marine Mammal Protection Act
MP	monopile
NARW	North Atlantic right whale
NCEI	National Centers for Environmental Information
nm	nautical mile
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	NOAA National Marine Fisheries Service
OCS	Outer Continental Shelf
OPR	Office of Protected Resources
PAM	Passive Acoustic Monitoring
PDMP	Pile Driving Monitoring, Mitigation, and Management Plan
PDV	Pile driving vessel
Project	Dominion Coastal Virginia Offshore Wind Commercial Project
PSO	Protected Species Observer

PTS	permanent threshold shift
ROD	Record of Decision
SAR	Stock Assessment Report
SEL_{cum}	Cumulative Sound Exposure Level
SFV	sound field verification
SMA	Seasonal Management Area
T&C	terms and conditions
USACE	United States Army Corps of Engineers
VM	Vessel Master
VSAP	Vessel Strike Avoidance Plan
WTG	Wind Turbine Generator

1 INTRODUCTION

Virginia Electric and Power Company doing business as Dominion Energy Virginia (Dominion Energy), is proposing to construct, own, and operate the Coastal Virginia Offshore Wind (CVOW) Commercial Project (Project) in the Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf (OCS) Offshore Virginia (Lease No. OCS-A 0483, the Lease Area; Figure 1) and in coastal waters where an Offshore Export Cable Route Corridor will be established. Dominion Energy will use high-resolution geophysical (HRG) survey equipment during construction activities in support of the Project; Dominion Energy also intends to use vibratory and impact pile driving to install Wind Turbine Generator (WTG) Monopile Foundations and Offshore Substation Jacket Foundations (jacket foundations with pin piles).

The National Oceanic and Atmospheric Administration (NOAA) and the Bureau of Ocean Energy Management (BOEM) have advised that pile driving associated with Project construction activities (including monopile and jacket foundation installation) as well as sound-producing HRG survey equipment operating below 180 kilohertz (kHz; e.g., sub-bottom profilers), have the potential to cause acoustic harassment to marine species, in particular marine mammals.

Dominion Energy has committed to the following comprehensive set of mitigation and monitoring measures for all Project-associated vessels during all Project-related activities, including but not limited to construction, operation and maintenance, decommissioning, and survey activities. Dominion Energy also commits to engaging in ongoing consultations with NOAA National Marine Fisheries Service (NOAA Fisheries) regarding mitigation and monitoring protocols. The measures detailed in this Construction Mitigation and Monitoring Plan (CMMP; the Plan) are designed to avoid, minimize, or mitigate adverse effects on marine protected species from Project activities.

Dominion Energy is dedicated to upholding the requirements the issued Letter of Authorization (LOA),[1] applicable conditions of the NOAA Fisheries Biological Opinion Terms and Conditions (T&Cs)[2], BOEM Construction and Operations Plan (COP) approval T&Cs, the BOEM/NOAA Fisheries Record of Decision T&Cs (to the extent consistent with the COP approval T&Cs),[3] and the United States Army Corps of Engineers (USACE) Permit Special Conditions.[4] The procedures and policies presented in this plan have

[1] Measures of the issued LOA that have been integrated into this Plan include, but are not limited to, the following: 3.(a)(2)Training; 3.(a)(3)NARW monitoring; 3.(a)(4) Sighting communication; 3.(a)(11) A.I.S.; 3.(b)(1)-(16) Vessel strike avoidance measures; 4(a) PSO and PAM operator qualifications 4(b)(2) PSO observational position; 4(g) Reporting; and 5(c) Adaptive management.

[2] Dominion Energy is committed to upholding the Terms and Conditions (T&Cs) of the Biological Opinion (see Section 11.3), which implement the Reasonable and Prudent Measures from Section 11.2 of the aforementioned document, including, but not limited to T&Cs 5(b), 6, and 8(e).

[3] Dominion Energy is committed to upholding the T&Cs of BOEM's approval of the Construction and Operations Plan. The Project's Record of Decision (ROD) constitutes BOEM and NOAA Fisheries joint ROD for the Final Environmental Impact Statement prepared for the Project's Construction and Operations Plan following the requirements of the National Environmental Policy Act, 42 United States Code §§ 4321 *et seq.*, and 40 Code of Federal Regulations §§ 1500-1508. Appendix A of the Project's ROD identifies mitigation, monitoring, and reporting requirements (measures 5.12.2, 5.12.3, 5.12.4, 5.13.1, 5.13.4, and 5.13.5) that apply to extent consistent with the T&Cs of BOEM's COP approval.

[4] The Project-specific Special Conditions of note for vessel strike avoidance include, but are not limited to 7, 51, 59(b), and 60(a) through 60(d).

been developed through an extensive collaborative process with the federal oversight agencies and every effort has been made to integrate the best available science, technology, industry recommendations, and best practices. COP approval terms and conditions have been incorporated in relevant sections of the plan. Every Project-related vessel will have a copy of the COP approval terms and conditions on board as well as compliance and reporting information with easy reference to protocols and contact information. All Project personnel will receive training on compliance protocols and procedures, including the COP approval terms and conditions, prior to commencing work. The CVOW Commercial Environmental Compliance Coordinators and environmental support staff will conduct thorough reviews of all data and reports developed during construction activities to ensure Project compliance. The Environmental Compliance Coordinators and environmental support staff will also review all situational reporting and ensure that the information is communicated to the oversight agencies as applicable.

In the event of any inconsistency between this Plan and the conditions of the COP approval, LOA for the Taking of Marine Mammals Incidental to Construction Activities on the Outer Continental Shelf, or the ESA Section 7 Biological Opinion and Conference for the Construction, Operation, Maintenance, and Decommissioning of the Coastal Virginia Offshore Wind Commercial Project, the latter provisions will supersede this document. This Plan is subject to updates in accordance with all future amendments or revisions to the aforementioned requirements and regulations. Dominion Energy is committed to communicating any changes and seeking approval of a revised Plan with the relevant agencies should future amendments or revisions be necessary.

2 OVERVIEW

All Project-associated vessels will be equipped with an Automatic Identification System and Dominion Energy will report all Maritime Mobile Service Identities numbers to NOAA Fisheries Office of Protected Resources prior to initiating in-water activities (Appendix A). Prior to initiation of Project activities, an Environmental Training program will be provided to NOAA Fisheries for review (Appendix B). Prior to commencement of Project activities, all Project personnel will undergo this comprehensive Environmental Training, encompassing protected species identification and the specific details outlined in this Plan. Upon completion of this Environmental Training, each individual will be trained and able to fulfill the responsibilities of a Designated Visual Observer (DVO), a mandatory role for all vessels in motion (i.e., vessels that are ‘underway,’ signifying the vessel is in motion and progressing, excluding anchoring, being made fast to the shore, aground, or otherwise remaining stationary in position). As elaborated in this Plan, DVOs are entrusted with the exclusive duty of vigilantly monitoring the forward trajectory of underway vessels. Subsequently, they are required to communicate their observations for the implementation of mitigative actions, as specified in Section 8.

Dominion Energy will ensure that vessel operators and dedicated vessel crew members, excluding visitors or temporary technicians or contractors, maintain a vigilant watch for protected species during all Project activities. All vessel crew members will receive site-specific Environmental Training on protected species sighting, reporting, and vessel strike avoidance measures. Dominion Energy will track and document the aforementioned Environmental Training. Central to this document is a steadfast commitment to navigational and human safety. The monitoring and mitigation measures, which include, but are not limited to, the provisions described in Section 4 through Section 11, will be followed diligently by Dominion

Energy. Exceptions apply solely in extraordinary circumstances when complying with these requirements would put the safety of the vessel or crew at risk, present an imminent threat to the health, safety, or life of a person, or when a vessel is actively engaged in emergency rescue or response duties, necessitating speeds exceeding 10 knots (18.5 kilometers per hour [km/h]) or is otherwise inhibited by navigational constraints. It is the responsibility of all crew members to communicate observations of marine protected species, noting that the priority of all crew members is their safety and tasks, which can include serving as the DVO or Environmental Compliance Monitor (ECM). Any crew member serving as an ECM or DVO will not be performing duties in another capacity during that specific time. This is inclusive of the Protected Species Observers (PSOs) who are typically exclusively assigned and dedicated to their specific roles on vessels. Where vessel capacity is limited or restricted by regulation or statute, Dominion Energy will ensure that the personnel responsible for safely operating and navigating smaller vessels shall appoint a trained crew member or trained person onboard with the responsibility of acting in the capacity of a DVO to the best of their abilities. The marine mammal visual monitoring crew (i.e., DVO, ECM, and PSO) are all marine species visual observers working to visually monitor marine protected species.

The Environmental Training, provided as Appendix B to this Plan, as well as daily health, safety and environment briefings, will ensure the crew understands the major risks and any concerns for protected species for that day.

3 MARINE PROTECTED SPECIES IN THE PROJECT AREA

Thirty-eight marine mammal species (Table 1), five sea turtle species (Table 2), and five species of protected fish (Table 3) are known to be present, at least seasonally, in the Project Area. All marine mammals are protected under the Marine Mammal Protection Act (MMPA), and six marine mammal species are additionally listed under the Endangered Species Act (ESA). All of the sea turtle and protected fish species are listed under the ESA as either threatened or endangered.

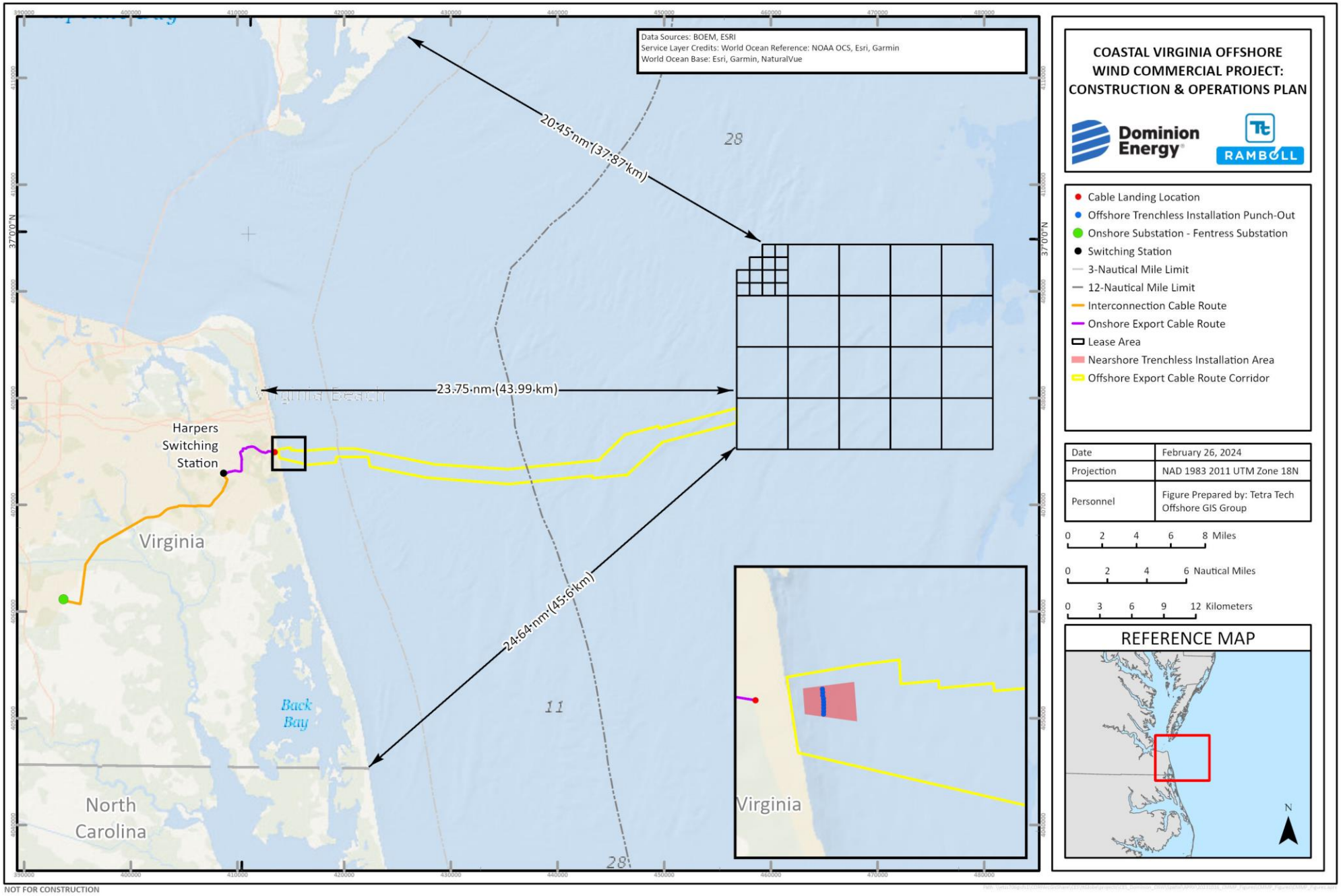

Figure 1. Project Area

Table 1. Marine Mammals Known to Occur in the Marine Waters of Coastal and Offshore Virginia

