DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 217

[Docket No. 230424–0110]

RIN 0648–BL74

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to the Coastal Virginia Offshore Wind Commercial Project Offshore of Virginia

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

ACTION: Proposed rule; proposed letter of authorization; request for comments.

SUMMARY: NMFS has received a request from the Virginia Electric and Power Company, doing business as Dominion Energy Virginia (Dominion Energy), for Incidental Take Regulations (ITR) and an associated Letter of Authorization (LOA) pursuant to the Marine Mammal Protection Act (MMPA). The requested regulations would govern the authorization of take, by Level A harassment and Level B harassment, of small numbers of marine mammals over the course of 5 years (2024–2029) incidental to construction of the Coastal Virginia Offshore Wind Commercial (CVOW–C) project offshore of Virginia within the Bureau of Ocean Energy Management (BOEM) Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf (OCS) Lease Area OCS–A 0483 (Lease Area) and associated Export Cable Routes. Project activities likely to result in incidental take include pile driving activities (impact and vibratory) and site assessment surveys using high-resolution geophysical (HRG) equipment. NMFS requests comments on its proposed rule. NMFS will consider public comments prior to making any final decision on the promulgation of the requested ITR and issuance of the LOA; agency responses to public comments will be summarized in the final notice of our decision. The proposed regulations, if promulgated, would be effective February 5, 2024, through February 4, 2029.

DATES: Comments and information must be received no later than June 5, 2023.

ADDRESSES: Submit all electronic public comments via the Federal e-Rulemaking Portal. Go to *www.regulations.gov* and enter NOAA–NMFS–2023–0030 in the Search box. Click on the ''Comment'' icon, complete the required fields, and enter or attach your comments.

Instructions: Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered by NMFS. All comments received are a part of the public record and will generally be posted for public viewing on *www.regulations.gov* without change. All personal identifying information (*e.g.,* name, address), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NMFS will accept anonymous comments (enter ''N/A'' in the required fields if you wish to remain anonymous).

FOR FURTHER INFORMATION CONTACT: Kelsey Potlock, Office of Protected Resources, NMFS, (301) 427–8401.

SUPPLEMENTARY INFORMATION:

Availability

A copy of Dominion Energy's Incidental Take Authorization (ITA) application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-other-energy-activities-renewable.* In case of problems accessing these documents, please call the contact listed above (see **FOR FURTHER INFORMATION CONTACT**).

Purpose and Need for Regulatory Action

This proposed rule, if promulgated, would provide a framework under the authority of the MMPA (16 U.S.C. 1361 *et seq.*) to allow for the authorization of take of marine mammals incidental to construction of the CVOW–C project within the Lease Area and along export cable corridors to landfall locations in Virginia. NMFS received a request from Dominion Energy for 5-year regulations and a LOA that would authorize take of individuals of 21 species of marine mammals (seven species by Level A harassment and Level B harassment and 21 species by Level B harassment only), comprising 22 stocks, incidental to Dominion Energy's construction activities. No mortality or serious injury is anticipated or proposed for authorization. Please see below for definitions of harassment. Please see the *Legal Authority for the Proposed Action* section below for definitions of harassment, serious injury, and incidental take.

Legal Authority for the Proposed Action

The MMPA prohibits the ''take'' of marine mammals, with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made, regulations are promulgated (when applicable), and public notice and an opportunity for public comment are provided.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other ''means of effecting the least practicable adverse impact'' on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, the availability of the species or stocks for taking for certain subsistence uses (referred to as ''mitigation''), and requirements pertaining to the mitigation, monitoring and reporting of the takings are set forth.

As noted above, no serious injury or mortality is anticipated or proposed for authorization in this proposed rule. Relevant definitions of MMPA statutory and regulatory terms are included below:

- *Take*—to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal (16 U.S.C. 1362, 50 CFR 216.3);
- *Incidental taking*—an accidental taking. This does not mean that the taking is unexpected, but rather it includes those takings that are infrequent, unavoidable or accidental (see 50 CFR 216.103);
- *Serious Injury*—any injury that will likely result in mortality (50 CFR 216.3);
- *Level A harassment*—any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild (16 U.S.C. 1362); and
- *Level B harassment*—any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (16 U.S.C. 1362).

Section 101(a)(5)(A) of the MMPA and the implementing regulations at 50 CFR part 216, subpart I, provide the legal basis for proposing and, if appropriate, issuing 5-year regulations and associated LOA. This proposed rule also establishes required mitigation, monitoring, and reporting requirements for Dominion Energy's proposed activities.

Summary of Major Provisions Within the Proposed Rule

The major provisions of this proposed rule include:

• Authorize take of marine mammals by Level A harassment and/or Level B harassment. No mortality or serious injury of any marine mammal is proposed to be authorized;

• Establish a seasonal moratorium on pile driving during the months of highest North Atlantic right whale (*Eubalaena glacialis*) presence in the project area (November 1st–April 30th);

• Require both visual and passive acoustic monitoring by trained, NOAA Fisheries-approved Protected Species Observers (PSOs) and Passive Acoustic Monitoring (PAM) operators before, during, and after the in-water construction activities;

• Require training for all Dominion Energy personnel that would clearly articulate all relevant responsibilities, communication procedures, marine mammal monitoring and mitigation protocols, reporting protocols, safety, operational procedures, and requirements of the ITA and ensure that all requirements are clearly understood by all participating parties;

• Require the use of sound attenuation device(s) during all vibratory and impact pile driving of wind turbine generators (WTG) and offshore substations (OSS) foundation piles to reduce noise levels;

• Delay the start of pile driving if a North Atlantic right whale is observed at any distance by the PSO on the pile driving or dedicated PSO vessel;

• Delay the start of pile driving if other marine mammals are observed entering or within their respective clearance zones;

• Shut down pile driving (if feasible) if a North Atlantic right whale is observed or if other marine mammals enter their respective shut down zones;

• Conduct sound field verification monitoring during a minimum of three WTGs and all three OSS foundation installation events to measure *in situ* noise levels for comparison against the model results;

• Implement soft starts during impact pile driving and using the least hammer energy possible;

• Implement ramp-up for high-resolution geophysical (HRG) site characterization survey equipment prior to operating at full power;

• Implement various vessel strike avoidance measures;

• Increase awareness of North Atlantic right whale presence through monitoring of the appropriate networks and VHF Channel 16, as well as reporting any sightings to the sighting network;

• Implement Best Management Practices (BMPs) during fisheries monitoring research surveys and activities to reduce the risk of marine mammals being considered at-risk or of interacting with deployed gear; and

• Require frequent scheduled and situational reporting including, but not limited to, information regarding activities occurring, marine mammal observations and acoustic detections, and sound field verification monitoring results.

National Environmental Policy Act (NEPA)

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq.*) and NOAA Administrative Order (NAO) 216–6A, NMFS must evaluate the proposed action (*i.e.,* promulgation of regulations and subsequent issuance of a 5-year LOA) and alternatives with respect to potential impacts on the human environment.

Accordingly, NMFS proposes to adopt the BOEM Environmental Impact Statement (EIS), provided our independent evaluation of the document finds that it includes adequate information analyzing the effects of promulgating the proposed regulations and LOA issuance on the human environment. NMFS is a cooperating agency on BOEM's EIS. BOEM's CVOW–C Draft Environmental Impact Statement for Commercial Wind Lease OCS–A 0483 (DEIS), was made available for public comment through a Notice of Availability on December 16, 2022 (87 FR 77135), available at *https://www.boem.gov/renewable-energy/state-activities/CVOW-C*. The DEIS had a 60-day public comment period; the comment period was open from December 16, 2022 to February 14, 2023. Additionally, BOEM held three virtual public hearings on January 25, 2023, January 31, 2023, and February 2, 2023.

Information contained within Dominion Energy's ITA application and this proposed rule collectively provide the environmental information related to these proposed regulations and associated 5-year LOA for public review and comment. NMFS will review all comments submitted in response to this proposed rule prior to concluding our NEPA process or making a final decision on the requested 5-year ITR and associated LOA.

Fixing America's Surface Transportation Act (FAST–41)

This project is covered under Title 41 of the Fixing America's Surface Transportation Act, or ''FAST–41.'' FAST–41 includes a suite of provisions designed to expedite the environmental review for covered infrastructure projects, including enhanced interagency coordination as well as milestone tracking on the public-facing Permitting Dashboard. FAST–41 also places a 2-year limitations period on any judicial claim that challenges the validity of a Federal agency decision to issue or deny an authorization for a FAST–41 covered project (42 U.S.C. 4370m–6(a)(1)(A)).

Dominion Energy's proposed project is listed on the Permitting Dashboard. Milestones and schedules related to the environmental review and permitting for the CVOW–C project can be found at *https://www.permits.performance.gov/permitting-project/coastal-virginia-offshore-wind-commercial-project*.

Summary of Request

On February 16, 2022, NMFS received a request from Dominion Energy for the promulgation of a 5-year ITR and issuance of an associated LOA to take marine mammals incidental to construction activities associated with the CVOW–C project offshore of Virginia in the Lease Area and associated export cable routes. Dominion Energy's request is for the incidental, but not intentional, take of a small number of 21 marine mammal species (comprising 22 total stocks) by Level B harassment and by Level A harassment for seven marine mammal species, comprising 7 stocks. Neither Dominion Energy nor NMFS expects serious injury or mortality to result from the specified activities, and Dominion Energy did not request and NMFS is not proposing to authorize mortality or serious injury of any marine mammals species or stock.

In response to our comments and following extensive information exchanges with NMFS, Dominion Energy submitted a final, revised application on August 5, 2022, that NMFS deemed adequate and complete on August 12, 2022. The final version of the application is available on NMFS' website at *https://www.fisheries.noaa.gov/action/incidental-take-authorization-dominion-*

energy-virginia-construction-coastal-virginia.

On September 15, 2022, NMFS published a notice of receipt (NOR) of the adequate and complete application in the **Federal Register** (87 FR 56634), requesting comments and soliciting information related to Dominion Energy's request during a 30-day public comment period. During the NOR public comment period, NMFS received one public comment letter from another Federal agency (the United States Geological Survey (USGS)) and one public comment letter from an environmental non-government organization (the Southern Environmental Law Center). NMFS has reviewed all submitted material and has taken these into consideration during the drafting of this proposed rule.

In June 2022, Duke University's Marine Spatial Ecology Laboratory released updated habitat-based marine mammal density models (Roberts *et al.,* 2016; Robert and Halpin, 2022). Because Dominion Energy applied marine mammal densities to their analysis in their application, Dominion Energy submitted a final Updated Density and Take Estimation Memo (herein referred to as Updated Density and Take Estimation Memo) on January 10, 2023 that included marine mammal densities and take estimates based on these new models which NMFS posted on our website in May 2023.

In January 2023, BOEM informed NMFS that the proposed activity had changed from what is presented in the adequate and complete MMPA application. Specifically, the changed proposed activity involved the reduction of maximum WTGs built (from 205 to 202 WTGs) as under the original Project Design Envelope (PDE) and the OSSs would be located in the vessel transit routes. Under the 202 build-out, three WTGs would be removed and the three OSSs would be shifted into these WTG positions. However, in late-January 2023, Dominion Energy confirmed that their Preferred Layout of 176 WTGs is the base case for construction, but that they could possibly need up to 7 WTGs re-piled in alternate positions due to unstable sediment conditions, which could necessitate up to 183 independent piling events. WTG positions have been removed from consideration for one or more of the following reasons: impracticable due to foundation technical design risk, shallow gas presence, commercial shipping and navigation risk concerns, erosion risk, and presence of a designated fish haven. Based on the information provided, NMFS carried forward the analysis assuming a total build-out of 176 WTGs plus seven re-piled WTGs (a total of 183 independent piling events for WTGs) and the 3 originally planned OSSs. Due to the significant reduction of turbines from the original proposed action found in the adequate and complete ITA application (reduction of approximately 14 percent), Dominion Energy, in consultation with NMFS, provided an updated proposed action summary, revised exposure estimates, revised take requests, and an updated piling schedule in mid-February 2023 (herein referred to as the Revised Proposed Action Memo). NMFS posted this to our website in May 2023.

NMFS has previously issued six Incidental Harassment Authorizations (IHAs) to Dominion Energy. Two of those IHAs, issued in 2018 (83 FR 39062; August 8, 2018) and 2020 (85 FR 30930, May 21, 2020) supported the development of the Coastal Virginia Offshore Wind project, known as the CVOW Pilot Project (wherein two turbines were constructed). The remaining four IHAs (two of which were modified IHAs) were high resolution site characterization surveys within and around the CVOW–C Lease Area (see 85 FR 55415, September 8, 2020; 85 FR 81879, December 17, 2020 (modified 2020 IHA); 86 FR 21298, April 22, 2021 (modified 2021 IHA); and 87 FR 33730, June 3, 2022).

To date, Dominion Energy has complied with all the requirements (*e.g.,* mitigation, monitoring, and reporting) of the previous IHAs. Information regarding Dominion Energy's take estimates and monitoring results may be found in the Estimated Take section. The monitoring reports can be found on NMFS' website, along with the relevant, previously issued IHAs: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-other-energy-activities-renewable.*

On August 1, 2022, NMFS announced proposed changes to the existing North Atlantic right whale vessel speed regulations (87 FR 46921; August 1, 2022) to further reduce the likelihood of mortalities and serious injuries to endangered right whales from vessel collisions, which are a leading cause of the species' decline and a primary factor in an ongoing Unusual Mortality Event. Should a final vessel speed rule be issued and become effective during the effective period of this ITR (or any other MMPA incidental take authorization), the authorization holder would be required to comply with any and all applicable requirements contained within the final rule. Specifically, where measures in any final vessel speed rule are more protective or restrictive than those in this or any other MMPA authorization, authorization holders would be required to comply with the requirements of the rule. Alternatively, where measures in this or any other MMPA authorization are more restrictive or protective than those in any final vessel speed rule, the measures in the MMPA authorization would remain in place. The responsibility to comply with the applicable requirements of any vessel speed rule would become effective immediately upon the effective date of any final vessel speed rule and, when notice is published on the effective date, NMFS would also notify Dominion Energy if the measures in the speed rule were to supersede any of the measures in the MMPA authorization such that they were no longer required.

Description of the Specified Activities

Overview

Dominion Energy's CVOW–C project would allow the Commonwealth of Virginia to meet its clean energy goal of achieving 100 percent clean energy by 2045 through the implementation of up to 5,200 megawatts (MW) of offshore wind-generated energy, as established in the Virginia Clean Economy Act (HB 1526/SB 851; *https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP1193+hil&201+ful+CHAP1193+hil*). To achieve this, Dominion Energy has proposed to construct and operate CVOW–C in state and Federal waters of the Atlantic Ocean in the Lease Area that is capable of producing between 2,500 and 3,000 MW of renewable energy and would be the largest offshore wind project in the United States at the time of its construction.

Dominion Energy's precursor pilot project (*i.e.,* CVOW Pilot Project) was a 12 MW, two-turbine test project and the first to be installed in Federal waters. Designed as a research/test project, the two turbines associated with the CVOW Pilot Project became operational in October 2020 approximately 27 miles (mi; 43.45 kilometers (km)) off of Virginia Beach, Virginia. Information on this Pilot Project was used to inform the proposed CVOW–C project. More information on the Pilot Project can be found on BOEM's website (*https://www.boem.gov/renewable-energy/state-activities/coastal-virginia-offshore-wind-project-cvow*) and in the IHA authorized by NMFS in May 2020 for BOEM Lease Area OCS–A–0497 (*https://www.fisheries.noaa.gov/action/incidental-take-authorization-dominion-energy-virginia-offshore-wind-construction-activities*).