Common Name	Scientific Name	Occurrence/Seasonality a/	Status
Harbor porpoise	*Phocoena phocoena*	Common/Winter/Spring	MMPA – non-strategic
Atlantic spotted dolphin	*Stenella frontalis*	Common/Year-round	MMPA – non-strategic
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Uncommon/Fall/ Winter/Spring	MMPA – non-strategic
Bottlenose dolphin	*Tursiops truncatus*	Common/Year-round	MMPA – non-strategic
Clymene dolphin	*Stenella clymene*	Extralimital/Summer	MMPA – non-strategic
Dwarf sperm whale	*Kogia sima*	Uncommon/Variable	MMPA – non-strategic
False killer whale	*Pseudorca crassidens*	Uncommon/Variable	MMPA – non-strategic
Fraser's dolphin	*Lagenodelphis hosei*	Uncommon/Variable	MMPA – non-strategic
Killer whale	*Orcinus orca*	Uncommon/Year-round	MMPA – non-strategic
Long-finned pilot whale	*Globicephala melas*	Common/Year-round	MMPA – non-strategic
Short-finned pilot whale	*Globicephala macrorhynchus*	Uncommon/Year-round	MMPA – non-strategic
Pantropical spotted dolphin	*Stenella attenuata*	Uncommon/Summer	MMPA – non-strategic
Melon-headed whale	*Peponocephala electra*	Uncommon/Variable	MMPA – non-strategic
Pygmy killer whale	*Feresa attenuata*	Uncommon/Variable	MMPA – non-strategic
Pygmy sperm whale	*Kogia breviceps*	Uncommon/Year-round	MMPA – non-strategic
Risso's dolphin	*Grampus griseus*	Common/Year-round	MMPA – non-strategic
Rough-toothed dolphin	*Steno bredanensis*	Uncommon/Year-round	MMPA – non-strategic
Common dolphin (short-beaked)	*Delphinus delphis*	Common/Year-round	MMPA – non-strategic
Sperm whale	*Physeter macrocephalus*	Uncommon/Year-round	MMPA-strategic; ESA-– Endangered
Spinner dolphin	*Stenella longirostris orientalis*	Uncommon/Year-round	MMPA – non-strategic
Striped dolphin	*Stenella coeruleoalba*	Uncommon/Year-round	MMPA – non-strategic
White beaked dolphin	*Lagenorhynchus albirostris*	Uncommon/Variable	MMPA – non-strategic
Blainville's beaked whale	*Mesoplodon densirostris*	Uncommon/Spring/Summer	MMPA – non-strategic
Cuvier's beaked whale	*Ziphius cavirostris*	Uncommon/Variable	MMPA – non-strategic
Gervais' beaked whale	*Mesoplodon europaeus*	Uncommon/Spring/Summer	MMPA – non-strategic
Sowerby's beaked whale	*Mesoplodon bidens*	Uncommon/Variable	MMPA – non-strategic
True's beaked whale	*Mesoplodon mirus*	Uncommon/Spring/Summer	MMPA – non-strategic
Blue whale	*Balaenoptera musculus*	Uncommon/Year-round	MMPA – strategic; ESA – Endangered
Common minke whale	*Balaenoptera acutorostrata*	Common/Year-round	MMPA – non-strategic
Fin whale	*Balaenoptera physalus*	Common/Year-round	MMPA – strategic; ESA –Endangered
Humpback whale (West Indies DPS) b/	*Megaptera novaeangliae*	Common/Fall/Winter/Spring	MMPA – non-strategic
Sei whale	*Balaenoptera borealis*	Uncommon/Winter/Spring/Summer	MMPA – strategic; ESA –Endangered

Common Name	Scientific Name	Occurrence/Seasonality a/	Status
North Atlantic right whale (NARW)	*Eubalaena glacialis*	Common/Year-round	MMPA – strategic; ESA –Endangered
West Indian manatee	*Trichechus manatus*	Extralimital/Variable	MMPA – strategic; ESA –Threatened
Gray seal	*Halichoerus grypus*	Uncommon/Fall/Winter/Spring	MMPA – non-strategic
Harbor seal	*Phoca vitulina*	Common/Fall/Winter/Spring	MMPA – non-strategic
Harp seal	*Pagophilus groenlandicus*	Uncommon/Winter/Spring	MMPA – non-strategic
Hooded seal	*Cystophora cristata*	Extralimital/Summer/Fall	MMPA – non-strategic

Notes:
a/ Occurrence defined as:
Common: occurrences are regularly documented and the Project Area is generally considered within the typical range of the species.
Uncommon: occurrences are occasionally documented and the Project Area is generally considered within the typical range of the species.
Extralimital: few occurrences have been documented and the Project Area is generally considered outside the typical range of the species; any occurrences would likely be of incidental individuals.

b/ Note that the humpback whale (Megaptera novaeangliae) was previously federally listed as endangered; however, based on the revised listing completed by NOAA Fisheries in 2016, the Distinct Population Segment (DPS) of humpback whales that occurs along the East Coast of the U.S., the West Indies DPS, is no longer considered endangered or threatened. The Commonwealth of Virginia has retained the endangered state listing status for the humpback whale.

Sources: Hayes et al. 2022; Roberts et al. 2016; Roberts and Halpin 2022

Table 2. Sea Turtles Known to Occur in the Marine Waters of Coastal and Offshore Virginia

Common Name	Scientific Name	Known Offshore Project Area Distribution	Occurrence/ Seasonality a/	Federal Status
Leatherback Sea Turtle	*Dermochelys coriacea*	Offshore, continental shelf and deeper	Uncommon/Year-round	Endangered
Atlantic Hawksbill Sea Turtle	*Eretmochelys imbricata*	N/A	Extralimital/Year-round	Endangered
Green Sea Turtle (North Atlantic Distinct Population Segment	*Chelonia mydas*	Coastal, bays, estuaries, and inlets	Uncommon/Year-round	Threatened
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Coastal, bays, estuaries, and inlets	Common/Year-round	Endangered
Loggerhead Sea Turtle (Northwest Atlantic Distinct Population Segment)	*Caretta caretta*	Throughout: offshore, continental shelf and deeper; coastal, bays, estuaries, and inlets	Common/Year-round	Threatened

Notes:
a/ Occurrence defined as:
Common: Occurrences are regularly documented, and the Project Area is generally considered within the typical range of the species.
Uncommon: Occurrences are occasionally documented, and the Project Area is generally considered within the typical range of the species.
Extralimital: Few occurrences have been documented, and the Project Area is generally considered outside the typical range of the species; any occurrences would likely be of incidental individuals.
Sources: NEFSC 2011; NOAA Fisheries 2015; NOAA Fisheries and USFWS 2009, 2013a, 2013b, 2015; TEWG 2007

Table 3. Protected Fish Known to Occur in the Marine Waters of Coastal and Offshore Virginia

Common Name	Scientific Name	Known Offshore Project Area Distribution	Federal Status
Atlantic Sturgeon	*Acipenser oxyrinchus oxyrinchus*	Coastal rivers/estuaries, assumed presence in Offshore Project Area	Endangered
Shortnose Sturgeon	*Acipenser brevirostrum*	Low salinity rivers (Potomac and James rivers), Chesapeake Bay	Endangered
Giant Manta Ray	*Manta birostris*	Offshore Project Area	Threatened
Oceanic Whitetip Shark	*Carcharhinus longimanus*	Offshore Project Area	Threatened
Scalloped Hammerhead Shark	*Sphyrna lewini*	Offshore Project Area	Threatened

Source: Federal Register 1967; Federal Register 2012; (Federal Register 2014; Federal Register 2018a, 2018b;

4 GENERAL VESSEL STRIKE AVOIDANCE PROCEDURES

Dominion Energy will ensure that vessel operators, hereafter referred to interchangeably as vessel operator, vessel master, or captain, and all Project personnel maintain a vigilant watch for protected species during all Project activities as detailed in the Vessel Strike Avoidance Plan (VSAP; Appendix A). The VSAP applies year-round within the spatial delineation of the specified geographical region, the Mid-Atlantic Bight, defined as the region between Cape Hatteras, North Carolina and Martha's Vineyard, Massachusetts, extending eastward into the Atlantic to the 100-meter (m; 328-foot [ft]) isobath. The proposed activities will occur within the vicinity of the North Atlantic right whale (*Eubalaena glacialis*, NARW) Mid-Atlantic Seasonal Management Area (SMA) at the mouth of the Chesapeake Bay. Rather than only adhering to the seasonal NARW speed restrictions (operating at less than 10 knots [18.5 km/h]) within the spatial delineation of the SMAs, the seasonal speed restrictions apply to all Project-related vessels operating within the Mid-Atlantic Bight region to the 100 m (328 ft) isobath during the seasonal restriction period (November 1 through April 30). A speed restriction (10 knots [18.5 km/h]) for Project-related vessels transiting within the vessel corridor, defined as the Portsmouth Marine Terminal to the Lease Area, is also in place year-round except during the months of May through October, provided a Passive Acoustic Monitoring (PAM) system that is capable of providing accurate protections for marine protected species is approved by NOAA Fisheries, concurred by BOEM and the Bureau of Environmental Enforcement (BSEE), and deployed in the transit corridor. All CVOW Project-related personnel will receive the site-specific Environmental Training, which includes, but is not limited to, details on protected species sighting, reporting, and vessel strike avoidance measures. Vessel strike avoidance measures will include, but are not limited to, the following:

- All vessel operators and Project personnel will maintain vigilant watch for cetaceans, pinnipeds, and sea turtles and slow down or stop their vessel to avoid striking these protected species.
- All vessels will employ a dedicated lookout on the bow of the vessel while underway and making way. This role will typically be filled by the PSO, ECM, or DVO as outlined below. In the event of limited vessel capacity on smaller vessels, Dominion Energy will ensure that the personnel responsible for safely operating and navigating smaller vessels shall appoint a trained crew member or trained person onboard with the responsibility of acting in the capacity of a DVO to the best of their abilities.

Vessel speed and required navigational mitigative actions are outlined below:

- All vessel operators will comply with 10 knot (<18.5 km/h) speed restrictions in the entirety of the specified geographic region, the Mid-Atlantic Bight, which can also include, but is not limited to, any SMA, Dynamic Management Areas (DMA), Slow Zone, or when NARW detection by the PAM array which also requires reduced transit speeds. All vessels, regardless of size, operating from November 1 through April 30 will operate at speeds of 10 knots (<18.5 km/h) or less in the entirety of the Mid-Atlantic Bight.
- All vessel operators will reduce vessel speed to 10 knots (<18.5 km/h) or less when mother/calf pairs, pods, or larger assemblages of whales are observed within 500 m (1,640 ft) of an underway vessel.
- All vessels will maintain a separation distance, or vessel strike avoidance zone, of 500 m (1,640 ft) or greater from any sighted ESA-listed species. If an ESA-listed species is sighted within the relevant separation distance, the vessel must steer a course away at 10 knots or less (4 knots for water depths less than 4 feet) until the 500-m separation distance has been established. If a whale is observed but cannot be confirmed as a species that is not ESA-listed, the vessel operator must assume that it is an ESA-listed species and take appropriate action. NARW-specific vessel strike avoidance measures are detailed in Appendix A. Data on the sighting will be recorded and reported as per the Lease conditions.
- All vessels will maintain a separation distance of 100 m (328 ft) or greater from any sighted baleen whale that is not listed under the ESA. If sighted, the vessel underway must, if safe and feasible to do so upon the assessment of the vessel captain, reduce speed and shift the engine to neutral and must not engage the engines until the whale has moved outside of the vessel's path and beyond 100 m (324 ft). If a survey vessel is stationary, the vessel will not engage engines until the whale has moved out of the vessel's path and beyond 100 m (328 ft).
- All vessels will maintain a separation distance of 50 m (164 ft) or greater from any sighted dolphins or pinnipeds, except for specific species of the *Delphinus*, *Stenella*, *Lagenorhynchus*, and *Tursiops* genera, where an exception is provided as these species are known to bow-ride on moving vessels.
- If underway, vessels must steer a course away from any sighted endangered species at 10 knots (<18.5 km/h) or less until the 500 m (1,640 ft) minimum separation distance has been established. If an endangered species is sighted in a vessel's path, or within 500 m (1,640 ft) to an underway vessel, the underway vessel will reduce speed and potentially shift the engine to neutral. If the vessel is unable to shift to neutral, the vessel will reduce speed to the lowest speed possible and steer a course away from the sighted ESA-listed species. If safe and feasible to shift into neutral upon the assessment of the vessel captain, engines will not be engaged until the endangered species has moved outside of the vessel's path and beyond 500 m (1,640 ft). If stationary, the vessel must not engage engines until the endangered species has moved beyond 500 m (1,640 ft).
- All vessels underway will not divert to approach any dolphin or pinniped and will remain parallel to a sighted dolphin's or pinniped's course whenever possible. The vessel will not adjust course and speed until the dolphin or pinniped has moved beyond 50 m (164 ft) or has moved abeam of

the underway vessel, with the exception of animals known to bow-ride (delphinids from the genera *Delphinus, Lagenorhynchus, and Stenella* or *Tursiops*).

- Any vessel underway will avoid excessive speed or abrupt changes in direction to avoid injury to the sighted dolphin or pinniped. All vessels will reduce vessel speed to 10 knots (18.5 km/h) or less when pods (including mother/calf pairs) or large assemblages of dolphins are observed. The vessel will not adjust course and speed until the dolphins have moved beyond 50 m (164 ft) or abeam of the vessel unless necessary for safety or navigation reasons.

For additional details on vessel strike avoidance procedures, please see the VSAP (Appendix A).

4.1 Additional Sea Turtle and Sturgeon Vessel Strike Avoidance

Supplementary to the above vessel strike avoidance measures, additional measures will be implemented to reduce the risk of morbidity or mortality to sea turtles and sturgeon from Project vessels. These measures include:

- Vessel operators will avoid transiting through areas of dense, surface-visible jellyfish aggregations or floating *Sargassum* (seaweed) lines, mats, or other large consolidations of seaweed whenever possible with respect to any potential safety or navigational concerns.
- All vessels will seek to maintain a separation distance of 500 m (1,640 ft) from sea turtles and sturgeon whenever possible with respect to any potential safety or navigational concerns.
- If a sea turtle or sturgeon is spotted within 100 m (328 ft) of the forward path of an underway vessel, vessel operators must reduce speed to 4 knots (<7.4 km/h) or less and steer away from the animal until the 500 m (1,640 ft) minimum separation distance has been established. If a sea turtle or sturgeon is sighted within 50 m (164 ft) of a vessel's forward path, the underway vessel must reduce speed and shift the engine to neutral as soon as it is safe to do so. When safe to do so, engines will be re-engaged, and the vessel will navigate away from the animal at 4 knots (<7.4 km/h) or less until the 500 m (1,640 ft) separation zone is re-established. If stationary, the vessel must not engage engines until the sea turtle or sturgeon has moved beyond 500 m (1,640 ft).

5 ENVIRONMENTAL TRAINING

5.1 All Project-Associated Personnel

A mandatory Environmental Training course will be delivered to all Project personnel prior to working on the Project. Confirmation of all required training will be documented on a training course log sheet and reported to NOAA Fisheries Office of Protected Resources prior to initiating Project activities. The training is comprehensive and covers all species with potential to interact with Project activities as well as all media and compliance requirements including, but not limited to, the identification of sea turtles and marine mammals, vessel strike avoidance and reporting protocols, how and when to communicate with the vessel operator, the authority of the PSOs, marine debris awareness, and the associated regulations for avoiding vessel collisions with protected species prior to the start of in-water construction activities (Appendix B). There will be additional activity-specific training modules related to the following specific activities, which will be required for personnel on the following associated vessels: foundation installation and HRG surveys.

The training will be conducted between the maritime supervisors and Project personnel (including sub-contractors), the PSOs, ECMs, DVOs, and Dominion Energy at the outset of the Project. The purpose of the Environmental Training will be to define and establish responsibilities, define the chains of command, discuss communication procedures, provide an overview of monitoring requirements and purpose, review operational procedures, and provide an opportunity for all personnel to interact and ask questions as needed.

Dominion Energy will make available aboard all Project vessels reference materials for identifying sea turtles and marine mammals, and copies of the Marine Mammal and Sea Turtle Monitoring Plans and Vessel Strike Avoidance Plan. Dominion Energy will communicate to all crew members the expectation that the crew report sightings of marine protected species, as well as the process for reporting marine protected species (including live, entangled, and dead individuals), and will post the reporting instructions, including communication channels, in highly visible locations aboard all Project vessels.

Priority will be for live trainings. However, Dominion Energy intends to also provide the Environmental Training via an electronic platform. Dominion Energy is developing electronic training to be interactive and engaging for the audience, which will simultaneously ensure a consistent and effective delivery of the entirety of the content. The technology used will also have the ability to track and create a record of all individuals who complete the training. Documenting the completion of Environmental Training will be one of the components required for all individuals during the on-boarding process at the Monitoring and Coordination Center (MCC). Training will be led by Project personnel and the Lead PSO, who will oversee the execution of the training, the ECM, the other PSOs, and other monitoring related duties. All Project personnel that complete the electronic Environmental Training will have the opportunity to interact directly with Dominion Energy personnel as well as a NOAA-Fisheries-approved PSO.

Confirmation of the training and understanding of the requirements will be documented on a training course log sheet, and Dominion Energy will provide the log sheets to NOAA Fisheries prior to the commencement of in-water Project-related activities and to BOEM and BSEE upon request.

5.2 Environmental Compliance Monitor Requirements

Any individual who has completed the Environmental Training will have the ability to act as an ECM in support of activities for which a PSO is not required (e.g., crew vessel transits). Confirmation of the training and understanding of the requirements will be documented on a training course log sheet or within digital records. These records will certify that the crew members understand and will comply with the necessary requirements throughout the Project activities. This training program will include vessel strike avoidance protocols to ensure the ECMs can sufficiently monitor for the presence of marine protected and endangered species while ensuring compliance with all other environmental regulations including NOAA Fisheries mitigation, monitoring, and reporting requirements.

5.3 PSO/PAM Operator Requirements

The sole Project-related duty of PSOs and PAM operators will be to observe, collect, and report data, and communicate with and instruct relevant vessel crew regarding the presence of protected species and mitigation requirements (including brief alerts regarding maritime hazards). Each watch period for PSOs and PAM operators must not exceed four consecutive hours and be followed by a break of at least two

hours between watches. The total cumulative watch may not exceed a total of 12 hours within a 24-hour period.

All PSOs will be independent, dedicated, qualified, and NOAA Fisheries-approved third-party PSOs. PAM operators will also be approved by NOAA Fisheries before the start of a survey. PSO qualifications will include a science degree and direct field experience on a marine mammal/sea turtle observation vessel and/or aerial surveys in the Atlantic Ocean/Gulf of Mexico with an overall examination score of 80 percent or greater.[5] The *curriculum vitaes* (CVs), PSO training certifications, and NOAA Fisheries approval letters of all proposed PSOs will be submitted to BOEM for review and approval at least 60 days prior to the start of activities requiring monitoring. Application requirements to become a NOAA Fisheries-approved PSO for construction activities can be found on the NOAA website[6] or for geological and geophysical surveys by sending an inquiry to nmfs.psoreview@noaa.gov.

All PSOs will receive supplemental training as per the LOA, in addition to the Environmental Training that will be provided to all Project personnel prior to the start of required monitoring activities (Table 4) and during any changes in Project personnel, such that all personnel are fully aware and understand the mitigation, monitoring, and reporting requirements. Supplemental PSO training will include a Permits and Environmental Compliance Plan training and a two-day refresher session held by the PSO provider to cover marine mammal identification and behaviors, documentation of field observations, data collection protocols, and any necessary training on appropriate use of relevant software. Confirmation of the training and understanding of the requirements will be documented on a training course log sheet. Signing the log sheet will certify that the Project personnel understand and will comply with the necessary requirements throughout the activities requiring monitoring. The training program will be provided to NOAA Fisheries for review prior to the start of these activities. Dominion Energy will provide training certificates for individual PSOs to BOEM or BSEE upon request. Specific requirements applicable to PSOs on duty during pile driving activities are addressed in Appendix F Foundation Installation PSO Plan.

Table 4. Activities requiring PSO/PAM coverage

Coverage	Vessels Transit	Foundation Installation	HRG Surveys
PSO		X	X (for HRG equipment operating less than 180 kHz)
PAM	X (for vessel transits over 10 knots)	X	X (reduced visibility conditions)
ECM	X	X	X
DVO	X	X	X
Note: ECMs may serve as the DVO. PSOs may also serve as the DVO within adherence to standard PSO shifts, breaks, and maximum hours per day of active duty.			

All PAM operators will be NOAA Fisheries approved and will have completed an appropriate PSO training program in addition to a PAM training course as assigned by the provisioner of PSO and PAM services.

[5] https://repository.library.noaa.gov/view/noaa/15851
[6] http://www.fisheries.noaa.gov/new-england-mid-atlantic/careers-and-opportunities/protected-species-observers

PAM operators will have relevant acoustic monitoring experience in the Atlantic Ocean or Gulf of Mexico. The resumes of all proposed PSOs and PAM operators will be submitted to BOEM for review and approval by NOAA Fisheries on an appropriate timeline determined via consultation with NOAA Fisheries and BOEM prior to the start of mitigation and monitoring activities.

PAM operators will have the qualifications and relevant experience to meet the needs of the PAM program, including safe deployment and retrieval of equipment as necessary, set-up and monitoring of acoustic processing software, and knowledge in detecting and localizing marine mammal vocalizations.

In addition to the training indicated above, PAM operators will also complete supplemental training covering marine mammal identification and behaviors, documentation of field observations, data collection protocols, any necessary training on appropriate use of relevant software, and a refresher session with the PSO provider and Project compliance representative(s). The refresher session will review the protected species expected in the Project Area and associated regulatory requirements, and it will be conducted shortly before the anticipated start of Project activities. The refresher session will be tailored to the needs of the particular PAM team and will take into consideration the recent field projects completed by the PAM team.

6 EQUIPMENT STANDARDS

6.1 Visual Monitoring Equipment

The PSOs will be equipped with binoculars and range finders to estimate distances to marine protected species located in proximity to their established zones (Foundation Installation PSO Plan, Appendix F). Reticulated binoculars will also be available to PSOs for use as appropriate based on conditions and visibility to support the sighting and monitoring of marine species. Digital single-lens reflex camera equipment will be used to record sightings and verify species identifications and will be available on the construction vessel and on the PSO vessel(s). Larger zones will be monitored using Big Eyes (long range binoculars) during impact pile driving.

6.1.1 Nighttime/Low-Light Visual Monitoring for Pile Driving

An Alternative Monitoring Plan (Section 10), if approved by BOEM, BSEE, and NOAA Fisheries, will be implemented during periods of low-light or reduced visibility (e.g., darkness, rain, fog, etc.). Please note that Dominion Energy would only initiate foundation pile driving (inclusive of both vibratory and impact) during daylight hours within their specific pile driving window (i.e., May 1st through October 31st), defined as no earlier than 1 hour after civil sunrise and no later than 1.5 hours before civil sunset. Because of this, no nighttime pile driving (defined as pile driving beginning after defined nighttime hours), is expected to occur. However, Dominion Energy may continue pile driving after dark only if installation of the same pile began during daylight hours (i.e., 1.5 hours before civil sunset). In either situation, Dominion Energy would still need to adequately monitor all relevant zones to ensure the most effective mitigative actions are being undertaken, in alignment with an Alternative Monitoring Plan that would be submitted to BOEM, BSEE, and NOAA Fisheries for approval prior to foundation pile driving beginning. Equipment specifications for nighttime visual monitoring during pile driving are provided in Appendix F, Attachment F-2 Night Vision Devices and Infra-Red Equipment Specifications.

6.1.2 Low-Light Visual Monitoring Equipment for Nearshore Activity

Visual monitoring of nearshore activities will employ supplemental equipment during low-light conditions, which can include night-vision equipment (night-vision goggles with thermal clip-ons) and/or infrared (IR) capabilities. Studies have concluded that the use of thermal IR imaging technology allows for the detection of marine protected species at night as well as improves the detection during all periods with automated detection algorithms (Weissenberger 2011). In a recent study comparing the relative performance of thermal IR imaging-based systems and marine protected species visual observers, the distance to detection peaks for the IR systems ranged from approximately 0.5 to 3.0 km with differences in peak location attributed to platform height (lower platforms resulted in closer detection peaks), animal behavior, sea state, wind force, and visibility. In reduced visibility conditions, such as dense fog, the detection performance of the IR system and marine protected species visual observers was impeded equally, while during hazy and misty conditions, the IR system can "see" farther than the marine protected species visual observer (Zitterbart et al. 2020). Results of studies demonstrate that thermal imaging can be used for reliable and continuous marine mammal protection (Zitterbart 2013) within these distances. For this reason, Dominion Energy finds that use of IR systems for mitigation purposes warrants additional application in the field as both a stand-alone tool and in conjunction with other alternative monitoring methods (e.g., night vision binoculars). Additionally, rapidly developing experimental applications of technology, such as autonomous vehicles, remote operated vehicles, and machine learning analyses, may provide for enhanced monitoring capabilities in low light or limited vision situations (Macrander et al. 2021; Dujon et al. 2021).

6.1.3 Nighttime/Low-Light Visual Monitoring Equipment for HRG Surveys

An Alternative Monitoring Plan (Section 10), if approved by BOEM, BSEE, and NOAA Fisheries, will be implemented during nighttime HRG survey operations when equipment operating below 180 kHz is in use: vessel-based PSOs will use night-vision equipment (night-vision goggles with thermal clip-ons), IR technology, and PAM (Appendix D).

6.2 Protected Species Risk Reduction Measures for Acoustic Buoy Operations

Buoy equipment and deployment activities are designed to adhere to the best management practices recommended by NOAA Fisheries via the ESA consultation to minimize any potential risks to protected marine species. All buoys will be properly labeled, including ownership and contact information.

To reduce the risk of entanglement, the best available mooring systems will be used, specifically designed for the individual water depth at which each buoy will be deployed and in consideration of the local current and wave conditions. Mooring arrangements will be based on appropriate industry standards and will employ the shortest practicable line length for buoy deployment, thus ensuring that no excess line is present in the water column and further minimizing the risk of entanglement while ensuring the safety and integrity of the structure. Designs include intermediate in-line floats, rubber cords for the wave rider, and suitable ground lines (e.g., chains or cables) that prevent lines from looping, wrapping, or otherwise entrapping protected species. Additional protection measures, such as protective rubber sleeves to ensure lines are rigid and taut to reduce entanglement, will also be considered as practicable, although there are no current planned activities to which this measure would be applicable.

Trained Project personnel (e.g., DVOs or PSOs) will maintain a vigilant watch for protected species, covering a 500-m radius zone during buoy deployment and retrieval operations. In the event that a protected species is sighted within the 500-m zone, activities will stop until the animal has been observed exiting the zone. Buoy deployment will be a controlled process such that equipment is lowered to the seabed using a deck winch and A-frame to further minimize risks to benthic habitats.

In the event that any live or dead marine protected species becomes entangled, Project personnel will immediately report the interaction to the NOAA Fisheries stranding coordinator via the 24-hour Stranding Hotline at (866) 755-6622. Project personnel will assist in data collection and recovery efforts as practicable.

7 CONSTRUCTION ACTIVITIES

7.1 Pile Driving for Foundations

Noise attenuation technology will be utilized during foundation installation vibratory and impact pile driving to mitigate impacts to protected species. Dominion Energy commits to using soft-start procedures to keep marine protected species away from the activities by utilizing lower hammer energies during the start of the pile driving process and gradually increasing the force of pile driving. Further details on pile driving protocols and associated monitoring and reporting are detailed in the Pile Driving Monitoring, Mitigation, and Management Plan (Appendix C), the Foundation Installation PSO Plan (Appendix F), and the PAM Plan (Appendix D). A monitoring zone of 500 m in all directions will be maintained for ESA-listed fish species. If any ESA-listed species is sighted, data on the sighting will be recorded and reported as per the COP approval conditions.