CVOW–C would consist of several different types of permanent offshore infrastructure, including up to 176 wind turbine generators (WTGs; *e.g.,* such as the Siemens Gamesa SG–14–222 DD 14–MW model with power boost technology potentially allowing up to 14.7–MW, equating to a total of 2,587.2–MW for full build-out), three offshore substations (OSS), and inter-array and substation interconnect cables. Dominion Energy plans to install WTG and OSS foundations via a joint-installation approach using both vibratory and impact pile driving. Dominion Energy would also conduct the following supporting activities: temporarily install and remove, by vibratory pile driving, up to nine cofferdams to connect the offshore export cables to onshore facilities; temporarily install and remove, by impact pile driving and a pipe thruster, respectively, up to 108 goal posts (12 goal posts for each of nine Direct Pipe locations) to guide casing pipes; permanently install scour protection around WTG and OSS foundations; permanently install and perform trenching, laying, and burial activities associated with the export cables from the OSSs to shore-based switching and sub-stations and WTG inter-array cables; annually perform, using active acoustic sources with frequencies of less than 180 kilohertz (kHz), high-resolution vessel-based site characterization geophysical (HRG) surveys; and intermittently perform, via a modified dredge, and a pot-based monitoring approach, fishery monitoring surveys to enhance existing data for specific benthic and pelagic species of concern. Vessels would transit within the project area and between ports and the wind farm to transport crew, supplies, and materials to support construction activities. All offshore cables would be connected to onshore export cables at the sea-to-shore transition point via trenchless installation (*i.e.,* underground tunneling utilizing micro tunnel boring installation methodologies) in a parking lot found west of the firing range at the State Military Reservation located in Virginia Beach, Virginia. From the sea-to-shore transition point, onshore underground export cables are then connected in series to switching stations/substations, overhead transmission lines, and ultimately to the grid connection.

Marine mammals exposed to elevated noise levels during impact and vibratory pile driving and site characterization surveys may be taken, by Level A harassment and/or Level B harassment, depending on the specified activity.

Dates and Duration

Dominion Energy anticipates that activities with the potential to result in incidental take of marine mammals would occur throughout all five years of the proposed regulations which, if issued, would be effective from February 5, 2024, through February 4, 2029. Based on Dominion Energy's proposed schedule, the installation of all permanent structures would be completed by the end of October 2025. More specifically, the installation of WTG foundations is expected to occur between May 1st–October 31st of 2024 and 2025, over approximately 12 months (6 months within each year). OSS jacket foundations using pin piles would be installed between May 1st–October 31st, 2024 and 2025. However, delays due to weather or other unanticipated and unforeseen events may require Dominion Energy to install some foundations in 2026. If this occurs, foundation installation would occur between the predetermined pile driving seasonal window (May 1st–October 31st in 2026) and occur over 6 months. However, as this would represent a shift in the schedule, rather than additional piles being installed, the proposed activities would still maintain the same amount of take proposed for authorization, both annual maximum and five-year total. The temporary structures used for nearshore cable landfall construction (*i.e.,* temporary cofferdams and temporary goal posts) would be installed and subsequently removed between May 1st–October 31st, 2024. Lastly, Dominion Energy anticipates HRG survey activities using boomers, sparker, and Compressed High-Intensity Radiated Pulses (CHIRPs) to occur annually and across the five-year period. Up to 65 days of surveys are planned in 2024, 249 are planned in 2025, 58 are planned in 2026, and 368 survey days are planned annually in each of 2027 and 2028. No surveys are planned to occur in 2029. These surveys may occur across the entire CVOW–C Lease Area and Export Cable Routes and may take place at any time of year.

Dominion Energy has provided a schedule for all of their proposed construction activities (Table 1). Based on the schedule presented, no activities (installation, removal, or HRG surveys) are planned to occur in 2029, even though part of this year would fall within the five-year effective period of the proposed regulations. This table also presents a breakdown of the timing and durations of the activities proposed to occur during the construction and operation of the CVOW–C project.

TABLE 1—CVOW–C'S CONSTRUCTION AND OPERATIONS SCHEDULE DURING THE EFFECTIVE PERIOD OF THE LOA [a]

Project activity	Expected timing	Expected duration (approximate)
Scour Protection Pre-Installation	Q2 through Q4 of 2024	9 months.
	Q2 through Q4 of 2025	9 months.
WTG Foundation Installation [b e]	Q2 through Q4 of 2024	6 months.
	Q2 through Q4 of 2025	6 months.
Scour Protection Post-installation	Q2 through Q4 of 2024	9 months.
	Q2 through Q4 of 2025	9 months.
OSS Foundation Installation [b e]	Q2 through Q4 of 2024	6 months.
	Q2 through Q4 of 2025	6 months.
Cable Landfall Construction (Goal Posts and Cofferdams) [h]	Q1 through Q4 of 2024	6 months.
HRG Surveys [c d]	Q1 2024 through Q4 2028	Any time of year.
Site Preparation	Q1 2024 through Q2 2024	6 months.
Inter-array Cable Installation	Q2 2025 through Q4 2026	19 months.
Export Cable Installation	Q3 2024 through Q3 2025	14 months.
Fishery Monitoring Surveys: [f g]		

TABLE 1—CVOW–C'S CONSTRUCTION AND OPERATIONS SCHEDULE DURING THE EFFECTIVE PERIOD OF THE LOA [a]—Continued

Project activity	Expected timing	Expected duration (approximate)
Surf Clam	Q2 2023	1 week.
Whelk	Q2 2023 through Q1 2025	24 months.
Black Sea Bass	Q2 2023 through Q1 2025	24 months.

Note: "Q1, Q2, Q3, and Q4" each refer to a quarter of the year, starting in January and comprising 3 months each. Therefore, Q1 represents January through March, Q2 represents April through June, Q3 represents July through September, and Q4 represents October through December.

[a] While the effective period of the proposed regulations would extend a few months into 2029, no activities are proposed to occur in 2029 by Dominion Energy so these were not included in this table.

[b] Activities would only occur between May 1st through October 31st annually.

[c] Activities would begin in February 2024, upon the issuance of a LOA, and continue through construction and post-construction.

[d] For HRG surveys, Dominion Energy anticipates up to 65 days of surveys would occur during the pre-construction period (2024), up to 307 days during the primary construction years (2025 and 2026), and up to 736 days would be needed during the post-construction years (2027 and 2028) with a 50/50 split of 368 days each year. No surveys are planned for 2029.

[e] Dominion Energy anticipates that all WTGs and OSS foundations will be installed by October 31st, 2025; however, unanticipated delays may require some foundation pile driving to occur in 2026.

[f] Some fishery monitoring survey activities are planned prior to February 2024 but are not included here as they would not occur during the effective dates of the ITR and LOA.

[g] Dates displayed here are for field work, as that would be the only component that could impact marine mammals.

[h] Although cable landfall activities are anticipated to occur over 9–12 months total, activities capable of harassing marine mammals would only occur for the specified duration described here as other activities necessary for landfall construction (*i.e.,* area preparation, material transportation, etc.) would also occur.

Dominion Energy anticipates that the first 40 WTGs would become operational in 2025, after foundation installation is completed and after all necessary components (such as array cables, OSSs, export cables routes, and onshore substations) are installed. Up to 120 additional WTGs would be commissioned/operational in 2026. Dominion Energy anticipates that all turbines would be commissioned by 2027, with the last 16 being operational that year.

Specific Geographic Region

Dominion Energy would construct the CVOW–C project in Federal and state waters offshore of Virginia within the BOEM Lease Area OCS–A 0483 and associated Export Cable Routes (Figure 1). The Lease Area covers approximately 456.5 km^2 (112,799 acres) and is located approximately 27 mi (43.5 km) east of Virginia Beach, Virginia. The water depths in the Lease Area range from 19.9 m to 38.1 m (65 to 125 ft) while water depths along the Export Cable Routes range from 0 to 28 m (0 to 92 ft). Cable landfall construction work would be conducted in shallow water (temporary cofferdams would be in water 3.3 m (10.83 ft) deep, and the goal posts would be at depths of 22.9 m (75 ft)). Sea surface temperatures range from 32 to 88 degrees Fahrenheit (°F; 0 to 31 degrees Celsius (°C)) while the depth-averaged annual water temperature is 56.39 °F (13.55 °C) (NOAA n.d.B). Cables would come ashore adjacent to the western boundary of the State Military Reservation firing range in Virginia Beach.

Dominion Energy's specified activities would occur along a portion of the Mid-North Atlantic continental shelf that experiences various concurrent processes that shape the overall geology of the region. These processes include glacio-eustatic sea level change (*i.e.,* a change in sea level due to the uptake or release of water from glaciers and polar ice), drainage from Chesapeake Bay, and storm-related effects to sedimentation. The basin structure in which the CVOW–C project area is located, the Baltimore Canyon Trough, is oriented northeast to southwest and consists of a wedge of sediments that thicken to the east (Dominion Energy, 2023).

The Mid-Atlantic Bight, where the CVOW–C project would be located, spans from Cape Hatteras, North Carolina to Cape Cod, Massachusetts and continues to extend into the west Atlantic to the 100-m isobath. The oceanographic conditions along the Mid-Atlantic Bight are comparable to the conditions found along the Mid-Atlantic East Coast, where summer months are warmer and winter months are milder. The area is known for its high levels of primary productivity, specifically in the nearshore and estuarine regions, where coastal phytoplankton tend to bloom in the winter and summer. Given the proximity to the continental shelf, this area forms an important habitat for various benthic and fish species, as well as forms important habitat for fin whales, humpback whales, North Atlantic right whales, and other large whales as they migrate through the area. The CVOW–C project area is located within the Mid-Atlantic Bight and relatively flat with "very gentle to gentle slopes", as described by the BOEM classification found in the CVOW–C Construction and Operations Plan (COP) (Dominion Energy, 2023). In the Export Cable Routes, the seafloor slopes are less than 1 degree ("very gentle" based again on the BOEM classification; Dominion Energy, 2023). The most significant slopes can be found on the flanks of morphological features and other topographic highs where the seabed gradient ranges up to 4 degrees (Dominion Energy, 2023). The most prominent seabed features with the project area are pronounced sand ridges that create a ridge and swale topography. In the northeastern portion of the project area, the heights of the sand ridges are lower, topographic variation across the ridges is reduced, seafloor bathymetry is deeper, and water depths are less variable.

A complete mapping of the seabed has identified a low number of boulders present on the seafloor (Dominion Energy, 2023). Only 10 boulders and 110 seabed targets interpreted as possible boulders have sizes greater than 1 m (3 ft). No patterns were identified in the location of boulders across the Lease Area and Export Cable Routes.

The seafloor in the CVOW–C project area is dynamic and changes over time due to current, tidal flows, and wave conditions. The benthic habitat of the project area contains a variety of seafloor substrates, physical features, and associated benthic organisms. The soft bottom sediments in the project area are reflective of the rest of the Mid-Atlantic Bight region, and characterized by fine sand as well as gravel and silt/sand mixes (Milliman, 1972; Steimle and Zetlin, 2000). Underwater soils in the area are known to be soft, with two specific soils noted that could increase the risk of pile run (Dominion Energy, 2023). The presence of bedforms, mobile sediments, and potential for scouring exist in the project area (Dominion Energy, 2023). However, the paleochannel strata is not considered a weak layer due to stiffness and strength values being within normal ranges and as such, is not considered a hazard to cable or foundation installation (Dominion Energy, 2023). The dominant benthic fauna within the Lease Area are annelids, mollusks, and arthropods (Dominion Energy, 2023).

Additional information on the underwater environment's physical resources can be found in CVOW–C's COP (Dominion Energy, 2023) available at *https://www.boem.gov/renewable-energy/state-activities/coastal-virginia-offshore-wind-project-construction-and*.

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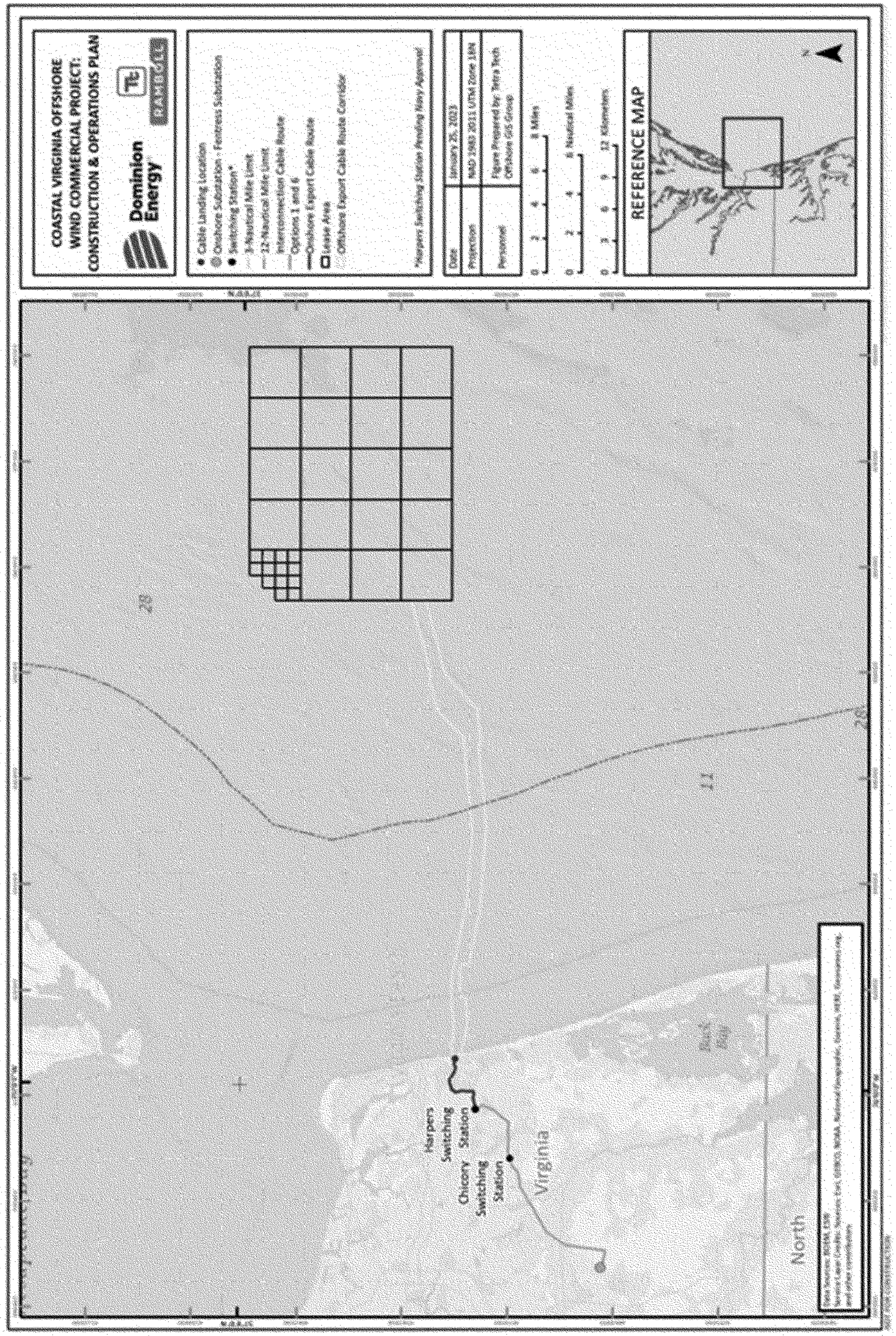
COASTAL VIRGINIA OFFSHORE WIND COMMERCIAL PROJECT: CONSTRUCTION & OPERATIONS PLAN
Dominion Energy
RAMBOLL
Cable Landing Location
Onshore Substation - Fentress Substation
Switching Station*
3-Nautical Mile Limit
12-Nautical Mile Limit
Interconnection Cable Route
Options 1 and 6
Onshore Export Cable Route
Lease Area
Offshore Export Cable Route Corridor
*Harpers Switching Station Pending Navy Approval
Date
January 25, 2023
Projection
NAD 1983 2011 UTM Zone 18N
Personnel
Figure Prepared by: Tetra Tech Offshore GIS Group
0 2 4 6 8 Miles
0 2 4 6 8 Nautical Miles
0 3 6 9 12 Kilometers
REFERENCE MAP
28
11
Harpers Switching Station
Chicory Switching Station
Virginia
Back Bay
North

BILLING CODE 3510–22–C

Figure 1—The CVOW–C Project Area

Detailed Description of Specified Activities

Below, we provide detailed descriptions of Dominion Energy's activities, explicitly noting those that are anticipated to result in the take of marine mammals and for which incidental take authorization is requested. Additionally, a brief explanation is provided for those activities that are not expected to result in the take of marine mammals.