7.1.1 Clearance and Shutdown Zones

Clearance and Shutdown zones will be established and continuously monitored during foundation installation activities which are designed to minimize impacts to marine protected species during vibratory and impact pile driving as per the conditions of the LOA, Biological Opinion, and COP approval (Table 5 and Table 6). NOAA Fisheries has established the minimum visibility distance to be 2,000 m. For the CVOW Commercial Project, the use of Big Eyes will ensure coverage of the minimum visibility zone.

Noise attenuation via a double big bubble curtain will be utilized during impact and vibratory pile driving for foundation installation and supplemented as necessary with an alternative abatement technology. During impact and vibratory pile driving activities, a monitoring zone of 500 m in all directions will be maintained for ESA-listed fish species. If any ESA-listed species is sighted, data on the sighting will be recorded and reported as per the Lease conditions. Dominion Energy will follow the Clearance and Shutdown Zones for vibratory pile driving of both monopiles and pin piles, as shown in Table 5 and Figure 2. The Clearance and Shutdown Zones for impact pile driving activities for foundations are shown in Table 6, Figure 3, and Figure 4.

Table 5. Clearance and Shutdown Zones for Vibratory Pile Driving of Foundations

Species	Clearance Zone (m)		Shutdown Zone (m)	
	One Per Day	Two per Day	One Per Day	Two per Day
North Atlantic right whale – PAM	at any distance	at any distance	at any distance	at any distance
North Atlantic right whale – visual detection	at any distance*	at any distance*	at any distance*	at any distance*
Minimum visibility distance	2,000	2,000	2,000	2,000
All other Mysticetes and sperm whales	1,000	1,000	1,000	1,000
Harbor porpoise	500	500	500	500
Dolphins and pilot whales	250	250	250	250
Seals	250	250	250	250
Sea Turtles	1,000	1,000	100	100

Notes:

Clearance and shutdown zones account for practicality concerns, including the functional effective distances for visual monitoring. In general, if the modeled PTS distance was less than 100 m, the clearance zone was set at 250 m; whereas if the modeled zone was greater than 100 m but less than 500 m, it was set at 500 m. A monitoring zone of 500 m in all directions will be maintained for ESA-listed fish species.

Table 6. Clearance and Shutdown Zones for Impact Pile Driving of Foundations

Species	Clearance Zone (m)		Shutdown Zone (m)	
	One per Day	Two per Day	One per Day	Two per Day
North Atlantic right whale – PAM	at any distance	at any distance	at any distance	at any distance
North Atlantic right whale – visual detection	at any distance*	at any distance*	at any distance*	at any distance*
Minimum visibility distance	2,000	2,000	2,000	2,000
All other Mysticetes and sperm whales	5,100	6,500	1,750	1,750
Harbor porpoise	750	750	750	750
Dolphins and pilot whales	500	500	500	500
Seals	500	500	500	500
Sea Turtles	1,000	1,000	500	500

Notes:

Clearance and shutdown zones account for practicality concerns, including the functional effective distances for visual monitoring. Note for high frequency cetaceans, the peak PTS distance was used given the small size of harbor porpoises and the likely visible identification range. In general, if the modeled PTS distance was greater than 100 m but less than 500 m, it was set at 500 m. A monitoring zone of 500 m in all directions will be maintained for ESA-listed fish species.

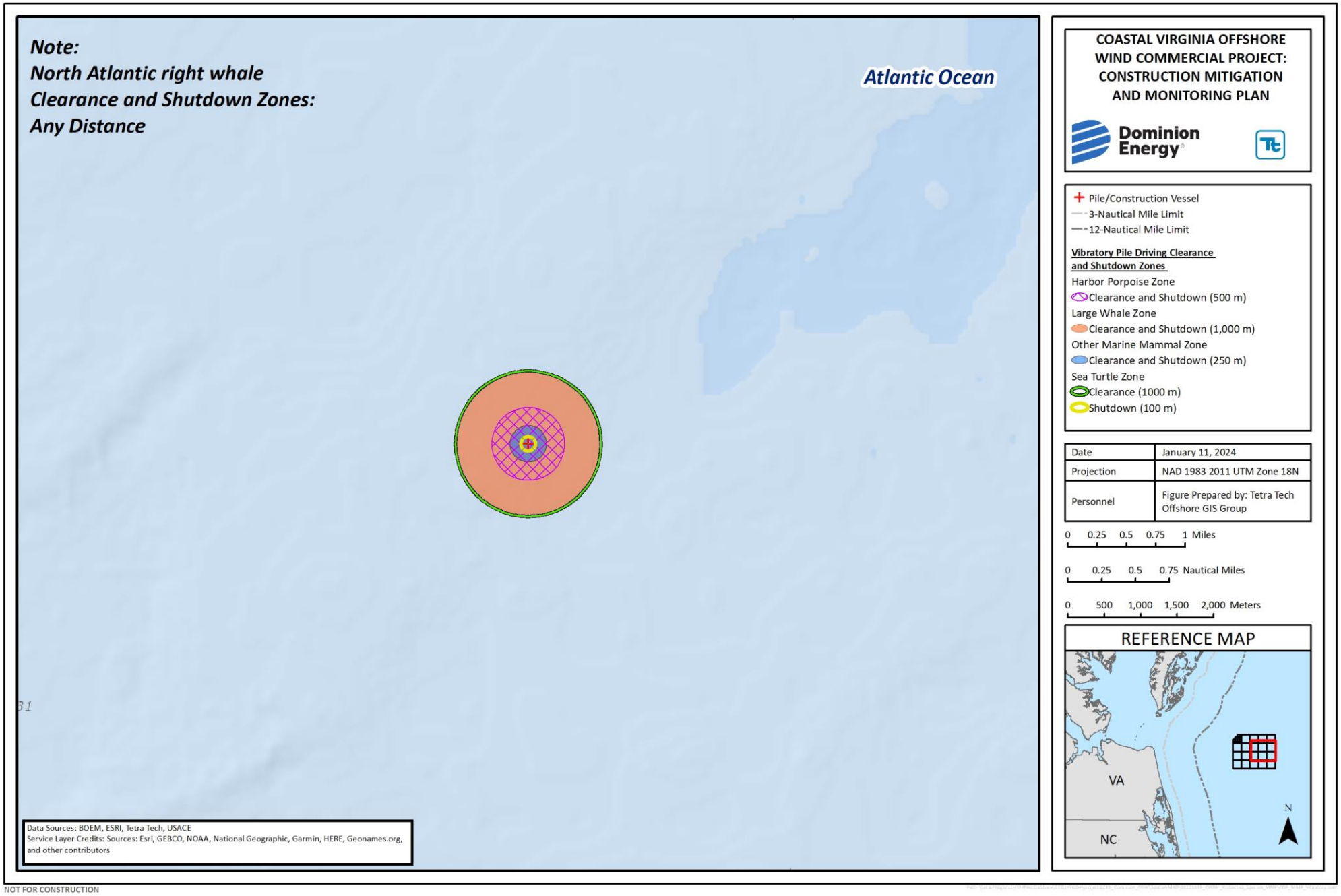

Figure 2. Clearance and Shutdown Zones for Vibratory Pile Driving

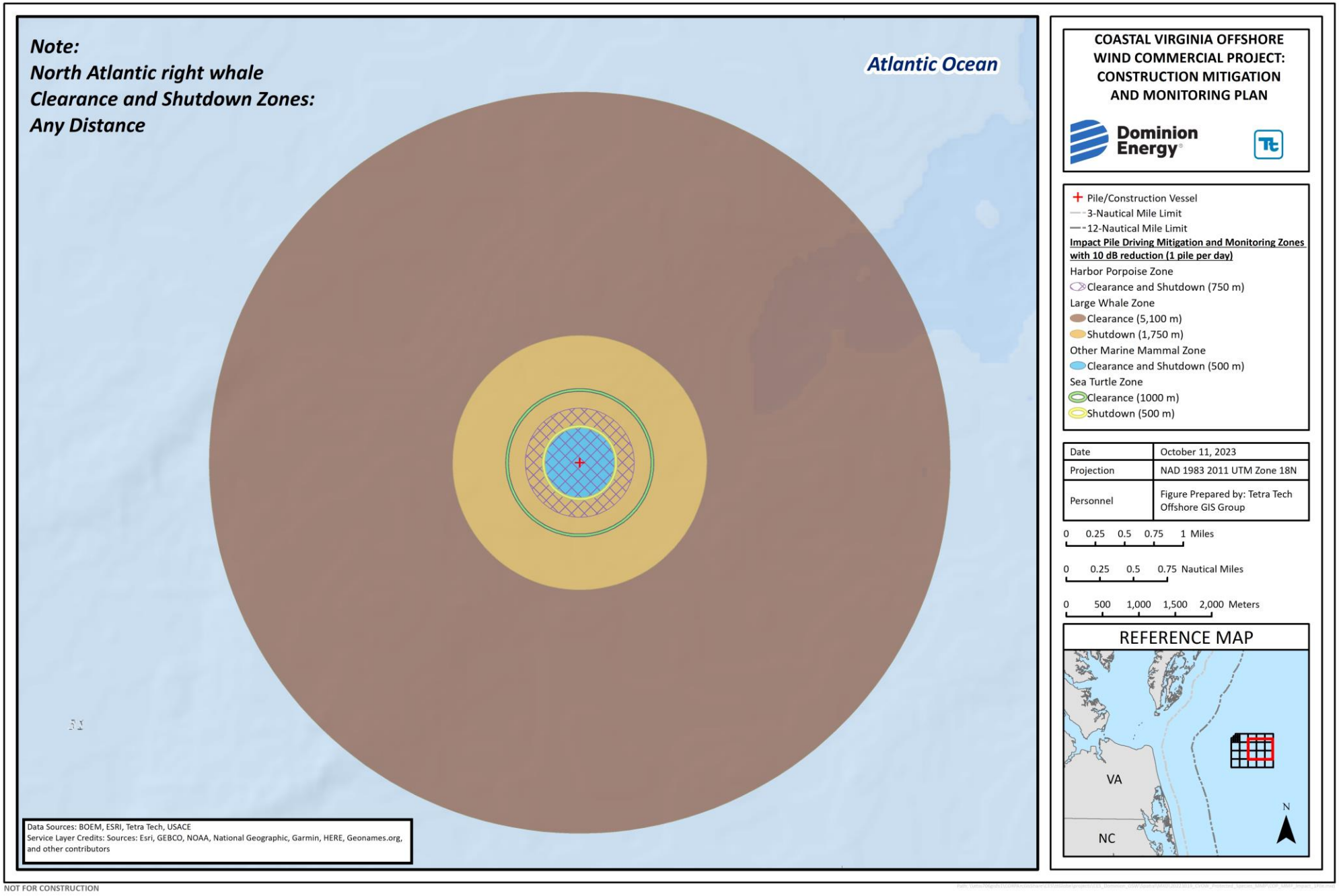

Figure 3. Impact Pile Driving Clearance and Shutdown Zones (1 pile per day)

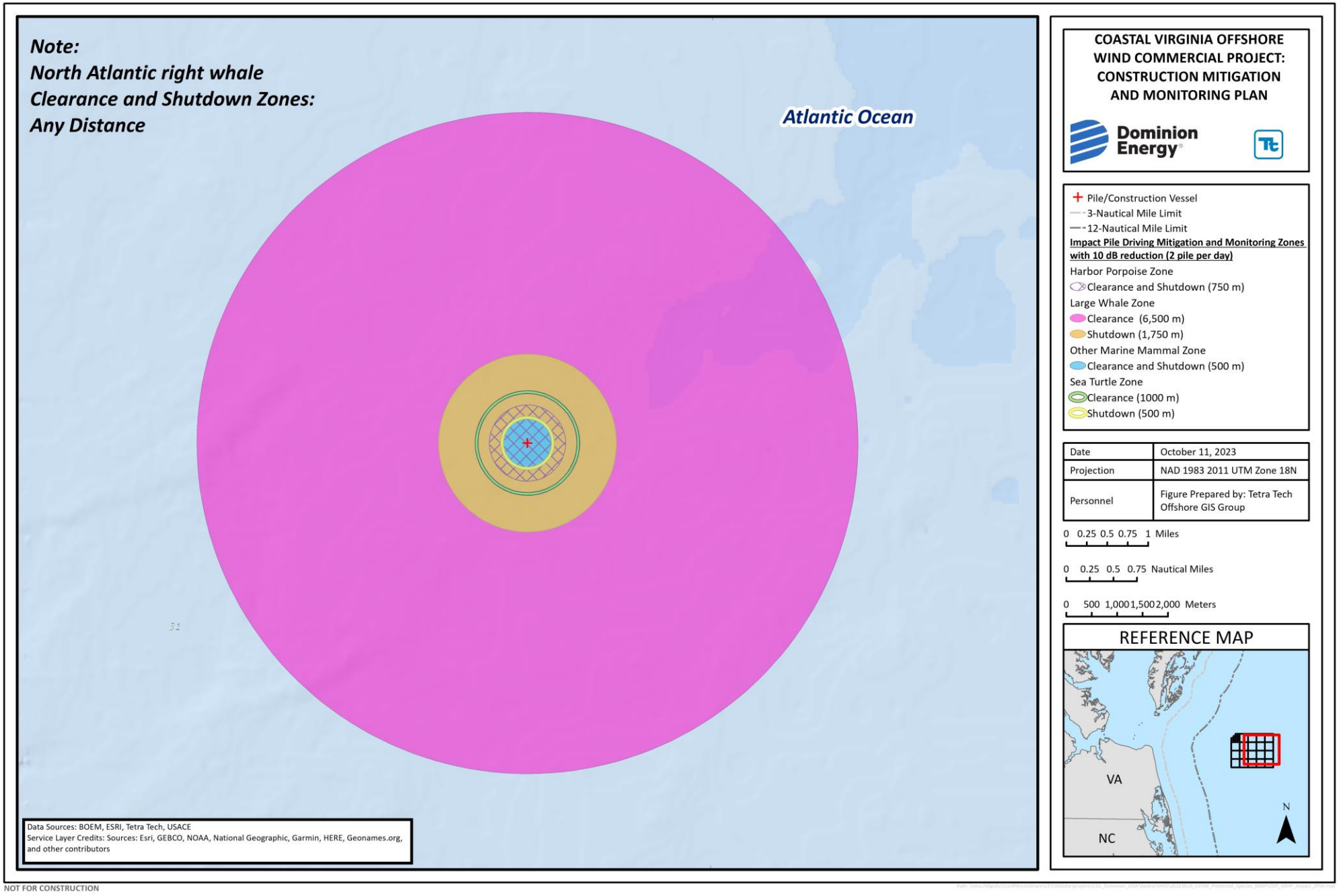

Figure 4 **Impact Pile Driving Clearance and Shutdown Zones (2 piles per day)**

7.1.2 Mitigation Methods for Construction Sound Sources

7.1.2.1 Noise Abatement Systems

To meet underwater modeled acoustic noise distances, Dominion Energy will deploy a double big bubble curtain capable of achieving the target of a 10-dB sound level reduction for all foundation installation activities. Dominion Energy achieved this level of reduction with a double big bubble curtain system during installation of the Pilot Project. Alternative technologies will be considered for implementation should Dominion Energy need to achieve additional attenuation. A more detailed description of the methods and plan for implementing the Double Big Bubble Curtain is available in Appendix G.