WTG and OSS Foundations

Dominion Energy proposes to install up to 176 WTGs on monopile foundations and 3 OSSs on jacket foundations. They anticipate all WTG foundations could be installed between May 1st through October 31st in 2024 and 2025, over the course of six months in each year. However, it may be possible that monopile installation associated with the WTG foundations would need to continue into a third year (2026), depending on construction logistics and local and environmental conditions that may influence Dominion Energy's ability to maintain the planned construction schedule. If this is determined to be necessary, WTG foundations would only be installed between May 1st through September 30th of 2026. However, this schedule shift would not change NMFS' proposed determinations as the total number of piles would remain the same. While this shift is unlikely to occur, the proposed rulemaking does retain flexibility in addressing unforeseen circumstances. However, all foundations would be installed during the effective period of this proposed rule, if issued. OSS jacket foundations would most likely be installed in August 2024; however, they could be installed anytime between May 1st through October 31st. For both types of foundations, Dominion Energy has committed to not installing from November 1st through April 30th, annually.

A WTG monopile foundation typically consists of a single steel tubular section, with several sections of rolled steel plate welded together. Each monopile would have a maximum diameter tapering from 7.5 m (24.6 ft) at the top to 9.5 m (31 ft) at the seafloor (collectively referred to as a 9.5/7.5-m monopile). WTGs would be spaced approximately 0.75 nautical miles (nm; 1.39 km) in an east-west direction and 0.93 nm (1.72 km) in a north-south direction and will have an average penetration depth of 42 m (138 ft; between 30 m and 46 m per Attachment Z–3 of Appendix A in Dominion Energy's ITA application). Although only 176 WTGs would be installed, seven foundations may need to be re-installed at a different location; hence Dominion Energy has accounted for up to 183 WTG individual piling events in its analysis, which we have carried forward with in this proposed rule.

Each OSS installed by Dominion Energy would be supported by a jacket foundation. A piled jacket foundation is formed by a steel lattice construction (comprising tubular steel members and welded joints) secured to the seabed by means of hollow steel pin piles attached to the jacket. Each jacket foundation would consist of up to four pin piles. In total, Dominion Energy would install up to 3 OSSs for a total of 12 pin piles. Up to two pin piles would be installed per day. Pin piles will have a maximum diameter of 2.8 m (9.2 ft) each and will be installed vertically. The maximum penetration depth of each pin pile would be 82 m (269 ft).

Given the project area's soil conditions, the installation of both WTG monopile foundations and OSS jacket foundations would necessitate the use of both vibratory and impact pile driving to avoid pile run (also known as "punch-through"). Pile run can occur when a monopile or a pin pile rapidly penetrates in an uncontrolled manner through a weak layer of soil, due to the soil resistance being lower than the weight of the pile and hammer (transferring impulsive energy to the pile). Pile runs can occur instantaneously and through a depth of meters to dozens of meters. A pile run incident can have severe negative consequences, both for the safety of personnel aboard the installation vessel and significant risk of damage to equipment. To mitigate this risk, Dominion Energy would first perform vibratory hammering, which would allow for a more controllable installation process when installing piles in soft sediments as the vibrohammer is directly in contact with the pile (see Figures 2 through 5 in Dominion Energy's ITA application), as opposed to installation using the impact hammer (see Figures 6 and 7 in Dominion Energy's ITA application). Once the pile run risk depth has been passed, the method of installation would transition from a vibratory hammer to an impact hammer. It is anticipated the transition from a vibratory hammer to an impact hammer would require approximately 1.2 hours wherein no pile driving would occur. Once installation of the monopile and/or pin pile is complete, the pile driving vessel would move to the next installation location. While Dominion Energy states that not all piles will require the use of the vibrohammer in conjunction with the impact hammer, it was considered more conservative to analyze all installed piles using this dual approach as it is not yet known how many would require the dual installation method. No concurrent pile driving at multiple locations would occur.

Per monopile, use of the vibrohammer is estimated to occur for approximately 30 to 60 minutes (depending on if the pile uses a standard driving or hard-to-drive scenario, respectively) to firmly stabilize the foundation pile. A 72 minute (1.2 hour) pause to allow for the vibratory hammer to be exchanged with an impact hammer would occur. Then, the impact hammer would be used for approximately three hours (constituting approximately 3 hours for 3,240–3,720 total hammer strikes, with more strikes needed if the pile is considered difficult to install). A joint standard and hard-to-drive scenario (Scenario 3) for the installation of up to two monopiles in a single day may require up to 90 minutes of vibratory pile driving followed by up to 6,960 hammer strikes. In all situations, the impact hammer would drive the pile until it reaches its target embedment depth (approximately 42 m (138 ft) for monopiles). The three possible WTG monopile installation scenarios are laid out in Table 2 below:

TABLE 2—WTG MONOPILE SCENARIOS WITH SCENARIO-SPECIFIC INSTALLATION CHARACTERISTICS

Installation scenario	Number of WTG monopiles installed	Maximum vibratory hammer duration (minutes)	Maximum impact hammer strikes	Impact hammer energy (kJ)
Scenario 1 (Standard)	1	60	3,240	4,000
Scenario 2 (Hard-to-drive)	1	30	3,720	4,000

TABLE 2—WTG MONOPILE SCENARIOS WITH SCENARIO-SPECIFIC INSTALLATION CHARACTERISTICS—Continued

Installation scenario	Number of WTG monopiles installed	Maximum vibratory hammer duration (minutes)	Maximum impact hammer strikes	Impact hammer energy (kJ)
Scenario 3 (Standard and Hard-to-drive)	2	90	6,960	4,000

For pin piles, vibratory pile driving is anticipated to require approximately 120 minutes (2 hours), a 72 minute (1.2 hours) pause in activities, and then continue with impact pile driving using a hammer energy up to 3,000 kJ, resulting in a total estimate of 15,210 hammer strikes. As with WTG foundations, the impact hammer would drive the pin pile until it reaches its target embedment depth (approximately 82 m (269 ft) for pin piles). A maximum of two pin piles would be driven per day. Each OSS jacket foundation would take approximately five days to install with a total of 30 days needed for the completion of all three OSSs (n=3) with all of their pin piles (n=12). This 30-day period does include periods of non-pile driving time where other activities related to the jacket foundations may be installed.

The current construction schedule assumes foundation installation would occur in 2024 and 2025; however, as previously discussed in the Dates and Duration section, limited installation of WTGs may need to be installed in 2026 if the project falls off of the construction schedule. Given an estimated installation schedule, Dominion Energy expects that up to 95 monopile foundations would be installed in 2024 and up to 88 monopiles would be installed in 2025. If pile driving must occur in this 3rd year, installation would only occur across a five month period (May 1st through September 30th, 2026). All WTG and OSS foundation installation would occur during daylight hours only. The only exception would be if, for safety reasons, ceasing pile driving activities would compromise both the health of humans and the environment or if ceasing the pile driving would cause instability and integrity concerns on the project. In most cases, one pile would be installed per day, although two may be installed during some months. No concurrent pile driving is planned or proposed to occur. The same exception described above for WTG foundations applies to OSS foundations where integrity or safety concerns may necessitate the pile to be finished after sunset. The proposed WTG and OSS pile driving schedule can be found in Table 3 below that describes the construction schedule on both an annual and monthly basis.

TABLE 3—PROPOSED PILE DRIVING SCHEDULE FOR THE CVOW–C PROJECT OF 176 WTGS AND 3 OSSS, PLUS 7 POSSIBLE WTG RE-PILING EVENTS

Year [b]	Month	Total proposed number of piles	Number of hard-to-drive piles	Number of standard piles	Days when two monopiles may be installed per day
2024	May	18	5	13	1
	June	25	6	19	6
	July	26	7	19	6
	August	2 monopiles; 12 pin piles	1	1	1
	September	13	3	10	0
	October	11	1	10	0
2024 Annual Total		95 monopiles; 12 pin piles [a]	23	72	14
2025	May	16	6	10	1
	June	22	8	14	6
	July	24	8	16	6
	August	20	6	14	6
	September	5	2	3	0
	October	1	1	0	0
2025 Annual Total		88 monopiles	31	57	19

[a] Included only if seven re-piling events are necessary.
[b] While Dominion Energy plans for all pile driving to be completed by the end of the 2025 piling period (end of October 2025), unforeseen circumstances may necessitate that piling would need to continue into 2026. While not planned or anticipated, the proposed rule would allow for flexibility in shifting certain activities with the understanding that the maximum estimated takes would not exceed the amount described in the proposed rule.

Cable Landfall Construction

To support the connection of the offshore cable with the onshore cable, Dominion Energy would install both temporary goal posts and temporary cofferdams approximately 1,000 m (3,281 ft) offshore of the State Military Reservation in Virginia Beach, Virginia. These activities are two components of a broader set of activities conducted during cable landfall construction. The goal posts and cofferdams would support work associated with installing casing pipes housing the export cables. Dominion Energy would install the 9 casing pipes approximately 50 ft apart from each other at the cable landfall construction site using a Trenchless Installation approach. Using a tunneling approach similar to horizontal directional drilling (HDD), a boring machine would excavate the ground while simultaneously pushing strings of steel casing pipes along umbilical lines using rollers or other movable support structures behind the boring drill using a pipe thruster machine. The export cables would be fed through these pushed casing pipes, which would terminate at an onshore exit point located west of the firing range from the State Military Reservation.

Temporary goal posts (made up of 42-in diameter steel pipe piles) would be installed between each exit location and would be used to guide the progress and movement of the casing pipes and to provide lateral stability. Temporary cofferdams are used to aid cable pull in as the cable is fed through the underground tunnel (located 6.6 ft (2 m) below the seabed). A technical description of the Trenchless Installation approach can be found in Section 1 of Dominion Energy's ITA application.

Trenchless installation requires the use of extensive equipment that would be staged at the onshore location for the cable. However, only the equipment required to extract the boring device, post-tunneling, is temporarily staged at the onshore exit location. Despite the extensive equipment necessary for this activity (see the ITA application for details), most of it is not expected to result in the take of marine mammals as the source levels are all generally very low. Even the pipe thruster does not vibrate or make noise and simply pushes the pipe forward with the boring device. Because of this, only the aspects for cable landfall construction that could cause the take of marine mammals (*i.e.,* impact and vibratory pile driving) is discussed further. The aspects of landfall construction that could cause the harassment of marine mammals is specifically due to the installation of steel pipe piles for goal posts and the installation and removal of sheet piles for cofferdams.

The goal posts would consist of 1.07 m (42 in) steel pipe piles that would be installed using an impact hammer for up to 130 minutes daily (a maximum of 2 installed per day). The duration of each strike of the impact hammer would be between 0.5–2 seconds in duration and necessitate approximately 260 strikes per pile. Up to 12 goal posts are required at each of the 9 casing pipe locations; hence 108 goal posts would be installed. Given there are 12 goal posts per each of the nine Direct Pipe locations, a total of 108 piles would be installed. Given up to 2 piles would be installed per day, there could be 520 strikes per day. To install all goal posts, Dominion Energy would conduct pile driving for 54 days.

Once installed, the goal posts can be removed using equipment not expected to generate any underwater acoustic noise as the majority of the force applied would be to overcome the skin friction of the material that is embedded in the substrate. This is expected to consist of pulling/tugging of the piles using mechanical or hydraulic equipment and take a similar amount of time of installation (*i.e.,* a total of 54 days for removal, although no take is expected). Based on Dominion Energy's schedule, which includes both installation and removal of the goal posts, these activities are expected to occur in 2024, between May 1st–October 31st, and necessitate approximately 6 months for complete installation and removal. Given no take is expected from the removal of goal posts, only the 54 days for installation of 108 total pipe piles has been carried forward into the Estimated Take of Marine Mammals section.

Dominion Energy also anticipates that up to nine temporary cofferdams, which would only be installed and removed via vibratory pile driving, may be necessary during cable landfall construction activities. These would be located at the Nearshore Trenchless Installation Punch-Out location, where the export cables would transition (via underground drilling) to the onshore cable landing location, to facilitate the preferred approach of lowering of the Direct Pipe burial underground (approximately 2 m (6.6. ft) below the seabed) to reduce the need for additional cable protections and to minimize the release of sediments and drilling fluids into the water. Each temporary cofferdam would consist of 30 to 40 steel sheet piles measuring 0.51 m (20 in) in diameter arranged in a predetermined configuration (270 to 360 steel sheet piles total for all nine cofferdams). Vibratory pile drivers would be used to both install and remove the steel sheet piles. Each sheet pile would necessitate approximately 2 to 3 minutes of active drive time for installation, at a maximum installation rate of 20 sheet piles per day (up to 40–60 minutes daily). To allow for flexibility in the plan, Dominion Energy has assumed installation will take approximately 3 days (180 minutes total) per cofferdam. Removal of these sheet piles would also occur by a vibratory driver and is estimated to take approximately the same amount of time to remove as it was to install for a total of 3 days per cofferdam. A single cofferdam would take a total of 6 days to install and remove. In total, pile driving (installation and removal) associated with all cofferdams would occur over 54 non-consecutive days.

Collectively, Dominion Energy estimates that the installation and removal of all necessary components for cable landfall activities that have the potential to result in take of marine mammals (*i.e.,* pile driving of goal posts and cofferdams) would take 108 days. However, within this 45 week period, activities not expected to harass marine mammals would also be occurring (*e.g.,* area preparation, material transportation, equipment staging, *etc.*) as the activities necessary for the installation and removal of all relevant goal posts and cofferdams are not consecutive. Therefore, Dominion Energy has estimated that activities potentially resulting in the take of marine mammals would only be occurring for approximately 6 months between May 1st through October 31st, 2024, which is what is described here. Although temporary cofferdam installation and removal is anticipated to occur from May 1st through October 31st of 2024 and take approximately 6 months, per Dominion Energy's construction schedule, both installation and removal will not occur within a consecutive 6 days (the total number of days for installation and removal to occur) but may instead occur at different points during the 6 month estimated duration.

High-Resolution Geophysical Surveys

HRG surveys would be conducted to identify any seabed debris and to support micro-siting of the WTG and OSS foundations and all cable routes. After construction is complete, HRG surveys would be conducted to ensure that all underwater project components have been properly installed. These surveys may utilize acoustic equipment such as multibeam echosounders, side scan sonars, shallow penetration sub-bottom profilers (SBPs) (*e.g.,* Compressed High-Intensity Radiated Pulses (CHIRPs) non-parametric SBP), medium penetration sub-bottom profilers (*e.g.,* sparkers and boomers), and ultra-short baseline positioning equipment, some of which are expected to result in the take of marine mammals. Surveys would occur annually, with durations dependent on the activities occurring in that year (*i.e.,* construction years versus operational years). Of the HRG equipment types proposed for use, the following sources have the potential to result in take of marine mammals:

• Shallow penetration sub-bottom profilers (SBPs) to map the near-surface stratigraphy (top 0 to 5 m (0 to 16 ft) of sediment below seabed). A CHIRP system emits sonar pulses that increase in frequency over time. The pulse length frequency range can be adjusted to meet project variables. These are typically mounted on the hull of the vessel or from a side pole.

• Medium penetration SBPs (boomers) to map deeper subsurface stratigraphy as needed. A boomer is a broad-band sound source operating in the 3.5 Hz to 10 kHz frequency range. This system is typically mounted on a sled and towed behind the vessel.

• Medium penetration SBPs (sparkers) to map deeper subsurface stratigraphy as needed. A sparker creates acoustic pulses from 50 Hz to 4 kHz omni-directionally from the source that can penetrate several hundred meters into the seafloor. These are typically towed behind the vessel with adjacent hydrophone arrays to receive the return signals.

Table 4 identifies all the representative survey equipment that may be used during the CVOW–C proposed project.

TABLE 4—ACOUSTIC SOURCES PLANNED FOR USE DURING THE CVOW–C PROPOSED PROJECT AND THEIR OPERATIONAL PARAMETERS

Equipment classification	Representative equipment	Operating frequencies (kHz)	L_p	$L_{p,pk}$	Primary beam width (degrees)	Pulse duration (millisecond)
Subsea Positioning/ultra-short base-line (USBL).	Sonardyne Ranger 2 USBL	35–55	188	191	90	1
	EvoLogics S2CR	48–78	178	186	Horizontally Omnidirectional	500–600
	ixBlue Gaps	20–30	191	194	200	9–11
Multibeam Echosounder	R2Sonics 2026	170–450	191	221	0.45 × 0.45–1 × 1	0.015–1.115
Synthetic Aperture Sonar (SAS), combined bathymetry/sidescan [a].	Kraken Aquapix	337	210	213	>135 vertical, 1 horizontal	1–10
Side Scan Sonar [a]	EdgeTech 4200 dual frequency	300 and 600	[b] 206	[b] 212	140	5–10
Parametric SBP	Innomar SES–2000 Medium 100	2–22	241	247	2	0.07–1
NonParametric SBP	EdgeTech 216 CHIRP	2–16	193	196	15–25	5–40
	EdgeTech 512 CHIRP	0.5–12	[c] 177	[c] 191	16–41	20
Medium Penetration Seismic	Geo Marine Dual 400 Sparker 800J	0.25–4	[d] 200	[d] 210	Omnidirectional	0.5–0.8
	Applied Acoustics S-Boom (Triple Plate Boomer 1000J).	0.5–3.5	[e] 203	[e] 213	[f] 60	10
Magnetometer (Towed)	Geometrics G882	200	192	190	7	1.13

Note: dB re 1 µPa m—decibels referenced to 1 MicroPascal at 1 meter; kHz—kilohertz.

[a] The operating frequencies of these sources are above all relevant marine mammal hearing thresholds (>180 kHz) and are not expected to cause take by harassment of marine mammals.

[b] The source level is based on data from Crocker and Franantonio (2016) using the EdgeTech 4200 at 100 percent power and 100 kHz as a proxy.

[c] The source level is based on data from Crocker and Franantonio (2016) using the EdgeTech 512i at 100 percent power as a proxy.

[d] The source level is based information provided by the source manufacturer in the supplemental attachment to the ITA application called "Noise Level Stacked 400—tuned".

[e] The source level is based on data from Crocker and Franantonio (2016) using the Applied Acoustic S-Boom with CSP–N Energy Source set at 1,000 joules as a proxy.

[f] The beam width is based on data from Crocker and Franantonio (2016) using the Applied Acoustics S-Boom as a proxy.

As shown in Table 4 above, multibeam echosounders and side scan sonars used by Dominion Energy operate at frequencies above 180 kHz, which is outside of any marine mammal hearing range. Hence, take from these sources is not anticipated. In addition, due to the characteristics of non-impulsive sources (*i.e.,* Ultra-Short BaseLine (USBL), Innomar, and other parametric sub-bottom profilers), take is not anticipated due to operating characteristics like very narrow beam width which limit acoustic propagation. Finally, Dominion Energy may also use magnetometers; however, this equipment does not have an acoustic output, hence no take is anticipated. No harassment can be reasonably expected from the operation of any of these sources; therefore, they are not considered further in this proposed action. The sources that have the potential to result in harassment to marine mammals include CHIRPs, boomers, and sparkers.

HRG surveys would utilize between two or three vessels working concurrently in different sections of the Lease Area and Export Cable Routes. Both vessels would be operating several kilometers apart at any one time. On average, 58 km (36 mi) would be surveyed each survey day, per vessel, at a speed of approximately 2.4 km/hour (1.3 kts) on a 24-hour basis although some vessels may only operate during daylight hours (survey vessels operating for 12-hours). During the five-years the proposed rule would be effective an estimated area of 64,264 km^2 (24,812.5 mi^2; 15,879,980.2 acres) will be surveyed across the CVOW–C project area.

HRG site characterization surveys would occur annually and throughout the five years of the proposed authorization with duration dependent on the activities occurring in that year (*i.e.,* construction versus non-construction year). However, HRG survey activities would not commence earlier than February 5, 2024 (*i.e.,* the effective date of the proposed rule). The HRG survey schedule assumes 24-hour operations and does account for periods of potential downtime due to inclement weather or technical malfunctions. HRG surveys are anticipated to operate at any time of year for a maximum of 1,108 active sound source days (*i.e.,* days in which an acoustic source would be used) over the five-year project. Up to 65 days are anticipated pre-construction, 307 are anticipated to occur during the primary construction years (2025 and 2026), and 736 would occur the post-construction years (368 survey days annually). While the effective period of the proposed rulemaking would continue through a few months in 2029, no activities are planned to occur during this year so none are described here. An approximated schedule for Dominion Energy's HRG survey effort is shown in Table 5. As Dominion Energy is not sure of the exact geographic locations of the survey effort, these values cannot cleanly be broken up between the Lease Area and the Export Cable Routes. However, the values presented in Table 5 provide a comprehensive accounting of the total survey effort anticipated to occur, annually, by Dominion Energy.

TABLE 5—PROPOSED HRG SURVEY SCHEDULE FOR THE CVOW–C PROJECT

Survey segment	Year	Duration (days) [a]
Pre-Lay Surveys	2024	65
As-Built Surveys and Pre-Lay Surveys	2025	249
As-Built Surveys	2026	58
Post-Construction Surveys	2027	368
Post-Construction Surveys	2028	368

[a] As multiple vessels (*i.e.,* two survey vessels) may be operating concurrently across the project area, each day that a survey vessel is operating counts as a single survey day. For example, if two vessels are operating in one of the Export Cable Routes and one is operating in the Lease Area, but both are operating concurrently, this counts as two survey days.

Cable Laying and Installation

Cable burial operations would occur both in the Lease Area and export cable routes from the least area to shore. The inter-array cables would connect the 176 WTGs to any one of the three OSSs. Cables within the Export Cable Routes would carry power from the OSSs to shore at the landfall location near the firing range at the State Military Reservation in Virginia Beach, Virginia. The offshore export and inter-array cables would be buried in the seabed at a target depth of up to 0.8 m (2.6 ft) to 3 m (9.8 ft), although the exact depth will depend on the substrate in the area.

Cable laying, cable installation, and cable burial activities planned to occur during the construction of the CVOW–C project may include the following: jet plowing, jet trenching, chain cutting, hydro-plowing (simultaneous lay and burial), mechanical plowing (simultaneous lay and burial), pre-trenching (both simultaneous and separate lay and burial), mechanical trenching (simultaneous lay and burial), and/or other available technologies. As the noise levels generated from cable laying and installation work are low, the potential for take of marine mammals to result is discountable. Dominion Energy is not requesting and NMFS is not proposing to authorize take associated with cable laying activities. Therefore, cable laying activities are not analyzed further in this document.

Site/Seafloor Preparation

Prior to installation activities, Dominion Energy would conduct debris clearance, pre-lay grapnel runs, Unexploded Ordnance/Munitions and Explosives of Concern (UXO/MEC) relocation, and pre-lay surveys. While Dominion Energy does not expect any sandwave clearance or boulder removal activities to occur, planned vessel use described below in Table 6 indicates that these activities may occur. Because of this, we include additional information on what these activities may entail and how they would affect marine mammals.

Typically for offshore construction projects, some dredging may be required prior to cable laying due to the presence of sandwaves. Sandwave clearance is typically undertaken where cable exposure is predicted over the lifetime of a project due to seabed mobility. This facilitates cable burial below the reference seabed. Alternatively, sandwave clearance may be undertaken where slopes become greater than approximately 10 degrees (17.6 percent), which could cause instability to the burial tool. Dominion Energy does not anticipate any sandwave clearance (Dominion Energy, 2023). However, while unanticipated, if it becomes necessary to remove sandwaves, Dominion Energy will clear the area using subsea excavation methods. The work could be undertaken by traditional dredging methods such as a trailing suction hopper. Controlled flow excavation may be used to induce water currents to force the seabed into suspicion, where it would otherwise be directed to eventually settle (Dominion Energy, 2023). In some cases, pre-sweeping of the sandwaves may be necessary to provide a sufficient excavated platform at the base of the sandwave for tool installation. Surveys using multi-beams and other equipment may be necessary to inform on the seabed conditions before and after sandwave clearance and cable lay activities (Dominion Energy, 2023).

For monopile and jacket foundation installation, seafloor preparation could include required boulder clearance and removal of any obstructions within the Seafloor Preparation Area at each foundation location. Scour protection installation will occur prior to and/or after installation and will involve a rock dumping vessel placing scour at each foundation location.

For export cable installation, seafloor preparation typically includes required sandwave leveling, boulder clearance, and removal of any out of service cables. Boulder clearance trials are normally performed prior to wide-scale seafloor preparation activities to evaluate efficacy of boulder clearing techniques. Additionally, pre-lay grapnel runs may be undertaken to remove any seafloor debris along the Export Cable Routes. A specialized vessel will tow a grapnel rig along the centerline of each cable to recover any debris to the deck for appropriate licensed disposal ashore, where practicable. Concrete mattress separation layers may also be installed at cable routes prior to cable installation for both in-service assets as well as out-of-service assets that cannot be safely removed and pose a risk to the CVOW–C Export Cable Routes.

Boulder clearance may also be required in targeted locations to clear boulders along the Export Cable Routes, inter-array cable routes, and/or foundations prior to installation. Boulder removal can be performed using a combination of methods to optimize clearance of boulder debris of varying size and frequency. Removal is based on pre-surveys to identify location, size, and density of boulders. Surveys previously performed by Dominion Energy have indicated that no boulders over 0.5 m, or any other subsea obstructions, have been identified in the project area (Dominion Energy, 2023). If boulders are encountered during installation activities, Dominion Energy would move them from the Export Cable Routes, using either subsea grabs, or ploughs, and then relocate them to areas as close as possible to the original location of the undersea object (Dominion Energy, 2023). Boulder removal, if necessary to occur based on information obtained during pre-construction surveys, would be performed prior to the installation of the Export Cable Routes and would be completed by a support vessel. A boulder grab or a boulder plow may be used to complete boulder removal prior to installation. A boulder grab involves a grab most likely deployed from a dynamic positioning offshore support vessel being lowered to the seabed, over the targeted boulder. Once ''grabbed'', the boulder is relocated away from the cable route and/or foundation location.

Boulder clearance using a boulder plow is completed by a high-bollard pull vessel, with a towed plow generally forming an extended V-shaped configuration, splaying from the rear of the main chassis. The V-shaped configuration displaces any boulders to the extremities of the plow, thus clearing the corridor. A tracked plow with a front blade similar to a bulldozer may also be used to push boulders away from the corridor. The size of boulders that can be relocated is dependent on a number of factors including the boulder weight, dimensions, embedment, density and ground conditions. Typically, boulders with dimensions less than 2.5 m (8 ft) can be relocated with standard tools and equipment.

Effects from seafloor preparation on marine mammals are expected to be short-term, low intensity, and unlikely to qualify as a take. Dredging, sandwave leveling, and boulder clearance is expected to be extremely localized at any given time, and NMFS expects that any marine mammals would not be exposed at levels or durations likely to disrupt behavioral patterns (*i.e.,* migrating, foraging, calving, *etc.*). Therefore, the potential for take of marine mammals to result from these activities is so low as to be discountable. Dominion Energy did not request and NMFS is not proposing to authorize any takes associated with seabed preparation activities; therefore, they are not analyzed further in this document.

Vessel Operation

Dominion Energy would utilize a variety of vessels to construct the CVOW–C project. Vessels may be used for direct installation or construction activities, surveys, protected species resource monitoring, and for crew and/or supply transfers. All route plans for all vessels would be designed to meet the industry guidelines and best practices in accordance with the International Chamber of Shipping guidance. All vessels would utilize Automatic Identification Systems (AIS) for all aspects of the project, as required by the United States Coast Guard. AIS would be required to monitor the number of vessels and traffic patterns for analysis and compliance with vessel speed requirements. All vessels will operate in accordance with applicable rules and regulations for maritime operation within U.S. Federal and state waters.

The largest vessels are expected to be used during the WTG installation phase with floating/jack-up crane barges, cable-laying vessels, supply/crew vessels, and/or associated tugs and barges transporting construction equipment and materials. Large work vessels (*e.g.,* jack-up installation vessels and DP cable-laying vessels) for WTG and OSS foundation installation will generally transit to the work location and remain in the area until installation is complete. These large vessels will move slowly over a short distance between work locations. In contrast, other vessels will travel between several ports and the Lease Area over the course of the construction period following mandatory vessel speed restrictions (see Proposed Mitigation section). These vessels will range in size from smaller crew transport boats to tug and barge vessels. However, construction crews responsible for assembling the WTGs will hotel onboard installation vessels at sea, thus limiting the number of crew vessel transits expected during the installation of the Lease Area.

While marine mammals may respond to the presence of a vessel, given the predictable movement and ubiquitous presence of vessels in the marine environment, and especially the variable sizes, which consist of smaller support vessels that are predominate during offshore wind development, exposure to transiting vessels would not generally be expected to result in the disruption of marine mammal behavioral patterns such that a take would occur. As part of various vessel-based construction activities, including cable laying and construction material delivery, dynamic positioning thrusters may be utilized to hold vessels in position or move slowly. Sound produced through use of dynamic positioning thrusters is similar to that produced by transiting vessels, and dynamic positioning thrusters are typically operated either in a similarly predictable manner or used for short durations around stationary activities. Construction-related vessel activity, including the use of dynamic positioning thrusters, is not expected to result in take of marine mammals. Dominion Energy did not request and NMFS does not propose to authorize any take associated with vessel activity.

Dominion Energy has executed a lease agreement for a portion of the existing Portsmouth Marine Terminal facility in the city of Portsmouth, Virginia, to serve as a Construction Port (Sections 1–3, Dominion Energy, 2023). The Construction Port would be used to stage and store the monopiles and relevant transition pieces and to stage and store and pre-assemble wind turbine generation components. Dominion Energy is also currently evaluating several alternatives to lease portions of existing port facilities in the Hampton Roads, Virginia area for an operation and maintenance facility for the CVOW–C proposed project. The preferred location is Lambert's Point, located on a brownfield site in Norfolk, Virginia, although existing facilities at the Virginia Port Authority's Portsmouth Marine Terminal or Newport News Marine Terminal may also be viable options. These ports will continue to assist Dominion Energy to support offshore construction, assembly and fabrication, crew transfers, and logistics.