7.1.2.2 Soft-Start Protocols for Pile Driving Activities

The CVOW pile driving process consists of 4 consecutive phases:

1. Vibratory piling
2. Vibratory to Impact hammer switch
3. Impact piling soft start
4. Impact piling

Dominion Energy will utilize a soft-start protocol for all monopile and jacket foundation impact pile driving by performing no more than six strikes per minute using hammer energies not to exceed 20 percent. In total, the soft start procedure for each foundation pile will be no less than 20 minutes. A soft-start will occur at the beginning of the impact pile driving phase of each pile installation and at any time following the cessation of impact pile driving of 30 minutes or longer.

Soft-start is not applicable during vibratory pile installation.

7.1.2.3 Shutdown Protocols for Pile Driving Activities

The shutdown zones around the pile driving activities will be monitored by PSOs for the presence of marine protected species before, during, and after pile driving activity. In the case of pile driving, the shutdown requirement may not be practicable due to an emergency situation, such as imminent risk of injury or loss of life to an individual, risk of damage to a vessel, or if the lead engineer determines there is pile refusal or pile instability. During foundation pile driving, any significant stoppage of driving progress may allow time for displaced sediments along the piling surface areas to consolidate and bind resulting in pile refusal. Pile refusal occurs when the pile driving sensors indicate the pile is approaching refusal, and a shutdown would lead to a stuck pile, which then poses an imminent risk of injury or loss of life to an individual, or risk of damage to a vessel that creates risk for individuals. Pile instability occurs when the pile is unstable and unable to stay standing if the piling vessel were to ‘‘let go’’. During these periods of instability, the lead engineer may determine a shutdown is not feasible because the shutdown combined with impending weather conditions may require the piling vessel to ‘‘let go,’’ which then poses an imminent risk of injury or loss of life to an individual, or risk of damage to a vessel that creates risk for individuals. Dominion Energy will document and report to NOAA Fisheries all cases where the emergency exemption is taken. It is assumed any marine protected species occupying the area will move away from the sound source while

conducting impact pile driving. If a marine mammal is observed entering or within the respective zones after pile driving has commenced, a shutdown of pile driving will occur when practicable as determined by the lead engineer on duty, who must evaluate the following to determine whether shutdown is safe and practicable:

- Use of site-specific soil data and real time hammer log information to judge whether a stoppage would risk causing piling refusal at restart of piling;
- Confirmation that pile penetration is deep enough to secure pile stability in the interim situation, taking into account weather statistics for the relevant season and the current weather forecast; and
- Determination by the lead engineer on duty will be made for each pile as the installation progresses and not for the site as a whole.

If a shutdown is called for but the Pile Driving Operations Manager (PDOM) determines shutdown is not practicable due to an imminent risk of injury or loss of life to an individual, or risk of damage to a vessel that creates risk of injury or loss of life for individuals, reduced hammer energy (power down) will be implemented when the lead engineer determines it is practicable. Specifically, pile refusal or pile instability could result in the inability to shutdown or power down pile driving immediately. See Section 9 for further information.

Subsequent restart/increased power of the equipment can be initiated if the animal has been observed exiting its respective zone within 30 minutes of the shutdown, or after additional time has elapsed with no further sighting of the animal that triggered the shutdown (i.e., 15 minutes for small odontocetes and 30 minutes for all other species).

If pile driving shuts down for reasons other than mitigation (e.g., mechanical difficulty) for brief periods (i.e., less than 30 minutes), it may be activated again without soft-start, if PSOs have maintained constant observation and no detections of any marine mammal have occurred within the respective zones.

7.1.3 Monitoring Protocols for Construction

PSO protocols are addressed specifically in the Foundation Installation PSO Plan (Appendix F). In general, PSOs will be equipped with binoculars and range finders to estimate distances to marine protected species located in proximity to their established zones. Reticulated binoculars will also be available to PSOs for use as appropriate based on conditions and visibility to support the sighting and monitoring of marine species. Digital single-lens reflex camera equipment will be used to record sightings and verify species identification. Larger zones will be monitored using Big Eyes. Additional innovative technologies may be implemented through consultation with the appropriate federal agency as available market options continue to evolve.

Observations will take place from the highest available vantage point on the survey vessel in accordance with all appropriate human safety considerations and vessel operator approval. General 360-degree scanning will occur during the monitoring periods, and target scanning by the PSOs will occur when alerted of a marine mammal presence.

Data on all PSO observations will be recorded based on standard PSO collection requirements. This will include dates and locations of survey operations; time of observation, location, and weather; details of the

sightings (e.g., species, age classification [if known], numbers, behavior), and details of any observed "taking" (such as behavioral disturbances, injury, or mortality). The data sheet will be provided to both NOAA Fisheries, BSEE, and BOEM for review and approval prior to the start of in-water activities. In addition, prior to initiation of Project activities, all Project personnel will undergo Environmental Training, a component of which will focus on the procedures for sighting and protection of marine protected species. A briefing will also be conducted between the Project supervisors and personnel, the PSOs, and Dominion Energy. The purpose of the briefing will be to establish responsibilities of each party, define the chains of command, discuss communication procedures (see Section 8), provide an overview of monitoring purposes, and review operational procedures.

7.1.3.1 PSO Protocols for Construction

During pile driving, PSOs will be on active duty as follows:

- A minimum of three PSOs will be on active duty at the pile driving vessel/platform from 60 minutes before, during, and for 30 minutes after all pile driving activity; and
- A minimum of two PSOs will be on active duty on a dedicated PSO vessel positioned approximately 3 km from the pile from 60 minutes before, during, and for 30 minutes after all pile driving activity. The dedicated PSO vessel will be located at the best vantage point in order to observe and document marine mammal sightings in proximity to the Clearance/Shutdown zones. During the month of May, a secondary PSO vessel with a minimum of two PSOs on active duty will provide supplemental monitoring to increase the likelihood of detection for NARWs.
- PSO protocols may be revised based on Sound Field Verification (SFV) data in consultation with NOAA Fisheries and in accordance with the provisions in the LOA.

The bridge of the installation vessel is elevated. It is anticipated that PSOs will be placed on top of the bridge deck, at a high platform. PSOs will also be placed on the helipad if conditions allow for safe placement of PSOs at this level. The use of Big Eyes is planned and would further expand the viewshed.

Visual monitoring of the established shutdown zones and monitoring zones will be performed by qualified and NOAA Fisheries–approved third-party PSOs. The PSOs will be responsible for visually monitoring and identifying marine protected species approaching or entering the established shutdown zones during survey activities. It will be the responsibility of the Lead PSO on duty to communicate the presence of marine protected species as well as to communicate and enforce the action(s) that are necessary to ensure mitigation and monitoring requirements are implemented as appropriate. Observations from other PSOs will be communicated to the Lead PSO on duty, who will then be responsible for implementing the necessary mitigation procedures.

Dominion Energy will implement a 60-minute clearance period of the clearance zones for both impact and vibratory pile driving associated with foundation installation. Pile driving will not be initiated when a marine mammal is observed within its respective clearance zone. Pile driving will not begin until after the animal(s) has been observed exiting its respective zone, or until an additional time period has elapsed with no further sightings (i.e., 15 minutes for small odontocetes and pinnipeds and 30 minutes for all other species). Pile driving will be delayed upon a confirmed visual sighting of a NARW, at any distance, or in the event that PSOs cannot identify a large whale and would conservatively assume that the species is a

NARW and then would delay pile driving accordingly. If pile driving has been shut down due to the presence of a NARW, pile driving must not restart until the NARW has neither been visually nor acoustically detected for 30 minutes. Upon re-starting pile driving, soft-start protocols for impact piling only must be followed if pile driving has ceased for 30 minutes or longer.

Pile driving will also be delayed upon a confirmed PAM detection of a North Atlantic right whale, at any distance.

PSO Protocols for Construction - Lead PSO

Prior to commencement of construction activities, a senior-level PSO operator, defined by a NOAA Fisheries set of minimum criteria, will be designated Lead PSO on each location/vessel. The Lead will be the main point of contact (POC) for all communications between other Project or Vessel Managers and will ensure that all communication protocols are followed at all times during Project activities. The Lead will:

- Coordinate and oversee PSO Operations and ensure compliance with monitoring requirements;
- Record and report marine mammal sightings, construction activities, and environmental conditions according to plan;
- Monitor and advise on sound source and vessel operations for compliance with the environmental requirements for the plan;
- Communicate with the Project personnel to implement mitigation actions as required by environmental protocols (including delays to initiation of all construction equipment);
- Oversee all deployments and retrievals of the hydrophone cable; and
- Participate in daily meetings and drills with Project personnel when appropriate.

The Lead PSO will determine if site conditions prevent adequate monitoring of the pile driving clearance zones (i.e., if they are obscured by fog, inclement weather, poor lighting conditions) for a 60-minute period prior to the commencement of either vibratory hammer operation or soft-start for impact pile driving. The Lead PSO will call for a delay until the conditions present in the clearance zones have been alleviated and the entire clearance zone is visible in all directions. If pile driving has been initiated before the onset of inclement weather, activities may continue through these periods if deemed necessary to ensure human safety and/or the integrity of the Project.

PSO Protocols for Construction - PSOs

All PSOs will:

- Visually monitor, detect, and identify protected species;
- Record and report according to plan;
- Monitor and advise on sound source and vessel operations for compliance with the environmental requirements for the plan;
- Communicate with the Project personnel to implement mitigation actions as required by environmental protocols; and
- Participate in daily operation meeting with Project personnel when appropriate.

7.1.3.2 PAM Protocols for Construction

The Project will implement PAM during foundation installation and as a vessel strike mitigation measure. During foundation installation, including vibratory and impact hammer installation, PAM will begin 60 minutes prior to the initiation of vibratory pile driving, throughout foundation installation, and for 30 minutes after pile driving has been completed. PAM will be conducted by a dedicated, qualified, and NOAA Fisheries-approved PAM operator. At least one PAM operator will review data from at least 24 hours prior to pile driving and actively monitor hydrophones for 60 minutes prior to pile driving.

The PAM operator(s) will review the hydrophone signals and data transmitted in real time both aurally (using headphones) and visually (via the monitor screen displays). PAM operators will communicate detections of any marine protected species to the Lead PSO on duty who will ensure the implementation of the appropriate mitigation measures (i.e., delay or shutdown of pile driving). If the PAM system detects a marine mammal entering or within the respective Shutdown Zone after pile driving has begun, the PSO will confirm the detection and call for a shutdown of pile driving and Dominion Energy will stop pile driving immediately, unless shutdown is not practicable due to imminent risk of injury or loss of life to an individual or risk of damage to a vessel that creates risk of injury or loss of life for individuals, or the lead engineer determines there is risk of pile refusal or pile instability. An acoustic detection of a NARW at any distance triggers mitigative action (i.e., delay or shutdown of pile driving). As outlined in Van Parijs et al. (2021) NOAA and BOEM Minimum Recommendations for Use of Passive Acoustic Listening Systems in Offshore Wind Energy Development Monitoring and Mitigation Programs, the PAM system will 1) consider the target frequencies, especially those for detecting North Atlantic right whales; 2) consider species-specific automated detection software options if feasible, 3) consider localization capabilities if feasible, 4) assess whether a towed or fixed system would be more appropriate, and 5) within 90 calendar days following the completion of activities per year, send the full raw PAM recording data to the NOAA National Centers for Environmental Information (NCEI) PAM archive through pad.info@noaa.gov and will make all PAM species detection data available via the Northeast Passive Acoustic Reporting System via nmfs.nec.pacmdata@noaa.gov following International Organization for Standardization (ISO) standards for required detection, measurement, and metadata information. The system chosen will dictate the design and protocols of the PAM operations.

PAM Operator

All PAM operators will:

- Acoustically monitor, detect, and identify marine protected species and determine distance to source;
- Record and report marine mammal sightings, construction activities, and environmental conditions according to plan;
- Monitor and advise on sound source and vessel operations for compliance with the environmental requirements;
- Communicate with the Project personnel to implement mitigation actions as required by environmental protocols;
- Maintain and troubleshoot the PAM system hardware and software; and

- Oversee all deployments and retrievals of the hydrophone cable.

7.1.4 Adaptive Management

NOAA Fisheries retains the authority to perform adaptive management and revise or change the provisions in the final Letter of Authorization, in agreement and discussion with Dominion Energy, if new information presents itself. Additional innovative technologies may be implemented as available market options continue to evolve and increased data on efficacy of emerging monitoring technologies are available. Dominion Energy would consider incorporating new technologies that may provide adequate monitoring to allow for initiation of pile driving during nighttime hours in consultation with the appropriate Federal agencies; however, nothing proposed in terms of the construction scenarios (e.g., piles per day, etc.) or mitigation (e.g., clearance and shutdown zones) would change. In the event that adaptive management protocols are pursued, any and all changes proposed are subject to approval by the relevant federal agency.