Vessel types and usage estimated to occur during the entire five-year effective period of the proposed rule, if issued, is shown in Table 6. NMFS references the reader to Dominion Energy's COP for additional information on vessels planned for use during the CVOW–C proposed project (Dominion Energy, 2023).

TABLE 6—PROPOSED PROJECT VESSEL USE DURING THE 5-YEAR CVOW–C PROJECT [1]

Vessel role	Vessel class	Number of vessels	Breadth (ft)	Length (ft)	Draft (ft)	Days on project, including spare positions	Most likely operating period	Frequency of transit	Transit destination
Scour Protection Installation.	Fall Pipe Vessel.	1	106	507	25	657	10/2023 to 12/2024 and 02/2025 to 10/2025.	Weekly	Canada/USA.

TABLE 6—PROPOSED PROJECT VESSEL USE DURING THE 5-YEAR CVOW–C PROJECT [1]—Continued

Vessel role	Vessel class	Number of vessels	Breadth (ft)	Length (ft)	Draft (ft)	Days on project, including spare positions	Most likely operating period	Frequency of transit	Transit destination
Transport Monopile/Transition Pieces from U.S. Port to Installation Site.	U.S. Barge	2	105	400	20	823	04/2024 to 12/2025.	(188+17)/2 = 103 cycles in total for all barges.	Portsmouth, VA.
Tugs for Monopile/Transition Piece Transport Barges.	U.S. Ocean-going Tug.	3	41	132	18	823	04/2024 to 12/2025.	103 + 52 = 155 cycles in total.	Portsmouth, VA.
Monopile/Transition Piece/Offshore Substation Installation.	Heavy Lift Vessel (HLV).	1	161	711	36	804	04/2024 to 12/2025.	Monthly	Europe/Hampton Roads, VA.
Noise Monitoring.	Crew Transfer Vessel (CTV).	2	34	84	7	512	05/2024 to 10/2024 and 05/2025 to 10/2025.	Daily	Portsmouth, VA.
Noise Mitigation	Platform Support Vessel.	1	100	454	29	512	05/2024 to 10/2024 and 05/2025 to 10/2025.	2 cycles in total + X due to bad weather.	Portsmouth, VA.
Crew Transfer	CTV	1	23	65	6	822	04/2024 to 12/2025.	Every 2nd day	Portsmouth, VA.
Jacket Installation.	DP HLV	1	161	710	36	....	....	Monthly	Europe/Hampton Roads, VA.
Noise Monitoring for Jacket Installation.	Crew Transfer Vessel (CTV).	2	34	84	7	....	....	Daily	Portsmouth, VA.
Noise Mitigation for Jacket Installation.	Platform Support Vessel.	1	100	454	29	....	....	Daily	Portsmouth, VA.
Transport Jackets/TopSides From EU Port to Installation Site.	HLV	1	138	568	35	186	11/2024 to 04/2025.	3 cycles in total	Europe.
Assist Tugboat For Topside Installation.	U.S. Ocean-going Tug.	1	35	112	19	....	....	Daily	Hampton Roads, VA.
Offshore Cable Commissioning (Contingency Vessel).	DP2 JUV	2	230	132	20	288	11/2024 to 07/2025.	N/A	N/A.
Nearshore Trenchless Installation.	Drill Rig Spread	2	40	9	N/A	262	09/2023 to 02/2024.	N/A (staged at the direct pipe punch-out locations).	Hampton Roads, VA.
Nearshore Marine Assistance.	U.S. Multi Purpose Support Vessel (Multicat).	2	40	92	14	262	....	Weekly	Portsmouth, VA.
Nearshore Marine Assistance.	U.S. Tug (Small).	1	35	112	19	262	....	Weekly	Portsmouth, VA.
Landfall	Landfall Beach Spread.	1	N/A	N/A	N/A	523	01/2023 to 04/2024 and.	Weekly	Hampton Roads, VA.
Shore Pull-in	U.S. Pull-in Support Barge.	1	105	400	20	523	07/2024 to 09/2025.	Weekly	Portsmouth, VA.
Shore Pull-in	U.S. Workboat (Tug).	4	41	132	18	523	....	Weekly	Portsmouth, VA.
Cable Lift Jack-Up Installation Vessel (Contingency Vessel).	JUV	1	105	144	13	....	....	....	
Pre-lay Grapnel Run.	Multipurpose Support Vessel.	1	59	266	19	77	....	Weekly	Portsmouth, VA.
Pre-installation Survey.	Survey Vessel	1	234	187	10	180	....	Weekly	Portsmouth, VA.

TABLE 6—PROPOSED PROJECT VESSEL USE DURING THE 5-YEAR CVOW–C PROJECT [1]—Continued

Vessel role	Vessel class	Number of vessels	Breadth (ft)	Length (ft)	Draft (ft)	Days on project, including spare positions	Most likely operating period	Frequency of transit	Transit destination
Cable Laying and Burial.	Shallow-draft Cable Lay Vessel.	1	110	401	18	523	....	Monthly	Europe/Hampton Roads, VA.
Anchor Handling.	Multi Purpose Support Vessel (Multicat).	2	40	92	14	523	....	Daily	Hampton Roads, VA.
Transport Cable	Multi Purpose Support Vessel.	3	79	289	15	131	....	Single Trip	Europe/Hampton Roads, VA.
Cable Burial	Hydroplow (Jetting).	1	20	53	14	523	....	N/A	Europe/Hampton Roads, VA.
Crew Transfer	CTV	1	34	87	10	523	....	Every 2nd Day	Portsmouth, VA.
As-built Survey	Survey Vessel	1	234	87	10	46	....	Weekly	Portsmouth, VA.
Pre-lay Survey (Offshore Export Cable).	Survey Vessel	34	87	10	10	180	1/2023 to 04/2024 and 08/2024 to 09/2025 and 11/2025 to 02/2026.	Weekly	Portsmouth, VA.
Cable Laying and Burial (Offshore Export Cable).	Deep-draft Cable Lay Vessel.	1	106	528	22	535	....	Monthly	Hampton Roads, VA.
Cable Laying and Burial (Offshore Export Cable).	Deep-draft Cable Lay Vessel.	1	39	110	9	470	....	Monthly	Europe/Hampton Roads, VA.
Cable burial (Offshore Export Cable).	Trenching Support or Cable Laying Vessel.	1	105	529	25	604	....	Monthly	Europe/Hampton Roads, VA–.
Cable burial (Offshore Export Cable).	Trenching Support or Cable Laying Vessel.	1	112	561	28	605	....	Monthly	Europe/Hampton Roads, VA–.
Cable burial (Offshore Export Cable).	Burial Tool (Post-lay Jetting).	2	25	46	19	1,209	....	Monthly	Europe/Hampton Roads, VA–.
Offshore Jointing Vessel (Offshore Export Cable).	....	1	23	565	6	....	....	Monthly	Europe/Hampton Roads, VA.
Pre-lay Grapnel Run (Inter Array Cable).	Multipurpose Support Vessel.	1	26	92	9	109	01/2023 to 04/2024 and 11/2024 to 05/2026.	Weekly	Portsmouth, VA.
Pre-lay Survey (Inter-Array Cable).	Survey Vessel	1	23	85	5	52	....	Weekly	Portsmouth, VA.
Cable Laying and burial (Inter-Array Cable).	Deep-draft Cable Lay Vessel.	1	106	528	25	558	....	Every 60 days	Europe/Hampton Roads, VA.
Multipurpose Service Vessel (Inter-Array Cable).	W2W	2	76	292	18	303	....	Monthly	Hampton Roads, VA.
Crew Transfer (Inter-Array Cable).	CTV	2	23	65	6	558	....	Every 2nd Day	Portsmouth, VA.
Cable Burial (Inter-Array Cable).	Trenching Support Vessel or Cable Laying Vessel.	1	105	529	37	559	....	Every 60 days	Hampton Roads, VA.
Cable Burial (Inter-Array Cable).	Burial tool (Post-lay Jetting).	1	25	46	19	558	....	Every 60 days	Hampton Roads, VA.
As-built Survey (Inter-Array Cable).	Deep draft Cable Lay Vessel.	1	106	528	25	38	....	Weekly	Portsmouth, VA.
WTG Installation.	JUV	1	184	472	23	923	08/2025 to 02/2027.	Vessel 1: Every 10–14 days Vessel 2: N/A.	Vessel 1: Portsmouth, VA Vessel 2: N/A.

TABLE 6—PROPOSED PROJECT VESSEL USE DURING THE 5-YEAR CVOW–C PROJECT [1]—Continued

Vessel role	Vessel class	Number of vessels	Breadth (ft)	Length (ft)	Draft (ft)	Days on project, including spare positions	Most likely operating period	Frequency of transit	Transit destination
Transport WTGs from U.S. port to installation site.	U.S. Barge	2	100	400	20	792		Approximately every 3 days.	Portsmouth, VA.
Transport WTGs from U.S. Port to Installation Site.	U.S. Ocean-going Tug.	2	41	132	18	792		Approximately every 3 days.	Portsmouth, VA.
Assist Tugboat	U.S. Ocean-going Tug.	1	35	112	19			Approximately every 3 days.	Hampton Roads, VA.
Commissioning Spread.	Multi-role subsea Support Vessel with W2W.	1	52	354	18	792	08/2025 to 04/2027.	Bi-weekly	Portsmouth, VA.
Site Security	Safety vessel, Nearshore Trenchless Installation.	1	Varies	Varies	Varies	1.8684	09/2023 to 08/2027.	Bi-weekly	Portsmouth, VA.
Removing Sandwaves (Contingency Vessel).	Trailer Suction Hopper Dredger.	1	92	480	30	117.6	2023	Daily	Portsmouth, VA.
Boulder Pickering (Contingency Vessel).	Anchor Handling Tug + Crane Barge.	2	46	146	21	117.6	2023	Weekly	Portsmouth, VA.
Boulder Ploughing (Contingency Vessel).	Anchor Handling Tug + Towed Plow.	1	36	190	11	157.2	2023	Weekly	Portsmouth, VA.
Crossing Protection (Concrete Mattresses).	Fall Pipe Vessel or Deep Draft Cable Lay Vessel.	1	46	146	21	126	2024 to 2026	Between 2 and 27 cycles.	Portsmouth, VA.

Note: N/A means not applicable and—means the information was not provided by Dominion Energy.
[1] While most of these vessels are planned for construction, not all would be used. However, NMFS has opted to include all possible vessels with all available information to provide the best possible understanding of what vessels may be involved in the CVOW–C proposed project.

Helicopter Usage

Dominion Energy may supplement vessel-based transport with helicopter usage to transfer crew to and from both the shore and the Lease Area (crew transfer vessels described in Table 6 above does not consider helicopter use and thus, is a conservative estimate). Helicopter usage would align with the best practices from the Federal Aviation Administration and other relevant stakeholders when determining routes and altitudes for travel. Helicopter use is expected primarily from 2024–2026 at a rate of up to four roundtrip flights per week, equating to 208 roundtrips annually and up to 624 roundtrips total. Project-related aircraft would only occur at low altitudes over water during takeoff and landing at an offshore location where one or more vessels are located. Helicopters produce sounds that can be audible to marine mammals; however, most sound energy from aircraft reflects off the air-water interface as only sound radiated downward within a 26-degree cone penetrates below the surface water (Urick, 1972). Due to the intermittent nature and the small area potentially ensonified by this sound source for a very limited duration, Dominion Energy did not request, and NMFS is not proposing to authorize take of marine mammals incidental to helicopter flights; therefore, this activity will not be discussed further in this proposed action.

Fisheries Monitoring Surveys

Dominion Energy plans to undertake fisheries monitoring surveys, in partnership with the Virginia Institute of Marine Sciences (VIMS), Atlantic surf clam (*Spisula solidissima*) fishers, black sea bass (*Centropristis striata*) fishers, whelk (*Buccinidae* spp.) fishers, Rutgers University, and the Virginia Marine Resource Commission (VMRC), as required by BOEM to support the regulatory filings for renewable energy projects proposed in the Atlantic Lease Areas (30 CFR 585.627(a)(3)). Fisheries monitoring surveys have been designed in accordance with recommendations set forth by the Responsible Offshore Science Alliance (ROSA) Offshore Wind Project Monitoring Framework and Guidelines (*https://www.rosascience.org/offshore-wind-and-fisheries-resources/*; ROSA, 2021), which is based extensively on existing BOEM guidance for providing information on fisheries during work related to offshore wind projects (*https://www.boem.gov/sites/default/files/renewable-energy-program/Regulatory-Information/BOEM-Fishery-Guidelines.pdf*; BOEM, 2019). Dominion Energy would sample black sea bass and whelks using pots with weighted groundlines and Atlantic surf clams using a novel dredge tow (designed by Rutgers University and other industry experts). The pot/trap surveys will have a two-day soak time. Dominion Energy will be using on-demand fishing systems aimed at reducing the entanglement risk to protected species. These systems include, but are not limited to, spooled systems, buoy and stowed systems, lift bag systems, and grappling (more information on these systems can be found at *https://www.fisheries.noaa.gov/new-england-*

mid-atlantic/marine-mammal-protection/developing-viable-demand-gear-systems#:~:text=Line%20wrapped%20around%20a%20buoyant%20spool%20is%20tethered,retrieve%20it%2C%20and%20the%20gear%20on%20the%20string). The survey tows completed by this dredge will be shorter than typical commercial tows. Dredge tows do not inherently have the potential to result in take of marine mammals. Pot-based surveys may, absent mitigation, result in the take of marine mammals. However, Dominion Energy would implement mitigation and monitoring measures to avoid taking marine mammals, including, but not limited to: monitoring for marine mammals before and during dredging and gear deployment activities, not deploying or pulling gear in certain circumstances, maintaining marine mammal watches at least 15 minute before to both the deployment and retrieval of the gear, and moving to a new sampling location if a marine mammal appears at risk of interactions with the gear. A full description of the mitigation measures can be found in the Proposed Mitigation section. Dominion Energy had also proposed to conduct trawl surveys; however, they subsequently removed trawling from their plans. Hence, trawl surveys would not occur.

With the implementation of these measures, Dominion Energy does not anticipate, and NMFS is not proposing, to authorize take of marine mammals incidental to fishery surveys. Given no take is anticipated from these surveys, impacts from fishery surveys will not be discussed further in this document aside from listing the required mitigation measures (see Proposed Mitigation section).

Description of Marine Mammals in the Area of Specified Activities

Thirty-nine marine mammal species under NMFS' jurisdiction have geographic ranges within the western North Atlantic OCS (Hayes *et al.,* 2022), with six of these being protected under the Endangered Species Act (ESA). However, for reasons described below, Dominion Energy has requested and NMFS proposes to authorize take of only 21 species (comprising 22 stocks) of marine mammals. Sections 3 and 4 of Dominion Energy's application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history of the potentially affected species (Dominion Energy, 2023). NMFS fully considered all of this information, and we refer the reader to these descriptions in the application, incorporated here by reference, instead of reprinting the information. Additional information regarding population trends and threats may be found in NMFS's Stock Assessment Reports (SARs; *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*) and more general information about these species (*e.g.,* physical and behavioral descriptions) may be found on NMFS's website (*https://www.fisheries.noaa.gov/find-species*).