7.1.4.1 Sound Field Verification (SFV)

Dominion Energy will conduct field verifications (see Appendix E for details) of actual impact pile driving and vibratory pile driving during installation of at least the first three WTG monopile foundations and all piles associated with the three offshore substations for model validation purposes and to further determine the effectiveness of the mitigation measures employed. All raw SFV data will be sent to the NOAA NCEI PAM archive through pad.info@noaa.gov within 90 calendar days following the completion of each pile-driving season following the NCEI guidance for packaging the data. Additional SFV may be necessary upon delivery of reports and data to Federal partners and upon discussion. Specifics on the details of the SFV plan can be found in Appendix E.

7.2 Vibratory Pile Driving for Cofferdam Activities

The CVOW Project has determined that the cofferdam and goal post installation and removal activities are no longer necessary to complete the trenchless installation. Dominion Energy will instead be using a Controlled Flow Excavation tool at the Direct Pipe punchout as was presented in the COP and considered in the NOAA Fisheries Biological Opinion not to be a source of disturbance. Should the CVOW Project require installation and removal of cofferdams and/or goal posts, Dominion Energy will revise and resubmit these sections to request concurrence with the mitigation and monitoring specific aspects of these activities.

7.3 Trenchless Installation – Goal Posts

The CVOW Project has determined that the cofferdam and goal post installation and removal activities are no longer necessary to complete the trenchless installation. Dominion Energy will instead be using a Controlled Flow Excavation tool at the Direct Pipe punchout as was presented in the COP and considered in the NOAA Fisheries Biological Opinion not to be a source of disturbance. Should the CVOW Project require installation and removal of cofferdams and/or goal posts, Dominion Energy will revise and resubmit these sections to request concurrence with the mitigation and monitoring specific aspects of these activities.

7.4 HRG Surveys

Where technically feasible, a ramp-up procedure will be used for HRG survey equipment capable of adjusting energy levels at the start or re-start of HRG survey activities. Ramp-up must begin with the power of the smallest acoustic equipment at its lowest practical power output appropriate for the survey. When technically feasible, the power must then be gradually turned up and other acoustic sources added in a way such that the source level increases gradually.

Ramp-up activities will be delayed if a marine protected species (except for species known to bow-ride such as delphinids from genera *Delphinus, Lagenorhynchus, Stenella,* or *Tursiops*) enters a shutdown or clearance zone(s). Ramp-up will not continue until the animal has been observed exiting its respective shutdown or clearance zone or until an additional time has elapsed with no further sighting (i.e., 15 minutes for small odontocetes and pinnipeds and 30 minutes for all other species).

7.4.1 Clearance and Shutdown Zones

A visual clearance zone of 500 m in all directions will be maintained for ESA-listed species. The Clearance and Shutdown Zones for HRG survey activities are shown in Table 7.

Table 7. Clearance and Shutdown Zones for HRG Survey Activities

Species	Clearance Zone (m)	Shutdown Zone (m)
North Atlantic right whale – visual detection	500	500
Non-NARW ESA-listed species	500	500
All other marine mammals, except delphinids from genera *Delphinus, Lagenorhynchus, Stenella,* or *Tursiops*	100	100
Sea Turtles	500	100

Note:
Clearance and shutdown zones proposed based on distances to NOAA Fisheries harassment criteria (NOAA Fisheries 2018).

7.4.2 Mitigation Methods for HRG Sound Sources

In the two days prior to, and daily throughout operations of equipment with the potential to disturb marine protected species, the Lead PSO of the monitoring team will consult NOAA Fisheries North Atlantic right whale reporting systems and monitor WhaleAlert software for the presence of North Atlantic right whales. The proposed activities will occur within the vicinity of the Right Whale Mid-Atlantic SMA at the mouth of the Chesapeake Bay. Activities conducted prior to May 1 will comply with the seasonal mandatory speed restriction period for this SMA (November 1 through April 30) for any work or transit within this area.

Throughout all phases of the survey activities, Dominion Energy will monitor NOAA Fisheries North Atlantic right whale reporting systems for the establishment of a DMA. If NOAA Fisheries should establish a DMA in the Lease Area or cable route corridor being surveyed, within 24 hours of the establishment of the DMA Dominion Energy will work with NOAA Fisheries to determine necessary actions, including a potential shutdown or alteration of activities to avoid the DMA. Dominion Energy will comply with all speed restrictions as detailed in the VSAP (Appendix A).

7.4.2.1 Clearance for HRG Survey Activities

For operation of HRG survey equipment with operating frequencies below 180 kHz with the potential to acoustically harass marine protected species, Dominion Energy will implement a 30-minute clearance period of the shutdown and clearance zones prior to the initiation of ramp-up. During this period, the shutdown and clearance zones will be monitored by the PSOs, using the appropriate visual technology for the duration. Ramp-up may not be initiated if any marine protected species is within its respective shutdown or clearance zone. If a marine protected species is observed within a shutdown or clearance zone during the clearance period, ramp-up may not begin until the animal(s) has been observed exiting its respective zone or until additional time has elapsed with no further sightings (i.e., 15 minutes for small odontocetes and pinnipeds and 30 minutes for all other species).

7.4.2.2 Ramp-up Procedures

When technically feasible, survey equipment must be ramped-up at the start or re-start of survey activities. Ramp-up must begin with the power of the smallest acoustic equipment at its lowest practical power output appropriate for the survey. When technically feasible, the power must then be gradually turned up and other acoustic sources added in a way such that the source level increases gradually.

Ramp-up activities will be delayed if a marine protected species enters a shutdown or clearance zone(s). Ramp-up will not continue until the animal has been observed exiting its respective shutdown or clearance zone or until additional time has elapsed with no further sighting (i.e., 15 minutes for small odontocetes and pinnipeds and 30 minutes for all other species).

7.4.2.3 Shutdown for HRG Survey Activities

An immediate shutdown of the HRG survey equipment will be required if a marine protected species is sighted at or within its respective shutdown zone (Table 7). For dolphins, shutdown will not occur if the animal is determined to be exhibiting voluntary approach (e.g., bow-riding) behavior. For seals, whales, other marine protected species, and, in particular, the North Atlantic right whale, the vessel operator will comply immediately with any call for shutdown by the Lead PSO. Any disagreement between the Lead PSO and vessel operator will be discussed only after shutdown has occurred. Subsequent restart of the survey equipment can be initiated if the animal has been observed exiting its respective shutdown zone within 30 minutes of the shutdown or after additional time has elapsed with no further sighting (i.e., 15 minutes for dolphins and pinnipeds and 30 minutes for all other species).

If the acoustic source is shutdown for reasons other than mitigation (e.g., mechanical difficulty) for brief periods (30 minutes or less), it may be activated again without ramp-up if PSOs have maintained constant observation and no detections of any marine protected species have occurred within the respective shutdown zones.

If the acoustic source is shutdown for a period longer than 30 minutes and PSOs have maintained constant observation, then ramp-up procedures will be initiated as described in Section 7.4.2.2.

7.4.3 Monitoring Protocols for HRG Survey Activities

For HRG surveys where PSOs are required (i.e., equipment operated below 180 kHz) a team of between two to six PSOs must be present on every 24-hour survey vessel and two to three PSOs must be present on every 12-hour survey vessel to undertake visual watches, implement mitigation, and conduct data collection and reporting. At least one PSO must be on active-duty monitoring during HRG surveys conducted during daylight hours (i.e., from 30 minutes prior to civil sunrise through 30 minutes following civil sunset) and at least two PSOs must be on active duty monitoring during HRG surveys conducted at night. For all surveys, each PSO will be on duty for no more than a four-hour shift with at least a two-hour break in between each shift. No one PSO will be on duty for more than 12 hours during any 24-hour period. The PSOs on HRG vessels must begin monitoring 30 minutes prior to activating acoustic sources, during the use of these acoustic sources, and for 30 minutes after use of these acoustic sources has ceased. Any observations of marine protected species must be communicated to PSOs on all nearby survey vessels during concurrent HRG surveys. During daylight hours when survey equipment is not operating, Dominion Energy must ensure that visual PSOs conduct, as rotation schedules allow, observations for comparison of sighting rates and behavior with and without use of the specified acoustic sources. Off-effort PSO monitoring must be reflected in the monthly PSO reports. For HRG survey activities where PSOs are not required (i.e., equipment operated above 180 kHz), visual monitoring may be conducted by other marine protected species monitoring crew (i.e., ECMs/DVOs). For survey activity not requiring a PSO, other marine protected species monitoring crew (i.e., DVOs/ECMs) will be on duty to ensure compliance with all vessel strike avoidance protocols.

The following measures apply to PSOs during HRG surveys using equipment operating at frequencies less than 180 kHz:

Lead PSO

Prior to commencement of survey operations, a senior-level PSO will be designated Lead PSO on each survey/vessel. The Lead PSO will be the main POC for all communications between other Project or Vessel Managers and will ensure that all communication protocols are followed at all times during Project activities. The Lead PSO will:

- Coordinate and oversee PSO operations and ensure compliance with monitoring requirements;
- Visually monitor, detect, and identify marine protected species and determine distance to source;
- Record and report marine protected species sightings, survey activities, and environmental conditions according to survey plan;
- Monitor and advise on sound source and vessel operations for compliance with the environmental requirements for the plan;
- Communicate with the Project personnel to implement mitigation actions as required by environmental protocols (including delays to initiation of regulated survey equipment operating below 180 kHz); and
- Participate in daily meetings and drills with Project personnel when appropriate.

PSOs

All PSOs will:

- Visually monitor, detect, and identify protected species;
- Record and report according to survey plan;
- Monitor and advise on sound source and vessel operations for compliance with the environmental requirements for the survey plan;
- Communicate with the Project personnel to implement mitigation actions as required by environmental protocols; and
- Participate in daily operation meeting with Project personnel when appropriate.
- In situations where PSOs are not required on HRG survey vessels (i.e., when HRG equipment operates at above 180 kHz), visual monitoring may be conducted by other marine protected species monitoring crew (i.e., ECMs/DVOs). ECMs and DVOs are on every vessel. When PSOs are onboard, they can serve as an ECM/DVO.

ECMs

All ECMs will:

- Monitor compliance with environmental regulations, permits, and vessel strike avoidance zones;
- Monitor all NARW Monitoring Notification Systems (see Appendix A);
- Review relevant communications protocol for reporting any dead, injured, or entangled protected species (refer to Section 8);
- Communicate any observations of marine protected species, including NARWs, to the vessel operator and advising appropriate strike avoidance measures immediately (Appendix A);
- Ensure adherence to communication protocols, reporting, and recordkeeping procedures as described in the Project permits (see Section 11);
- Ensure communications with other vessel visual observers, DVOs, PSOs, and PAM Operators are maintained for any detections of NARWs and other protected species (see Section 8; see also Appendix A); and
- If applicable, transition into the role of DVO during periods of activity involving protected species, ensuring their safety and well-being.

DVOs

All DVOs will:

- Monitor ESA-listed species vessel strike avoidance zone around the vessel during transit;
- Monitor all NARW Monitoring Notification Systems (see Appendix A);
- Review relevant communications protocol for reporting any dead, injured, or entangled protected species (refer to Section 8);

- Communicate any observations of marine protected species, including NARWs, to the vessel operator and advising appropriate strike avoidance measures immediately (Appendix A);
- Follow all reporting and recordkeeping procedures as described in the Project permits (see Section 11); and
- Ensure communications with other vessel visual observers, ECMs, PSOs, and PAM Operators are maintained for any detections of NARWs and other protected species (see Section 8; see also Appendix A).

In certain scenarios, the roles of ECM and DVO can be held by the same individual, especially in situations with limited personnel or vessel occupancy limitations. Both roles involve monitoring the vessel strike avoidance zone, NARW Monitoring Notification Systems, adhering to communication protocols, and cooperating with other personnel. The distinction is that ECMs have broader responsibility which encompasses overall compliance with regulations and permits while DVOs have a specialized focus on observing the forward path of vessels underway and making way while recording the presence of protected species.

8 COMMUNICATION PLAN

The MCC will be the central communication hub for the Project and will conduct a daily briefing for all vessels, which will include communication of the details of all marine mammal observations as well as other Project-related observations. Additionally, all visual or acoustic observations of marine protected species will be reported and communicated to other Project visual monitoring crew and vessels as soon as practicable. These mandatory briefings will be conducted between the supervisors and Project personnels, the PSOs, ECMs, DVOs, and Dominion Energy project personnel prior to the start of all pile driving activities in order to clarify and reiterate all roles, responsibilities, communication procedures, marine mammal monitoring protocols (including daily reminders to be aware of protected species), safety, reporting, and other operational procedures. This briefing will be repeated as needed in the event that new personnel join the Project [§ 217.294 Mitigation Requirements (a)(2)].

A robust three-way communication strategy will be universally implemented across all project components and platforms. This approach ensures that information is shared, comprehended, and acknowledged, fostering transparent coordination and real time updates throughout the Project's operations. The individual broadcasting the communication should select the most efficient method whenever possible considering safety precautions associated with that means of communication. All parties shall respond to acknowledge receipt of communications to document that the message was conveyed and understood. If a time-sensitive message is not acknowledged as received by all relevant parties, the party initiating the communication must move on to a different communication method (e.g., radio or satellite phone).

Methods of communication can include in-person conveyance, radio, satellite phone, or a digital messaging software/app.

Additional details on roles, responsibilities, and communications protocols applicable during pile driving operations are addressed in the Pile Driving Monitoring, Mitigation, and Management Plan (PDMP) (Appendix C) and the Foundation Installation PSO Plan (Appendix F).

8.1 DMA and Right Whale Slow Zone Notifications

The mandatory daily briefings with the MCC as the central communication hub for the Project will include a discussion on the status of any DMAs and Slow Zones. Project vessels and their crew will be instructed to monitor the NOAA website for updates on DMAs, Slow Zones, and any NARW sightings in the Project area to maintain situational awareness.

PSOs will check the NOAA website and Whale Alert prior to the start of every monitoring shift for the presence of DMAs, Slow Zones, or NARW sightings in the Project Area to maintain situational awareness (Appendix A).

8.2 Project Personnel Briefings

Prior to the start of all Project activities conducted on the water, and whenever new personnel join the Project, briefings will be held between construction and Project supervisors, personnels, and the PSO team, to reiterate responsibilities, communication procedures, protected species monitoring protocols, and operational procedures (§ 217.294 Mitigation Requirements (a)(2)).

All vessel crew members will receive Environmental Training (Appendix B) which includes identification of protected species, an overview of regulations, and best practices for avoiding vessel collisions (Appendix A). Protected species identification reference material will be available aboard all Project vessels.

All relevant personnel and the marine mammal species monitoring team(s) are required to participate in joint, onboard briefings, prior to the beginning of Project activities. The briefings must be repeated whenever new relevant personnel (e.g., new PSOs, construction contractors, relevant crew) join the Project before work commences. During these briefings, Dominion Energy will instruct all Project personnel regarding the authority of the marine mammal monitoring team(s). These briefings will include the following content:

Technical:

- Mitigation review
    - Vessel strike avoidance by protected species groups
    - Operations shutdown/delays/restart by protected species groups
- NARW
    - Reporting procedure
    - Multiple Project vessel communication
    - Vessel Strike Avoidance (VSA) procedures
    - Vessel speed restrictions
        - DMA review-NARW present in area
        - SMA review
        - NARW Slow Zones
- PSO requirements
    - Reporting
    - Communication

  - Watch schedule
  - Species monitoring
  - NARW alerts
- ECM requirements
  - Compliance oversight
  - Environmental regulations
  - Species monitoring
  - NARW alerts
- DVO requirements
  - Required when vessel speed > 10 knots
  - Species monitoring
  - NARW alerts
- PAM requirements
  - Required when vessel speeds > 10 knots
  - Species monitoring
  - NARW Alerts
- Special Reporting Requirements (includes species of concern, dead/injured protected species)

Safety:

- Safety hazards associated with Project in relation to VSA implementation (Appendix A).

8.3 Soft-Start/Ramp-up Communication Procedure

The Vessel Master on duty informs the Lead PSO aboard the activity vessel what time the activity is planned to commence so the PSO and PAM teams can coordinate their clearance periods accordingly (see Section 7 for guidelines and reference the Foundation Installation PSO Plan [Appendix F] for additional information). After the clearance period has passed, the Lead PSO receives confirmation from the PSO and PAM teams that the clearance and shutdown zones have been appropriately monitored, no delay is required, and soft-start/ramp-up may begin.

8.3.1 Protected Species Detection During Soft-Start/Ramp-up

If a detection occurred within the identified clearance zones (Figure 2, Figure 3, and Figure 4), the activity may commence after another 30 minutes have elapsed without re-detection (for large whales, non-delphinid odontocetes, and other marine protected species) or 15 minutes have elapsed without re-detection (for all other marine protected species) (§ 217.294 Mitigation Requirements (c)(6)).

Once the Vessel Master has clearance to begin soft-start/ramp-up, they will notify the Lead PSO (who will then notify the PSO and PAM teams) that soft-start/ramp-up has commenced. After the soft-start/ramp-up is complete, the Vessel Master will inform the Lead PSO (who will in turn notify the PSO and PAM teams) that full power has commenced. PSO and PAM monitoring will continue for the duration of the activity and 30 minutes following cessation of activity. If at any time electronic communications are not available, (i.e., due to an internet outage) alternate means of communication will be available via satellite phone or

radio. Details on the procedures and communications protocols associated with soft-start communications are addressed in the PDMP (Appendix C), including a soft-start communications protocol flowchart.

8.4 Shutdown Request Communication Procedure

At the first detection of a protected species inside the respective shutdown zone, the PSO or PAM Analyst immediately notifies the Lead PSO aboard the activity vessel via VHF radio/WhatsApp that a shutdown of operations must be requested, and the Vessel Master (VM) is notified. The VM will confirm the shutdown with the Lead PSO who will notify the PSO and PAM Analyst. During the detection, the PSO/PAM will continue to monitor and record ongoing behavior of the detected animal(s). When the animal exits the zone, the time that the protected species is last detected inside the respective shutdown zone is documented. Monitoring continues for 15 to 30 minutes following the last detection as appropriate based on species. The PSO/PAM Analyst informs the Lead PSO that a ramp up is cleared to commence after another 30 minutes have elapsed without re-detection (for all large whales, non-delphinid odontocetes, and other marine protected species) or 15 minutes have elapsed without re-detection (for all other marine protected species) (§ 217.294 Mitigation Requirements (c)(4)). The PSO and PAM monitoring will continue throughout the activities and for 30 minutes following cessation of activities. Details on the procedures and communications protocols associated with pile-driving shutdown requests are addressed in the Foundation Installation PSO plan (Appendix F) and the PDMP (Appendix C), including a shutdown request communications flowchart within the PDMP (Appendix C).

8.5 Protected Species Detection Notification

For any NARW detection, either acoustic or visual, notifications will follow the NARW detection procedure outlined in Appendices D and F. For all other protected species, at the first detection of a protected species (e.g., detection of live, dead, entangled, or injured protected species), the observer immediately notifies the Lead PSO or ECM as per the protected species detection procedure outlined in Appendices D and F. Throughout the detection incident, the observer will continuously monitor and record ongoing behavior and location of the detected animal(s). The Lead PSO notifies the VM if mitigation measures, such as a shutdown, are requested. The VM assesses the viability of the mitigative action request and notifies MCC who then notifies the Dominion Energy Environmental Compliance Coordinator. The Lead PSO will compile a report of the detection incident (per Section 11) for the VM to submit to the Dominion Energy Environmental Compliance Coordinator. Notification of regulatory agencies will follow the procedures outlined in Section 11. Specifics on protected species detection notifications during pile driving are addressed in Appendices D and F.

In the event of a detection, either acoustic or visual, of a NARW, the notification process outlined in the NARW detection communications flowchart in Appendices D and F will be followed.

8.6 Foundation Installation Communication Protocols

Any time a vessel enters the 500 m zone of the heavy lift vessel (HLV), a notification should be given via radio. See Table 8 for guidance on Project communication protocols.

Table 8. Foundation Installation Communication Protocols

Notification	When	Who	How
Heavy Lift Vessel (HLV) captain decides **heading of the vessel for pile installation**. - Survey Team to Provide Positioning Sketch & Double Big Bubble Curtain (DBBC) Way Points	2 days prior to piling *Any deviations or alterations in plan to be communicated asap.*	HLV to: - DBBC vessel	E-mail by survey team or PDV engineers
Regular updates provided to all vessels on next pile.	ETA at next pile	HLV to: - DBBC vessel - Lead PSO	electronic communication, satellite communications, or E-mail sent by Captain or VM
Update Plans for Next Pile Installation Batch	End of piling at last location of a trip	HLV to: - DBBC vessel - Lead PSO	E-mail sent by VMs or other electronic communication
3-hr Pre-Piling Notice	3-hr prior to start of piling	HLV to: - DBBC vessel - Lead PSO	electronic communication or VHF or radio
1-hr Pre-Piling Notice	1-h prior to start of piling	HLV to: - DBBC vessel - Lead PSO	electronic communication or VHF or radio
30 min Pre-Piling Notice	30 min prior to start of piling	HLV to: - DBBC vessel - Lead PSO	electronic communication or VHF or radio
DBBC full pressure verification notice	When DBBC reaches full pressure	DBBC vessel to HLV	electronic communication or VHF
PSO Notice of Clearance to Start Piling (minimum visibility acceptable and 60 minutes of visual and PAM monitoring completed)	When possible, according to clearance protocols	LEAD PSO to VM	electronic communication or radio
Constant communication between vessels during all piling operations	Start / Stop piling / Piling interrupted / Other relevant info	HLV Lead PSO DBBC vessel and reverse.	electronic communication or VHF
Constant communication between PSO and VMs during MP piling	Soft-start/ Start piling / Stop piling / Piling interrupted / shutdown	Lead PSO to VM and reverse	electronic communication or radio
Communication between PSOs and PAM operators - According to CMMP (Construction Mitigation and Monitoring Plan)	When possible, during pre-piling and piling	Lead PSO to the PAM team and reverse	electronic communication or Satellite phone (back-up)
Sound Field Verification and PAM vessel operations ⇨ Update planning and buoy deployment	When possible	Lead PSO to the PAM team and reverse	electronic communication or email

9 DECISION PLAN

Decision trees formulated to help guide crucial decisions based on real-time conditions to ensure safety and efficiency are in place for relevant Appendices to guide the best course of action for vessel operators and crew. The VSAP (Appendix A), includes decision trees for vessel captains to determine actions required regarding engine neutrality and vessel speed restrictions for marine protected species mitigation protocols. Appendix C, the Pile Driving Monitoring Plan, includes a decision tree to determine best course of action for vessel captains in regards to soft starts and shutdown protocols. Please refer to these respective Appendices for decision plans.

10 ALTERNATIVE MONITORING PLAN

An Alternative Monitoring Plan, if approved by BOEM, BSEE, and NOAA Fisheries, will be implemented during nighttime operations or low light/restricted visibility conditions.

Note: If a vessel is underway in reduced visibility conditions when the 500 m (1,640 ft) vessel separation distances cannot be effectively monitored even with alternative monitoring equipment, the vessel shall proceed at a safe speed (less than 10 knots [18.5 km/h]) adapted to the prevailing circumstances and conditions.

10.1 Foundation Installation

Alternative monitoring protocols associated with foundation installation activities are addressed in the PDMP (Appendix C).

10.2 Nearshore Activities

An Alternative Monitoring Plan, if approved by BOEM, BSEE, and NOAA Fisheries, will also be implemented during any potential low light/restricted visibility situations during cable landfall activities: PSOs will use night-vision equipment (night-vision goggles with thermal clip-ons), and IR technology.

10.3 HRG Surveys

An Alternative Monitoring Plan, if approved by BOEM, BSEE, and NOAA Fisheries, will also be implemented during nighttime operations and during any potential low light/restricted visibility situations during cable landfall activities: PSOs will use night-vision equipment (night-vision goggles with thermal clip-ons), and IR technology. For nighttime operations, PAM will be performed to provide additional marine mammal monitoring.

Dominion Energy will include PAM as part of the mitigation measures during nighttime activities to provide for optimal acquisition of species detections in the respective areas. A NOAA Fisheries-approved PAM Operator will monitor the PAM systems and will liaise closely with the PSOs to ensure effective monitoring. Given the range of species that could occur, and that these species vary with regard to their vocalization frequencies (high vs. low), the PAM system proposed will consist of an array of hydrophones with three broadband (sampling mid-range frequencies of 1 kHz to 170 kHz) and three low-frequency

hydrophones (sampling range frequencies of 10 Hz to 70 kHz). The PAM systems specification will meet the job requirements and expected noise levels and species vocal frequencies.

The PAM operator(s) will monitor the hydrophone signals in real time both aurally (using headphones) and visually (via the monitor screen displays). PAM operators will communicate detections to the Lead PSO on duty who will ensure the implementation of the appropriate mitigation measure. Specifications for representative night-vision, infrared, and PAM equipment can be provided upon request. These equipment specifications are provided as examples of equipment most likely to be utilized. Specific night-vision, IR, and PAM equipment models will be subject to availability and will be provided to both NOAA Fisheries and BOEM for review and acceptance prior to the start of surveys.

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

Data on all PSO observations will be recorded based on standard PSO collection requirements and reported as detailed in Section 11.

11 REPORTING

Dominion Energy will submit all required documents related to ESA and non-ESA listed marine species reporting conditions in to BOEM at renewable_reporting@boem.gov, to BSEE via TIMSWeb with a notification email sent to protectedspecies@bsee.gov, to NOAA Fisheries Office of Protected Resources (OPR) at PR.ITP.MonitoringReports@noaa.gov, to NOAA Fisheries Greater Atlantic Regional Fisheries Office (GARFO) Protected Resources Division at nmfs.gar.incidental-take@noaa.gov, and to the USACE.

The expectation and process for reporting of protected species (including live, entangled, and injured or dead individuals) will be clearly communicated and posted in highly visible locations aboard all Project vessels. The clear and unambiguous process for reporting protected species ensures that an expectation is set for reporting to the designated vessel contact (such as the lookout or the vessel captain), while also establishing a seamless communication channel and procedure for crew members to fulfill their crucial reporting duties. Reporting format and data collection protocols for pile driving activities are addressed in the PSO, PAM, and SFV plans. Refer to Appendices D, E, and F for more information.

Dominion Energy will provide the following reports, as necessary, during Project activities starting the first month of in-water activity:

- Dominion Energy will follow appropriate notifications protocols detailed in the Environmental Compliance Plan for all aspects of the Project, to include contacting BOEM and NOAA Fisheries within 24 hours of the commencement of pile driving activities each year and again within 24 hours of the completion of the activity for that year.

The following reports will be provided as soon as possible or no later than 24 hours after occurrence:

- If a North Atlantic right whale is observed at any time by PSOs or personnel on any Project vessels, during any Project-related activity or during vessel transit, sighting information will be reported immediately by the Lead PSO to NOAA Fisheries, BOEM, BSEE, USACE, the U.S. Coast Guard via channel 16, through the WhaleAlert app (http://www.whalealert.org/), and the NOAA Fisheries

Northeast Region North Atlantic Right Whale Sighting Advisory System (RWSAS) at (866) 755-6622. Dominion Energy will include in its report the time, location, and number of animals sighted, animal behavior, animal's closest point of approach, Project activities at time of detection, vessel speed, any mitigation measures implemented, and the reporter's contact information.