Of the 39 marine mammal species and/or stocks with geographic ranges that include the CVOW–C project area found in the coastal and offshore waters of Virginia (Table 11 in Dominion Energy's ITA application), 17 are not expected to be present or are considered rare or unexpected in the project area based on sighting and distribution data; they are, therefore, not discussed further beyond the explanation provided here. Specifically, the following cetacean species are known to occur offshore of Virginia but are not expected to occur in the project area due to the location of preferred habitat outside the Lease Area and Export Cable Routes, based on the best available information: dwarf sperm whale (*Kogia sima*), Fraser's dolphin (*Lagenodelphis hosei*), killer whale (*Orcinus orca*), pygmy killer whale (*Feresa attenuata*), rough-toothed dolphin (*Steno bredanensis*), spinner dolphin (*Stenalla longirostris orientalis*), striped dolphin (*Stenella coeruleoalba*), white-beaked dolphin (*Lagenorhynchus albirostris*), Cuvier's beaked whale (*Ziphius cavirostris*), four species of Mesoplodont beaked whales (*Mesoplodon densitostris, M. europaeus, M. mirus, and M. bidens*), and the blue whale (*Balaenoptera musculus*). Two species of phocid pinnipeds are also uncommon in the CVOW–C project area, including: harp seals (*Pagophilus groenlandica*) and hooded seals (*Cystophora cristata*). In addition, the Florida manatees (*Trichechus manatus;* a sub-species of the West Indian manatee) has been previously documented as an occasional visitor to the Mid-Atlantic region during summer months (Morgan *et al.,* 2002; Cummings *et al.,* 2014). However, manatees are managed by the U.S. Fish and Wildlife Service (USFWS) and are not considered further in this document.

None of the aforementioned species were observed during HRG surveys conducted by Dominion Energy in and around Virginia from 2018–2021 based on monitoring reports received for previously issued high-resolution site characterization IHAs (85 FR 55415, September 8, 2020; 85 FR 81879, December 17, 2020; 86 FR 21298, April 22, 2021), for the construction of the CVOW Pilot Project (85 FR 30930, May 21, 2020) or Unexploded Ordnance/Munitions and Explosives of Concern (UXO/MEC)-specific surveys (83 FR 39062, August 8, 2018). However, four marine mammal species that might otherwise be considered rare were detected through PAM/visually observed by marine mammal monitors during work under these previous IHAs. These include: false killer whales (one acoustically detected, four observed), pygmy sperm whales (one acoustically detected, one observed), Clymene dolphin (five observed), and melon-headed whales (one acoustically detected, five recorded). Although these were detected in low numbers, these observations/detections did occur within locations near the CVOW–C project area where NMFS considers it reasonably likely that some individuals may be observed during the five-year effective period of the proposed rulemaking. Because of this, NMFS has proposed to authorize take of these species.

Table 7 lists all species and stocks for which take is expected and proposed to be authorized for this action, and summarizes information related to the population or stock, including regulatory status under the MMPA and Endangered Species Act (ESA) and potential biological removal (PBR) level, where known. PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (16 U.S.C. 1362(20)) and can be found in NMFS's SARs. While no mortality is anticipated or proposed for authorization here, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS's stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS's U.S. Atlantic and Gulf of Mexico SARs. All values presented in Table 7 are the most recent available at the time of publication and are available in NMFS' final 2021 SARs (Hayes *et al.,* 2022) and draft 2022 SARs available online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/draft-marine-mammal-stock-assessment-reports.*

TABLE 7—MARINE MAMMAL SPECIES [5] LIKELY TO OCCUR NEAR THE PROJECT AREA THAT MAY BE TAKEN BY DOMINION ENERGY'S PROPOSED ACTIVITIES

Common name	Scientific name	Stock	ESA/MMPA status; strategic (Y/N)[1]	Stock abundance (CV, N_{min}, most recent abundance survey)[2]	PBR	Annual mortalities or serious injuries (M/SI)[3]
Order Artiodactyla—Cetacea—Superfamily Mysticeti (baleen whales)						
Family Balaenidae:						
North Atlantic right whale	*Eubalaena glacialis*	Western Atlantic	E, D, Y	338 (0; 332; 2020)[5]	0.7	8.1
Family Balaenopteridae (rorquals):						
Fin whale	*Balaenoptera physalus*	Western North Atlantic	E, D, Y	6,802 (0.24; 5,573; 2016)	11	1.8
Humpback whale	*Megaptera novaeangliae*	Gulf of Maine	-, -, Y	1,396 (0; 1,380; 2016)	22	12.15
Minke whale	*Balaenoptera acutorostrata*	Canadian Eastern Coastal	-, -, N	21,968 (0.31; 17,002; 2016).	170	10.6
Sei whale	*Balaenoptera borealis*	Nova Scotia	E, D, Y	6,292 (1.02; 3,098; 2016)	6.2	0.8
Family Physeteridae:						
Sperm whale	*Physeter macrocephalus*	North Atlantic	E, D, Y	4,349 (0.28; 3,451; 2016)	3.9	0
Family Kogiidae:						
Pygmy sperm whale[7,8]	*Kogia breviceps*	Western North Atlantic	-, -, N	7,750 (0.38; 5,689; 2016)	46	0
Family Delphinidae:						
Atlantic spotted dolphin	*Stenella frontalis*	Western North Atlantic	-, -, N	39,921 (0.27; 32,032; 2016).	320	0
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Western North Atlantic	-, -, N	93,233 (0.71; 54,433; 2016).	544	27
Bottlenose dolphin	*Tursiops truncatus*	Western North Atlantic—Offshore.	-, -, N	62,851 (0.23; 51,914; 2016).	519	28
		Southern Migratory Coastal	-, -, Y	3,751 (0.6; 185; See SAR).	23	0–18.3
Clymene dolphin[7]	*Stenella clymene*	Western North Atlantic	-, -, N	4,237 (1.03; 2,071; 2016)	21	0
Common dolphin	*Delphinus delphis*	Western North Atlantic	-, -, N	172,897 (0.21; 145,216; 2016).	1,452	390
False killer whale[7]	*Pseudorca crassidens*	Western North Atlantic	-, -, N	1,791 (0.56; 1,154; 2016)	12	0
Melon-headed whale[7]	*Peponocephala electra*	Western North Atlantic	-, -, N	UNK (UNK; UNK; 2016)	UNK	0
Long-finned pilot whale[6]	*Globicephala melas*	Western North Atlantic	-, -, N	39,215 (0.3; 30,627; 2016).	306	29
Short-finned pilot whale[6]	*Globicephala macrorhynchus*	Western North Atlantic	-, -, Y	28,924 (0.24, 23,637, See SAR).	236	136
Pantropical spotted dolphin	*Stenella attenuata*	Western North Atlantic	-, D, N	6,593 (0.52, 4,367, See SAR).	44	0
Risso's dolphin	*Grampus griseus*	Western North Atlantic	-, -, N	35,215 (0.19; 30,051; 2016).	301	34
Family Phocoenidae (porpoises):						
Harbor porpoise	*Phocoena phocoena*	Gulf of Maine/Bay of Fundy	-, -, N	95,543 (0.31; 74,034; 2016).	851	16
Order Carnivora—Superfamily Pinnipedia						
Family Phocidae (earless seals):						
Gray seal[4]	*Halichoerus grypus*	Western North Atlantic	-, -, N	27,300 (0.22; 22,785; 2016).	1,389	4,453
Harbor seal	*Phoca vitulina*	Western North Atlantic	-, -, N	61,336 (0.08; 57,637; 2018).	1,729	339

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

2 NMFS' marine mammal stock assessment reports can be found online at: *www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*. CV is the coefficient of variation; N_{min} is the minimum estimate of stock abundance. In some cases, CV is not applicable.

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

4 NMFS' stock abundance estimate (and associated PBR value) applies to the U.S. population only. Total stock abundance (including animals in Canada) is approximately 451,431. The annual M/SI value given is for the total stock.

5 Information on the classification of marine mammal species can be found on the web page for The Society for Marine Mammalogy's Committee on Taxonomy (*https://marinemammalscience.org/science-and-publications/list-marine-mammal-species-subspecies/*; Committee on Taxonomy (2022)).

6 Although both species are described here, the requested take for both short-finned and long-finned pilot whales has been summarized into a single group (pilot whales spp.).

7 While these species were not originally included in Dominion Energy's request, given recorded sightings/detections of these species during previous Dominion Energy IHAs in the same general area, NMFS has included these as species that may be harassed (by Level B harassment only) during the five-year effective period of this proposed rulemaking.

8 Estimate is for Kogia spp. only.

As indicated above, all 21 species and 22 stocks in Table 7 temporally and spatially co-occur with the activity to the degree that take is reasonably likely to occur. Four of the marine mammal species for which take is requested are listed as threatened or endangered under the ESA, including North Atlantic right, fin, sei, and sperm whales. In addition to what is included in Sections 3 and 4 of Dominion Energy's ITA application (*https://www.fisheries.noaa.gov/action/incidental-take-authorization-dominion-energy-virginia-construction-coastal-virginia*), the SARs (*https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*), and NMFS' website (*https://www.fisheries.noaa.gov/species-directory/marine-mammals*), we provide further detail below informing the baseline for select species (*e.g.,* information regarding current Unusual Mortality Events (UME) and known important habitat areas, such as Biologically Important Areas (BIAs) (Van Parijs, 2015). There are no ESA-designated critical habitats for any species within the CVOW–C project area.

Under the MMPA, a UME is defined as ''a stranding that is unexpected; involves a significant die-off of any marine mammal population; and demands immediate response'' (16 U.S.C. 1421h(6)). As of April 13, 2023, five UMEs are considered active, with four of these occurring along the U.S. Atlantic coast for various marine mammal species; of these, the most relevant to the CVOW–C project are the North Atlantic right whale and the humpback whale, given the prevalence of these species in the project area. A more recent UME is active for the Northeast pinnipeds (harbor and gray seals) but has only been recorded in Maine, which is outside the project area. Two other UMEs, one for the Atlantic minke whale from 2017–2022 and one for the Northeast pinnipeds (harbor and gray seals) from 2018–2020, are considered non-active and are pending closure. More information on UMEs, including all active, closed, or pending, can be found on NMFS' website at *https://www.fisheries.noaa.gov/national/marine-life-distress/active-and-closed-unusual-mortality-events*.

Below we include information for a subset of the species that presently have an active or recently closed UME occurring along the Atlantic coast, or for which there is information available related to areas of biological significance. For the majority of species potentially present in the specific geographic region, NMFS has designated only a single generic stock (*e.g.,* ''western North Atlantic'') for management purposes. This includes the ''Canadian east coast'' stock of minke whales, which includes all minke whales found in U.S. waters and is also a generic stock for management purposes. For humpback and sei whales, NMFS defines stocks on the basis of feeding locations, *i.e.,* Gulf of Maine and Nova Scotia, respectively. However, references to humpback whales and sei whales in this document refer to any individuals of the species that are found in the specific geographic region. Any areas of known biological importance (including the BIAs identified in La Brecque *et al.,* 2015) that overlap spatially with the project area are addressed in the species sections below.

North Atlantic Right Whale

The North Atlantic right whale has been listed as Endangered since the ESA was enacted in 1973. They were recently uplisted from Endangered to Critically Endangered on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (Cooke, 2020). The uplisting was due to a decrease in population size (Pace *et al.,* 2017), an increase in vessel strikes and entanglements in fixed fishing gear (Knowlton *et al.,* 2012; Daoust *et al.,* 2017; Davis and Brillant, 2019; Sharp *et al.,* 2019; Moore *et al.,* 2021; Knowlton *et al.,* 2022), and a decrease in birth rate (Pettis *et al.,* 2021; Reed *et al.,* 2022). The Western Atlantic stock is considered depleted under the MMPA (Hayes *et al.,* 2022). There is a recovery plan (NOAA Fisheries, 2005) for the North Atlantic right whale, and NMFS completed 5-year reviews of the species in 2012,2017, and 2022 which concluded no change to the listing status is warranted.

The North Atlantic right whale population had only a 2.8 percent recovery rate between 1990 and 2011, and an overall abundance decline of 29.7 percent from 2011–2020 (Hayes *et al.,* 2022). Since 2010, the North Atlantic right whale population has been in decline (Pace *et al.,* 2017; Pace *et al.,* 2021), with a 40 percent decrease in calving rate (Kraus *et al.,* 2016; Moore *et al.,* 2021). North Atlantic right whale calving rates dropped from 2017 to 2020, with zero births recorded during the 2017–2018 season. The 2020–2021 calving season had the first substantial calving increase in five years, with 20 calves born, followed by 15 calves during the 2021–2022 calving season. However, mortalities continue to outpace births, and best estimates indicate fewer than 100 reproductively active females remain in the population.

NMFS' regulations at 50 CFR 224.105 designated nearshore waters of the Mid-Atlantic Bight as Mid-Atlantic U.S. Seasonal Management Areas (SMAs) for right whales in 2008. These specific SMAs were developed to reduce the threat of collisions between ships and right whales around their migratory route and calving grounds. As mentioned previously, the Chesapeake Bay SMA is within the vicinity of the proposed project area (*https://apps-nefsc.fisheries.noaa.gov/psb/surveys/MapperiframeWithText.html*). The SMA is currently active from November 1 through April 30 of each year and may be used by right whales for migrating. As noted above in the Summary of Request section, NMFS is proposing changes to the North Atlantic right whale speed rule (87 FR 46921; August 1, 2022).

The proposed project area (456.5 km^2) spatially overlaps a portion of the migratory corridor BIA (269,488 km^2 (66,591,935 acres)) within which right whales migrate south to calving grounds generally in November and December. A northward right whale migration into feeding areas north of the project area occurs in March and April (LaBrecque *et al.,* 2015; Van Parijs *et al.,* 2015). The proposed project area is also in the vicinity of the currently established November 1st through April 30th Chesapeake Bay SMA (73 FR 60173; October 10, 2008), which may be used by right whales for various activities, including migration. Due to the current status of North Atlantic right whales, and the overlap of the proposed CVOW–C project with areas of biological significance (*i.e.,* a migratory corridor), the potential impacts of the proposed project on right whales warrant particular attention.

In late fall, a portion of the right whale population (including pregnant females) typically departs the feeding grounds in the North Atlantic, moves south along the migratory corridor BIA, including through the proposed project area, to right whale calving grounds off Georgia and Florida. Right whales feed primarily on the copepod, *Calanus finmarchicus,* a species whose availability and distribution has changed both spatially and temporally over the last decade due to an oceanographic regime shift that has been ultimately linked to climate change (Meyer-Gutbrod *et al.,* 2021; Record *et al.,* 2019; Sorochan *et al.,* 2019). This distribution change in prey availability has led to shifts in right whale habitat-use patterns over the same time period (Davis *et al.,* 2020;

Meyer-Gutbrod *et al.,* 2022; Quintano-Rizzo *et al.,* 2021, O'Brien *et al.,* 2022) with reduced use of foraging habitats in the Great South Channel and Bay of Fundy and increased use of habitats within Cape Cod Bay and a region south of Martha's Vineyard and Nantucket Islands (Stone *et al.,* 2017; Mayo *et al.,* 2018; Ganley *et al.,* 2019; Record *et al.,* 2019; Meyer-Gutbrod *et al.,* 2021); these foraging habitats are all located several hundred kilometers north of the project area. Passive acoustic monitoring data demonstrates that since 2010, North Atlantic right whale use of the mid-Atlantic and southeast has increased (Davis *et al.,* 2017). Observations of these transitions in right whale habitat use, variability in seasonal presence in identified core habitats, and utilization of habitat outside of previously focused survey effort prompted the formation of a NMFS' Expert Working Group, which identified current data collection efforts, data gaps, and provided recommendations for future survey and research efforts (Oleson *et al.,* 2020). Recent research indicates understanding of their movement patterns remains incomplete and not all of the population undergoes a consistent annual migration (Davis *et al.,* 2017; Gowan *et al.,* 2019; Krzystan *et al.,* 2018). Non-calving females may remain in the feeding grounds, during the winter in the years preceding and following the birth of a calf to increase their energy stores (Gowen *et al.,* 2019).

North Atlantic right whale presence within the CVOW–C project area is predominantly seasonal with individuals likely to be transient and migrating through the area. The highest density months for North Atlantic right whales in this area are November through April, however, mitigation measures include a restriction on pile driving during this time period. Right whales have also been acoustically detected off coastal Virginia year-round with detections during the late fall (October–December) and late winter/early spring (February–March) (Salisbury *et al.,* 2016). Density data from Roberts and Halpin (2022) confirm, of the months planned for construction (May through October), the highest average density of right whales in the CVOW–C project area occurs in May (0.00015 individuals/km^2). However, based upon sightings and acoustic detections, right whales are likely to be present to some degree in or near the proposed project area throughout the year (Salisbury *et al.,* 2016; Davis et al., 2017; Cotter, 2019), though we do not expect that the right whale presence would be in the larger numbers typically associated with a foraging or calving ground.

Elevated right whale mortalities have occurred since June 7, 2017, along the U.S. and Canadian coast, with the leading category for the cause of death for this UME determined to be ''human interaction,'' specifically from entanglements or vessel strikes. As of April 13, 2023, there have been 36 confirmed mortalities (dead stranded or floaters), 0 pending mortalities, and 33 seriously injured free-swimming whales for a total of 69 whales. As of October 14, 2022, the UME also considers animals (n=29) with sub-lethal injury or illness (called ''morbidity'') bringing the total number of whales in the UME to 98. Approximately 42 percent of the population is known to be in reduced health (Hamilton *et al.,* 2021), likely contributing to smaller body sizes at maturation, making them more susceptible to threats and reducing fecundity (Moore *et al.,* 2021; Reed *et al.,* 2022; Stewart *et al.,* 2022). More information about the North Atlantic right whale UME is available online at: *www.fisheries.noaa.gov/national/marine-life-distress/2017-2021-north-atlantic-right-whale-unusual-mortality-event.*

Humpback Whale

Humpback whales are found worldwide in all oceans, but were listed as endangered under the Endangered Species Conservation Act (ESCA) in June 1970. In 1973, the ESA replaced the ESCA, and humpbacks continued to be listed as endangered.

On September 8, 2016, NMFS divided the once single species into 14 distinct population segments (DPS), removed the species-level listing, and, in its place, listed four DPSs as endangered and one DPS as threatened (81 FR 62259; September 8, 2016). The remaining nine DPSs were not listed. The West Indies DPS, which is not listed under the ESA, is the only DPS of humpback whales that is expected to occur in the project area. Bettridge *et al.* (2015) estimated the size of the West Indies DPS population at 12,312 (95 percent confidence interval (CI) 8,688–15,954) whales in 2004–05, which is consistent with previous population estimates of approximately 10,000–11,000 whales (Smith *et al.,* 1999; Stevick *et al.,* 2003) and the increasing trend for the West Indies DPS (Bettridge *et al.,* 2015).

Humpback whales are migratory off coastal Virginia, moving seasonally between northern feeding grounds in New England and southern calving grounds in the West Indies (Hayes *et al.,* 2022). However, not all humpback whales migrate to the Caribbean during the winter as individuals are sighted in mid- to high-latitude areas during this season (Swingle *et al.,* 1993; Davis *et al.,* 2020). In addition to a migratory pathway, the mid-Atlantic region also represents a supplemental winter feeding ground for juveniles and mature whales (Barco *et al.,* 2002). Records of humpback whales off the U.S. mid-Atlantic coast (New Jersey south to North Carolina) suggest that these waters are used as a winter feeding ground from December through March (Mallette *et al.,* 2017; Barco *et al.,* 2002; LaBrecque *et al.,* 2015) and represent important habitat for juveniles, in particular (Swingle *et al.,* 1993; Wiley *et al.,* 1995). Mallette *et al.* (2017) documented site fidelity of individual humpback whales to coastal Virginia waters across seasons and years from 2012–2017. Based upon the analysis of stomach contents from humpback whales that have previously stranded in the coastal Virginia area, whales may feed upon Atlantic menhaden and bay anchovy off coastal Virginia (Mallette *et al.,* 2017).

Since January 2016, elevated humpback whale mortalities along the Atlantic coast from Maine to Florida led to the declaration of a UME. Partial or full necropsy examinations have been conducted on approximately half of the 191 known cases (as of April 13, 2023). Of the whales examined (approximately 90), about 40 percent had evidence of human interaction, either ship strike or entanglement (*https://www.fisheries.noaa.gov/national/marine-life-distress/2016-2023-humpback-whale-unusual-mortality-event-along-atlantic-coast*). While a portion of the whales have shown evidence of pre-mortem vessel strike, this finding is not consistent across all whales examined and more research is needed. NOAA is consulting with researchers that are conducting studies on the humpback whale populations, and these efforts may provide information on changes in whale distribution and habitat use that could provide additional insight into how these vessel interactions occurred. More information is available at: *https://www.fisheries.noaa.gov/national/marine-life-distress/2016-2023-humpback-whale-unusual-mortality-event-along-atlantic-coast.*

Since December 1, 2022, the number of humpback strandings along the mid-Atlantic coast, including Virginia off Virginia Beach, has been elevated. In some cases, the cause of death is not yet known. In others, vessel strike has been deemed the cause of death. As the humpback whale population has grown, they are seen more often in the Mid-Atlantic. Along the New York/New Jersey/Virginia shore, these whales may be following their prey which are reportedly close to shore in the winter. These prey also attract fish that are of interest to recreational and commercial fishermen. This increases the number of boats in these areas. More whales in the water in areas traveled by boats of all sizes increases the risk of vessel strikes. Vessel strikes and entanglement in fishing gear are the greatest human threats to large whales.

Fin Whale

Fin whales frequently occur in the waters of the U.S. Atlantic Exclusive Economic Zone (EEZ), principally from Cape Hatteras, North Carolina northward and are distributed in both continental shelf and deep water habitats (Hayes *et al.,* 2022). Although fin whales are present north of the 35-degree latitude region in every season and are broadly distributed throughout the western North Atlantic for most of the year, densities vary seasonally (Edwards *et al.,* 2015; Hayes *et al.,* 2022). Acoustic detections suggest year-round presence in Virginia waters, with the greatest number of detections occurring from August through April (Davis *et al.,* 2020). Acoustic observations of fin whale singers from both the Atlantic Continental Shelf and deep-ocean areas provide evidence of fin whale singing throughout these regions year-round and support the conclusion that male fin whales are broadly distributed throughout the western North Atlantic for most of the year (Watkins *et al.,* 1987; Clark and Gagnon, 2002; Morano *et al.,* 2012; Davis *et al.,* 2020; Hayes *et al.,* 2022).

The New England area represents a major feeding ground for fin whales, with two known foraging BIAs in the general area. Fin whales typically feed in the Gulf of Maine and the waters surrounding New England, but their mating and calving (and general wintering) areas are largely unknown (Hain *et al.,* 1992, Hayes *et al.,* 2022). Hain *et al.* (1992) suggested calving occurs in the mid-Atlantic region from October through January, yet this remains to be confirmed. However, given the more southerly location of the Virginia Lease Area (located approximately 516 km (320.6 mi) away from the Montauk Point BIA (2,933 km^2 (724,760.1 acres); Hain *et al.,* 1992; LaBrecque *et al.,* 2015) and approximately 695 km (431.9 mi) from the southern Gulf of Maine BIA (18,015 km^2; 4,451,603.4 acres). Therefore, there would be no overlap from the CVOW–C project with either of the fin whale feeding BIAs.

Minke Whale

Minke whales are common and widely distributed throughout the U.S. Atlantic EEZ (Cetacean and Turtle Assessment Program (CETAP), 1982; Hayes *et al.,* 2022), although their distribution has a strong seasonal component. Individuals have often been detected acoustically in shelf waters from spring to fall and more often detected in deeper offshore waters from winter to spring (Risch *et al.,* 2013). Minke whales are abundant in New England waters from May through September (Pittman *et al.,* 2006; Waring *et al.,* 2014), yet largely absent from these areas during the winter, suggesting the possible existence of a migratory corridor (LaBrecque *et al.,* 2015). A migratory route for minke whales transiting between northern feeding grounds and southern breeding areas may exist to the east of the proposed project area, as minke whales may track warmer waters along the continental shelf while migrating (Risch *et al.,* 2014). Overall, minke whale use of the project area is likely highest during winter months when foundation installation would not be occurring. No mating or calving grounds have been identified along the U.S. Atlantic coast (LaBrecque *et al.,* 2015).

There are two minke whale feeding BIAs identified in the southern and southwestern section of the Gulf of Maine, including Georges Bank, the Great South Channel, Cape Cod Bay and Massachusetts Bay, Stellwagen Bank, Cape Anne, and Jeffreys Ledge from March through November, annually (LeBrecque *et al.,* 2015). However, these BIAs are located north of the CVOW–C project area, at approximately 656 km (407.6 mi) from the CVOW–C project area to the most southern BIA and would not overlap the CVOW–C project area.

Since January 2017, elevated minke whale mortalities detected along the Atlantic coast from Maine through South Carolina resulted in the declaration of a UME. As of April 13, 2023, a total of 142 minke whales have stranded during this UME. Full or partial necropsy examinations were conducted on more than 60 percent of the whales. Preliminary findings have shown evidence of human interactions or infectious disease in several of the whales, but these findings are not consistent across all of the whales examined, so more research is needed. This UME has been declared non-active and is pending closure. More information is available at: *https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2022-minke-whale-unusual-mortality-event-along-atlantic-coast*.

Sei Whale

The Nova Scotia stock of sei whales can be found in deeper waters of the continental shelf edge of the eastern United States and northeastward to south of Newfoundland (Mitchell, 1975; Hain *et al.,* 1985; Hayes *et al.,* 2022). During spring and summer, the stock is mainly concentrated in northern feeding areas, including the Scotian Shelf (Mitchell and Chapman, 1977), the Gulf of Maine, Georges Bank, the Northeast Channel, and south of Nantucket (CETAP, 1982; Kraus *et al.,* 2016; Roberts *et al.,* 2016; Palka *et al.,* 2017; Cholewiak *et al.,* 2018; Hayes *et al.,* 2022). Sei whales have been detected acoustically along the Atlantic Continental Shelf and Slope from south of Cape Hatteras, North Carolina to the Davis Strait, with acoustic occurrence increasing in the mid-Atlantic region since 2010 (Davis *et al.,* 2020). Although their migratory movements are not well understood, sei whales are believed to migrate north in June and July to feeding areas and south in September and October to breeding areas (Mitchell, 1975; CETAP, 1982; Davis *et al.,* 2020). Davis *et al.* (2020) acoustically detected sei whales in offshore waters of the mid-Atlantic region during the winter months. Very few sei whales were detected in the mid-Atlantic during the summer (the primary time of year when foundation installation would be occurring), with the exception of a detection that lasted for two days off Virginia. Although sei whales generally occur offshore, individuals may also move into shallower, more inshore waters (Payne *et al.,* 1990; Halpin *et al.,* 2009; Hayes *et al.,* 2022).

A sei whale feeding BIA occurs in New England waters from May through November (LaBrecque *et al.,* 2015). This BIA is located approximately 600 km (372.8 mi) northeast of the project area and is not expected to be impacted by project activities related to CVOW–C.

Phocid Seals

Since June 2022, elevated numbers of harbor seal and gray seal mortalities have occurred across the southern and central coast of Maine. This event has been declared a UME. Preliminary testing of samples has found some harbor and gray seals positive for highly pathogenic avian influenza. While the UME is not occurring in the CVOW–C project area, the populations affected by the UME are the same as those potentially affected by the project.

However, due to the two states being approximately 677.6 km (421 mi) apart, by water (from the most northern point of Virginia to the most southern point of Maine), NMFS does not expect that this UME would be further conflated by the proposed activities related to the CVOW–C project. Information on this UME is available online at: *https://www.fisheries.noaa.gov/2022-2023-pinniped-unusual-mortality-event-along-maine-coast*.

The above event was preceded by a different UME, occurring from 2018–2020 (closure of the 2018–2020 UME is pending). Beginning in July 2018, elevated numbers of harbor seal and gray seal mortalities occurred across Maine, New Hampshire, and Massachusetts. Additionally, stranded seals have shown clinical signs as far south as Virginia, although not in elevated numbers, therefore the UME investigation encompassed all seal strandings from Maine to Virginia. A total of 3,152 reported strandings (of all species) occurred from July 1, 2018, through March 13, 2020. Full or partial necropsy examinations have been conducted on some of the seals and samples have been collected for testing. Based on tests conducted thus far, the main pathogen found in the seals is phocine distemper virus. NMFS is performing additional testing to identify any other factors that may be involved in this UME, which is pending closure. Information on this UME is available online at: *https://www.fisheries.noaa.gov/new-england-mid-atlantic/marine-life-distress/2018-2020-pinniped-unusual-mortality-event-along*.

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g.,* Richardson *et al.,* 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.,* low-frequency cetaceans). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibel (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. Marine mammal hearing groups and their associated hearing ranges are provided in Table 8.

TABLE 8—MARINE MAMMAL HEARING GROUPS

[NMFS, 2018]

Hearing group	Generalized hearing range *
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz.
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz.
High-frequency (HF) cetaceans (true porpoises, *Kogia,* river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*).	275 Hz to 160 kHz.
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz.

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

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

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information. Twenty-one marine mammal species (19 cetacean species (5 mysticetes and 14 odontocetes) and 2 pinniped species (both phocid), consisting of 22 total stocks) have the reasonable potential to co-occur with the proposed project activities (Table 7).

NMFS notes that in 2019, Southall *et al.* recommended new names for hearing groups that are widely recognized. However, this new hearing group classification does not change the weighting functions or acoustic thresholds (*i.e.,* the weighting functions and thresholds in Southall *et al.* (2019) are identical to NMFS 2018 Revised Technical Guidance). When NMFS updates our Technical Guidance, we will be adopting the updated Southall *et al.* (2019) hearing group classification.

Potential Effects of Specified Activities on Marine Mammals and Their Habitat

This section includes a summary and discussion of the ways that components of the specified activity may impact marine mammals and their habitat. The Estimated Take of Marine Mammals section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by this activity. The Negligible Impact Analysis and Determination section considers the content of this section, the Estimated Take of Marine Mammals section, and the Proposed Mitigation section, to draw conclusions regarding the likely impacts of these activities on the reproductive success or survivorship of individuals and how those impacts on individuals are likely to impact marine mammal species or stocks. General background information on marine mammal hearing was provided previously (see the Description of Marine Mammals in the Area of Specified Activities section). Here, the potential effects of sound on marine mammals are discussed.

Dominion Energy has requested authorization to take marine mammals incidental to construction activities associated within the CVOW–C project area. In the ITA application, Dominion Energy presented analyses of potential impacts to marine mammals from use of acoustic sources. NMFS carefully reviewed the information provided by Dominion Energy and independently reviewed applicable scientific research and literature and other information to evaluate the potential effects of Dominion Energy's activities on marine mammals.