11.1 NARW Detection

If a North Atlantic right whale is confirmed to have been detected via the PAM system, a report of the detection will be reported to Dominion Energy and the notification will be submitted to WhaleAlert (www.WhaleAlert.org) and BOEM (renewable_reporting@boem.gov). A report shall be submitted to nmfs.pacmdata@noaa.gov using the NOAA Fisheries Passive Acoustic Reporting System (Metadata and Detection data spreadsheets [https://www.fisheries.noaa.gov/resource/document/passive-acoustic-reporting-system-templates]) no later than 24 hours after the detection. Trained crew are responsible for communicating visual observations when necessary, however, they will not be responsible for PAM monitoring. Trained, qualified, and NOAA Fisheries-approved PAM operators are the only personnel that receive and analyze the acoustic data. Visual marine protected species monitoring crew will not be interpreting PAM data.

- A summary report must be sent within 24 hours to NOAA Fisheries GARFO (nmfs.gar.incidentaltake@noaa.gov) and NOAA Fisheries OPR (PR.ITP.MonitoringReports@noaa.gov) with the above information and with confirmation that the sighting/detection was reported to the respective hotline, and describing: the vessel/platform from which the sighting/detection was made, the activity the vessel/platform was engaged in at time of sighting/detection, the Project construction and/or survey activity that was ongoing at time of sighting/detection (e.g., pile driving, cable installation, HRG survey), the distance from vessel/platform to animal at time of initial sighting/detection, the closest point of approach of whale to vessel/platform, vessel speed, and any mitigation actions taken in response to the sighting.

11.2 Non-NARW Large Whale Detection

If any large whale is observed during vessel transit, information will be recorded and reported via the WhaleAlert app as per the situational reporting requirements of the issued LOA with full data included in the weekly reporting to NOAA Fisheries (PR.ITP.MonitoringReports@noaa.gov). The report will include time, date, and location (latitude/ longitude; in Decimal Degrees); vessel activity, heading, and speed; sea state, water depth, and visibility; species identification to the best of the observer's ability; initial distance and bearing to marine mammal from vessel and closest point of approach; and any avoidance measures taken in response. The following summary draft and final reports will be provided during the course of Project activities:

- During foundation installation, weekly reports will be submitted to NOAA Fisheries that document the daily start and stop of all pile driving activity, start and stop of associated observation periods by PSOs; details on the deployment of PSOs; a record of all detections of marine protected species (acoustic and visual); any mitigation actions (or if mitigation actions could not be taken, provide reasons why); and details on the noise attenuation system(s) used and its performance.

11.3 Stranded, Entangled, Injured, or Deceased Protected Species

Dominion Energy will report any observed stranded, entangled, injured, or deceased marine mammal or ESA-listed species as soon as feasible and in accordance with NOAA Fisheries' standard reporting guidelines. The sighting will be reported to NOAA Fisheries OPR (PR.ITP.MonitoringReports@noaa.gov), the NOAA Fisheries GARFO (nmfs.gar.stranding@noaa.gov) Marine Mammal and Sea Turtle Stranding and Entanglement Hotline (866-755-6622), BOEM, BSEE (via TIMSWeb and notification email to protectedspecies@bsee.gov), the USACE, and the U.S. Coast Guard within 24 hours. Reports will include the following:

1. Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);
2. Species identification (if known) or description of the animal(s) involved;
3. Condition of the animal(s) (including carcass condition if the animal is dead);
4. Observed behaviors of the animal(s), if alive;
5. If available, photographs or video footage of the animal(s); and
6. General circumstances under which the animal was discovered.

11.4 Atlantic Sturgeon

Dominion Energy will ensure reports of Atlantic sturgeon take include a statement as to whether a fin clip sample for genetic sampling was taken. Fin clip samples are required in all cases with the only exception being when additional handling of the sturgeon may result in an imminent risk of injury to the fish or the PSO. Incidents falling within the exception are expected. Instructions for fin clips and associated metadata are available at https://www.fisheries.noaa.gov/new-england-midatlantic/consultations/section-7-take-reportingprogrammatics-greater-atlantic under the "Sturgeon Genetics Sampling" heading.

11.5 Project-Related Incidental Injury or Mortality

If the injury or death was caused by a Project activity, Dominion Energy must immediately cease all activities until NOAA Fisheries OPR is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of the Letter of Authorization. NOAA Fisheries may impose additional measures to minimize the likelihood of further prohibited take and ensure Marine Mammal Protection Act compliance. Dominion Energy may not resume their activities until notified by NOAA Fisheries. Dominion Energy will ensure its reports reference the Project and include the Take Report Form available on the NOAA Fisheries webpage (https://media.fisheries.noaa.gov/2021-07/Take%20Report%20Form%2007162021.pdf?_null). The report must include:

- Contact information (name, phone number, etc.), time, date, and location (coordinates) of the first discovery (and updated location information if known and applicable);
- Species identification (if known) or description of the animal(s) involved;

- Condition of the animal(s) (including carcass condition Biological Opinion and Conference for CVOW if the animal is dead);
- Observed behaviors of the animal(s), if alive;
- If available, photographs or video footage of the animal(s); and
- General circumstances under which the animal was discovered. Staff responding to the hotline call will provide any instructions for handling or disposing of any injured or dead animals, which may include coordination of transport to shore, particularly for injured sea turtles.

11.6 Project-Related Vessel Strike

In the event of a vessel strike of a marine protected species by any vessel associated with the Project, Dominion Energy shall immediately report the strike incident to the NOAA Fisheries OPR, NOAA Fisheries GARFO, BOEM, BSEE, and the USACE no later than 24 hours after the strike. Dominion Energy must immediately cease all activities until NOAA Fisheries OPR is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of the Letter of Authorization. NOAA Fisheries may impose additional measures to minimize the likelihood of further prohibited take and ensure Marine Mammal Protection Act compliance. Dominion Energy may not resume their activities until notified by NOAA Fisheries. The report must include the following information:

- Time, date, and location (latitude/longitude) of the incident;
- Species identification (if known) or description of the animal(s) involved (i.e., identifiable features including animal color, presence of dorsal fin, body shape and size);
- Vessel strike reporter information (name, affiliation, email for person completing the report);
- Vessel strike witness (if different than reporter) information (name, affiliation, phone number, platform for person witnessing the event);
- Vessel name and/or MMSI number;
- Vessel size and motor configuration (inboard, outboard, jet propulsion);
- Vessel's speed leading up to and during the incident;
- Vessel's course/heading and what operations were being conducted (if applicable);
- Part of vessel that struck whale or other protected species (if known);
- Vessel damage notes;
- Status of all sound sources in use;
- If animal was seen before strike event;
- Behavior of animal before strike event;
- Description of avoidance measures/requirements that were in place at the time of the strike and what additional measures were taken, if any, to avoid strike;

- Environmental conditions (e.g., wind speed and direction, Beaufort scale sea state, cloud cover, visibility) immediately preceding the strike;
- Estimated (or actual, if known) size and length of animal that was struck;
- Description of the behavior of the marine mammal immediately preceding and following the strike;
- If available, description of the presence and behavior of any other marine mammals immediately preceding the strike;
- Other animal details if known (e.g., length, sex, age class);
- Behavior or estimated fate of the animal post-strike (e.g., dead, injured but alive, injured and moving, external visible wounds (linear wounds, propeller wounds, non-cutting blunt-force trauma wounds), blood or tissue observed in the water, status unknown, disappeared);
- To the extent practicable, photographs or video footage of the animal(s); and
- Any additional notes the witness may have from the interaction.

11.7 Monthly Summary Reports

Monthly summary reports will be submitted to NOAA Fisheries OPR and GARFO (PR.ITP.MonitoringReports@noaa.gov, nmfs.gar.incidental-take@noaa.gov). Monthly reports will include a summary of all information in the weekly reports, including project activities carried out in the previous month, vessel transits (number, type of vessel, MMSI number, and route), number of piles installed, all detections of marine protected species, and any mitigative action taken. The monthly report will also identify which turbines have become operational and when (a map must be provided).

11.8 Annual Summary Reports

During years covered by the applicable Letter of Authorization for Taking of Marine Mammals (2024-2029), an annual report summarizing the prior year's activities will be provided to BOEM and NOAA Fisheries that fully documents the methods and monitoring protocols, summarizes the data recorded during monitoring, estimates the number of listed marine protected species that may have been incidentally taken during Project activities, and provides an interpretation of the results and effectiveness of all monitoring tasks. Draft annual reports will be provided March 1 of each year through 2030. Any recommendations made by NOAA Fisheries will be addressed in the final report, due after the LOA expires and will include a summary of all monitoring activities, prior to acceptance by NOAA Fisheries. Final reports will follow a standardized format for PSO reporting from activities requiring marine mammal mitigation and monitoring.

- Acoustic monitoring reports will include, but are not limited to, the following: dates and times of all detections, types and nature of sounds heard, whether detections were linked with visual sightings, water depth of the hydrophone array, bearing of the animal to the vessel (if determinable), species or taxonomic group (if determinable), spectrogram screenshot, a record of the PAM operator/PSO's review of any acoustic detections, and any other notable information.
- During post-construction HRG surveys, within 90 days after the completion of survey activities, a draft report will be provided to BOEM and NOAA Fisheries that fully documents the methods and monitoring protocols, summarizes the data recorded during monitoring, estimates the number of

listed marine protected species that may have been incidentally taken during Project activities, and provides an interpretation of the results and effectiveness of all monitoring tasks. Any recommendations made by NOAA Fisheries will be addressed in the final report prior to acceptance by NOAA Fisheries.

- A draft final report on all visual and acoustic monitoring for activities covered under the Letter of Authorization for Taking of Marine Mammals will be provided within 90 days of completion of covered activities. The final version of the final report will be submitted 30 days after receipt of NOAA Fisheries' comments on the draft final report.

11.9 Standardized Data Entry

All PSOs will use a standardized data entry format.

Monitoring Effort Information will include:

- Date (YYYY-MM-DD)
- Source status at time of observation (on/off)
- Number of PSOs on duty
- Start time of observations for each shift in UTC (HH:MM)
- End time of observations for each shift in UTC (HH:MM)
- Duration of visual observations of protected species
- Wind speed (knots), from direction
- Swell (meters)
- Water depth (meters)
- Visibility (km)
- Glare severity
- Block name and number
- Location: Latitude and Longitude
- Time clearance visual monitoring began in UTC (HH:MM)
- Time clearance monitoring ended in UTC (HH:MM)
- Duration of clearance visual monitoring
- Time of day of pre-clearance (day/night)
- Time power-up/ramp-up began (if applicable)
- Time equipment full power was reached (if applicable)
- Duration of power-up/ramp-up (if conducted)
- Time activity began
- Time activity ended
- Activity Duration
- Did a shutdown/power-down occur?
    - Time shutdown was called for (UTC)
    - Time equipment was shutdown (UTC)

- Vessel location (latitude/longitude, decimal degrees) when survey effort begins and ends; vessel location at beginning and end of visual PSO duty shifts; recorded at :30 intervals if obtainable from data collection software
- Habitat or prey observations

Detection Information will include:

- Date (YYYY-MM-DD)
- Sighting ID (multiple sightings of the same animal or group should use the same ID)
- Time at first detection in UTC (YY-MMDDT HH:MM)
- Time at last detection in UTC (YY-MM-DDT HH:MM)
- PSO name(s) (Last, First) on duty
- Effort (e.g., ON=Hammer On; OFF=Hammer Off)
- Start time of observations
- End time of observations
- Compass heading of vessel (degrees)
- Beaufort scale
- Precipitation
- Cloud coverage (%)
- Sightings including common name and scientific name
- Certainty of identification
- Number of adults
- Number of juveniles
- Total number of animals or estimated group size
- Bearing to animal(s) when first detected (ship heading+ clock face)
- Distance determination method
- Distance from vessel (e.g., reticle distance in meters)
- Description of unidentified animals (include features such as overall size; shape of head; color and pattern; size, shape, and position of dorsal fin; height, direction, and shape of blow, etc.)
- Detection narrative (note behavior, especially changes in relation to activity and distance from source vessel/platform)
- Direction of travel/first approach (relative to vessel/platform)
- Behaviors observed: indicate behaviors and behavioral changes observed in sequential order (use behavioral codes)
- If any bow-riding behavior observed, record total duration during detection (HH:MM)
- Initial heading of animal(s) (degrees)
- Final heading of animal(s)(degrees)
- Shutdown zone size during detection (meters)
- Was the animal inside the shutdown zone? (Y/N)
- Closest distance to vessel (reticle distance in meters)
- Time at closest approach (UTC HH:MM)
- Time animal entered shutdown zone (UTC HH:MM)

- Time animal left shutdown zone (UTC HH:MM)
- If observed/detected during ramp-up/power-up: first distance (reticle distance in meters), closest distance (reticle distance in meters), last distance (reticle distance in meters), behavior at final detection
- Did a shutdown/power-down occur? (Y/N)
- Time shutdown was called for (UTC)
- Time equipment was shutdown (UTC)
- Detections with PAM

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Appendix A

Vessel Strike Avoidance Plan

Appendix B

Environmental Training

Appendix C

Pile Driving Monitoring, Mitigation, and Management Plan (PDMP)

Attachment C-1 Installation Site Pile Driving Durations

Appendix D

Passive Acoustic Monitoring Plan

Appendix E

Sound Field Verification Plan

Appendix F

Foundation Installation PSO Plan

Appendix G

Double Big Bubble Curtain Plan

Attachment G-1 **Compressor specification sheet**

Attachment G-2 **Hose datasheet (for illustration only)**

Attachment G-3 **Bubble curtain maintenance procedure**

Attachment G-4 **Template performance report**

Attachment G-5 **Hose buoyancy calculation**