The proposed activities include the placement of up to 179 permanent foundations (176 WTGs and 3 OSSs), temporary nearshore cable landfall activities (*i.e.,* cofferdams and goal posts), and site characterization surveys (*i.e.,* HRG surveys). There are a variety of types and degrees of effects to marine mammals, prey species, and habitat that could occur as a result of the project. Below we provide a brief description of the types of sound sources that would be used in the project, the types of impacts that can potentially result from these sources and types of activities, and a brief discussion of the anticipated impacts on marine mammals from the CVOW–C project specifically, with consideration of the proposed mitigation measures.

Description of Sound Sources

This section contains a brief technical background on sound, on the characteristics of certain sound types, and on metrics used in this proposal inasmuch as the information is relevant to the specified activity and to a discussion of the potential effects of the specified activity on marine mammals found later in this document. For general information on sound and its interaction with the marine environment, please see, *e.g.,* Au and Hastings (2008); Richardson *et al.* (1995); Urick (1983) as well as the Discovery of Sound in the Sea (DOSITS) website at *https://dosits.org/*.

Sound is a vibration that travels as an acoustic wave through a medium such as a gas, liquid or solid. Sound waves alternately compress and decompress the medium as the wave travels. These compressions and decompressions are detected as changes in pressure by aquatic life and man-made sound receptors such as hydrophones (underwater microphones). In water, sound waves radiate in a manner similar to ripples on the surface of a pond and may be either directed in a beam (narrow beam or directional sources) or sound beams may radiate in all directions (omnidirectional sources).

Sound travels in water more efficiently than almost any other form of energy, making the use of acoustics ideal for the aquatic environment and its inhabitants. In seawater, sound travels at roughly 1,500 meters per second (m/s). In air, sound waves travel much more slowly at about 340 m/s. However, the speed of sound can vary by a small amount based on characteristics of the transmission medium such as water temperature and salinity.

The basic components of a sound wave are frequency, wavelength, velocity, and amplitude. Frequency is the number of pressure waves that pass by a reference point per unit of time and is measured in Hz or cycles per second. Wavelength is the distance between two peaks or corresponding points of a sound wave (length of one cycle). Higher frequency sounds have shorter wavelengths than lower frequency sounds and typically attenuate (decrease) more rapidly except in certain cases in shallower water. The intensity (or amplitude) of sounds are measured in decibels (dB), which are a relative unit of measurement that is used to express the ratio of one value of a power or field to another. Decibels are measured on a logarithmic scale, so a small change in dB corresponds to large changes in sound pressure. For example, a 10 dB increase is a ten-fold increase in acoustic power. A 20 dB increase is then a 100-fold increase in power and a 30 dB increase is a 1000-fold increase in power. However, a ten-fold increase in acoustic power does not mean that the sound is perceived as being 10 times louder. Decibels are a relative unit comparing two pressures; therefore, a reference pressure must always be indicated. For underwater sound, this is 1 microPascal (μPa). For in-air sound, the reference pressure is 20 microPascal (μPa). The amplitude of a sound can be presented in various ways; however, NMFS typically considers three metrics.

Sound exposure level (SEL) represents the total energy in a stated frequency band over a stated time interval or event and considers both amplitude and duration of exposure (represented as dB re 1 μPa2-s). SEL is a cumulative metric; it can be accumulated over a single pulse (for pile driving this is often referred to as single-strike SEL; SELss) or calculated over periods containing multiple pulses (SEL_{cum}). Cumulative SEL represents the total energy accumulated by a receiver over a defined time window or during an event. The SEL metric is useful because it allows sound exposures of different durations to be related to one another in terms of total acoustic energy. The duration of a sound event and the number of pulses, however, should be specified as there is no accepted standard duration over which the summation of energy is measured. Sounds are typically classified by their spectral and temporal properties.

Root mean square (rms) is the quadratic mean sound pressure over the duration of an impulse. Root mean square is calculated by squaring all of the sound amplitudes, averaging the squares, and then taking the square root of the average (Urick, 1983). Root mean square accounts for both positive and negative values; squaring the pressures makes all values positive so that they may be accounted for in the summation of pressure levels (Hastings and Popper, 2005). This measurement is often used in the context of discussing behavioral effects, in part because behavioral effects, which often result from auditory cues, may be better expressed through averaged units than by peak pressures.

Peak sound pressure (also referred to as zero-to-peak sound pressure or 0-pk) is the maximum instantaneous sound pressure measurable in the water at a specified distance from the source, and is represented in the same units as the rms sound pressure. Along with SEL, this metric is used in evaluating the potential for PTS (permanent threshold shift) and TTS (temporary threshold shift).

Sounds can be either impulsive or non-impulsive. The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (*e.g.,* Ward, 1997 in Southall *et al.,* 2007). Please see NMFS *et al.* (2018) and Southall *et al.* (2007, 2019) for an in-depth discussion of these concepts. Impulsive sound sources (*e.g.,* airguns, explosions, gunshots, sonic booms, impact pile driving) produce signals that are brief (typically considered to be less than 1 second), broadband, atonal transients (American National Standards Institute (ANSI), 1986, 2005; Harris, 1998; National Institute for Occupational Safety and Health (NIOSH), 1998; International Organization for Standardization (ISO), 2003) and occur either as isolated events or repeated in some succession. Impulsive sounds are all characterized by a relatively rapid rise from ambient pressure to a maximal pressure value followed by a rapid decay period that may include a period of diminishing, oscillating maximal and minimal pressures, and generally have an increased capacity to induce physical injury as compared with sounds that lack these features. Impulsive sounds are typically intermittent in nature.

Non-impulsive sounds can be tonal, narrowband, or broadband, brief or prolonged, and may be either continuous or intermittent (ANSI, 1995; NIOSH, 1998). Some of these non-impulsive sounds can be transient signals of short duration but without the essential properties of pulses (*e.g.,* rapid rise time). Examples of non-impulsive sounds include those produced by vessels, aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems.

Sounds are also characterized by their temporal component. Continuous sounds are those whose sound pressure level remains above that of the ambient sound with negligibly small fluctuations in level (NIOSH, 1998; ANSI, 2005) while intermittent sounds are defined as sounds with interrupted levels of low or no sound (NIOSH, 1998). NMFS identifies Level B harassment thresholds based on if a sound is continuous or intermittent.

Even in the absence of sound from the specified activity, the underwater environment is typically loud due to ambient sound, which is defined as environmental background sound levels lacking a single source or point (Richardson *et al.,* 1995). The sound level of a region is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.,* wind and waves, earthquakes, ice, atmospheric sound), biological (*e.g.,* sounds produced by marine mammals, fish, and invertebrates), and anthropogenic (*e.g.,* vessels, dredging, construction) sound. A number of sources contribute to ambient sound, including wind and waves, which are a main source of naturally occurring ambient sound for frequencies between 200 Hz and 50 kHz (International Council for the Exploration of the Sea (ICES), 1995). In general, ambient sound levels tend to increase with increasing wind speed and wave height. Precipitation can become an important component of total sound at frequencies above 500 Hz and possibly down to 100 Hz during quiet times. Marine mammals can contribute significantly to ambient sound levels as can some fish and snapping shrimp. The frequency band for biological contributions is from approximately 12 Hz to over 100 kHz. Sources of ambient sound related to human activity include transportation (surface vessels), dredging and construction, oil and gas drilling and production, geophysical surveys, sonar, and explosions. Vessel noise typically dominates the total ambient sound for frequencies between 20 and 300 Hz. In general, the frequencies of anthropogenic sounds are below 1 kHz, and if higher frequency sound levels are created, they attenuate rapidly.

The sum of the various natural and anthropogenic sound sources that comprise ambient sound at any given location and time depends not only on the source levels (as determined by current weather conditions and levels of biological and human activity) but also on the ability of sound to propagate through the environment. In turn, sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor and is frequency-dependent. As a result of the dependence on a large number of varying factors, ambient sound levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10–20 dB from day to day (Richardson *et al.,* 1995). The result is that, depending on the source type and its intensity, sound from the specified activity may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals. Underwater ambient sound in the Atlantic Ocean offshore of Virginia comprises sounds produced by a number of natural and anthropogenic sources. Human-generated sound is a significant contributor to the acoustic environment in the project location.

Pile driving sounds are broadband, omni-directional sound sources. Pile driving noise has the potential to result in harassment to marine mammals if the animal is close enough to the sound source (with the distances necessary to cause harassment dependent on source levels and transmission loss rates). HRG sources; however, are more complex as they vary widely (*e.g.,* side scan sonars, sub-bottom profilers, boomers, and sparkers). Recently, Ruppel *et al.* (2022) categorized HRG sources into four tiers based on their potential to affect marine animals. All HRG sources proposed for use by Dominion Energy fall into the Tier 3 or Tier 4 category (note Tier 1 is the most impactful category containing high-energy airguns). Tier 4 includes most high-resolution geophysical, oceanographic, and communication/tracking sources, which are considered unlikely to result in incidental take of marine mammals and therefore termed *de minimis.* Tier 3 covers most remaining non-airgun seismic sources, which either have characteristics that do not meet the *de minimis* category (*e.g.,* some sparkers), but have anticipated impacts less than airguns and for which additional mitigation may in some cases be able to avoid the likelihood of take, or could not be fully evaluated in the paper (*e.g.,* bubble guns, some boomers). Some sparkers fell into Tier 3, as the study found that most sparkers lack the frequency, beamwidth, and degree of exposure characteristics to automatically meet the *de minimis* criteria.

Potential Effects of Underwater Sound on Marine Mammals and Their Habitat

Anthropogenic sounds cover a broad range of frequencies and sound levels and can have a range of highly variable impacts on marine life from none or minor to potentially severe responses depending on received levels, duration of exposure, behavioral context, and various other factors. Broadly, underwater sound from active acoustic sources, such as those in the CVOW–C project, can potentially result in one or more of the following: temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, stress, and masking (Richardson *et al.,* 1995; Gordon *et al.,* 2003; Nowacek *et al.,* 2007; Southall *et al.,* 2007; Götz *et al.,* 2009). Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to high level underwater sound or as a secondary effect of extreme behavioral reactions (*e.g.,* change in dive profile as a result of an avoidance reaction) caused by exposure to sound include neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage (Cox *et al.,* 2006; Southall *et al.,* 2007; Zimmer and Tyack, 2007; Tal *et al.,* 2015).

In general, the degree of effect of an acoustic exposure is intrinsically related to the signal characteristics, received level, distance from the source, and duration of the sound exposure, in addition to the contextual factors of the receiver (*e.g.,* behavioral state at time of exposure, age class, *etc.*). In general, sudden, high level sounds can cause hearing loss as can longer exposures to lower level sounds. Moreover, any temporary or permanent loss of hearing will occur almost exclusively for noise within an animal's hearing range. We describe below the specific manifestations of acoustic effects that may occur based on the activities proposed by Dominion Energy.

Richardson *et al.* (1995) described zones of increasing intensity of effect that might be expected to occur in relation to distance from a source and assuming that the signal is within an animal's hearing range. First (at the greatest distance) is the area within which the acoustic signal would be audible (potentially perceived) to the animal but not strong enough to elicit any overt behavioral or physiological response. The next zone (closer to the receiving animal) corresponds with the area where the signal is audible to the animal and of sufficient intensity to elicit behavioral or physiological responsiveness. The third is a zone within which, for signals of high intensity, the received level is sufficient to potentially cause discomfort or tissue damage to auditory or other systems. Overlaying these zones to a certain extent is the area within which masking (*i.e.,* when a sound interferes with or masks the ability of an animal to detect a signal of interest that is above the absolute hearing threshold) may occur; the masking zone may be highly variable in size.

Below, we provide additional detail regarding potential impacts on marine mammals and their habitat from noise in general, starting with hearing impairment, as well as from the specific activities Dominion Energy plans to conduct, to the degree it is available (noting that there is limited information regarding the impacts of offshore wind construction on marine mammals).

Hearing Threshold Shift

Marine mammals exposed to high-intensity sound or to lower-intensity sound for prolonged periods can experience hearing threshold shift (TS), which NMFS defines as a change, usually an increase, in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level expressed in decibels (NMFS, 2018). Threshold shifts can be permanent, in which case there is an irreversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range or temporary, in which there is reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range and the animal's hearing threshold would fully recover over time (Southall *et al.,* 2019). Repeated sound exposure that leads to TTS could cause PTS.

When PTS occurs, there can be physical damage to the sound receptors in the ear (*i.e.,* tissue damage) whereas TTS represents primarily tissue fatigue and is reversible (Henderson *et al.,* 2008). In addition, other investigators have suggested that TTS is within the normal bounds of physiological variability and tolerance and does not represent physical injury (*e.g.,* Ward, 1997; Southall *et al.,* 2019). Therefore, NMFS does not consider TTS to constitute auditory injury.

Relationships between TTS and PTS thresholds have not been studied in marine mammals, and there is no PTS data for cetaceans. However, such relationships are assumed to be similar to those in humans and other terrestrial mammals. Noise exposure can result in either a permanent shift in hearing thresholds from baseline (PTS; a 40 dB threshold shift approximates a PTS onset; *e.g.,* Kryter *et al.,* 1966; Miller, 1974; Henderson *et al.,* 2008) or a temporary, recoverable shift in hearing that returns to baseline (a 6 dB threshold shift approximates a TTS onset; *e.g.,* Southall *et al.,* 2019). Based on data from terrestrial mammals, a precautionary assumption is that the PTS thresholds, expressed in the unweighted peak sound pressure level metric (PK), for impulsive sounds (such as impact pile driving pulses) are at least 6 dB higher than the TTS thresholds and the weighted PTS cumulative sound exposure level thresholds are 15 (impulsive sound) to 20 (non-impulsive sounds) dB higher than TTS cumulative sound exposure level thresholds (Southall *et al.,* 2019). Given the higher level of sound or longer exposure duration necessary to cause PTS as compared with TTS, PTS is less likely to occur as a result of these activities, but it is possible and a small amount has been proposed for authorization for several species.

TTS is the mildest form of hearing impairment that can occur during exposure to sound, with a TTS of 6 dB considered the minimum threshold shift clearly larger than any day-to-day or session-to-session variation in a subject's normal hearing ability (Schlundt *et al.,* 2000; Finneran *et al.,* 2000; Finneran *et al.,* 2002). While experiencing TTS, the hearing threshold rises, and a sound must be at a higher level in order to be heard. In terrestrial and marine mammals, TTS can last from minutes or hours to days (in cases of strong TTS). In many cases, hearing sensitivity recovers rapidly after exposure to the sound ends. There is data on sound levels and durations necessary to elicit mild TTS for marine mammals, but recovery is complicated to predict and dependent on multiple factors.

Marine mammal hearing plays a critical role in communication with conspecifics, and interpretation of environmental cues for purposes such as predator avoidance and prey capture. Depending on the degree (elevation of threshold in dB), duration (*i.e.,* recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious depending on the degree of interference of marine mammals hearing. For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that occurs during a time where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical (*e.g.,* for successful mother/calf interactions, consistent detection of prey) could have more serious impacts.

Currently, TTS data only exist for four species of cetaceans (bottlenose dolphin, beluga whale (*Delphinapterus leucas*), harbor porpoise, and Yangtze finless porpoise (*Neophocaena asiaeorientalis*)) and six species of pinnipeds (northern elephant seal (*Mirounga angustirostris*), harbor seal, ring seal, spotted seal, bearded seal, and California sea lion (*Zalophus californianus*)) that were exposed to a limited number of sound sources (*i.e.,* mostly tones and octave-band noise with limited number of exposure to impulsive sources such as seismic airguns or impact pile driving) in laboratory settings (Southall *et al.,* 2019). There is currently no data available on noise-induced hearing loss for mysticetes. For summaries of data on TTS or PTS in marine mammals or for further discussion of TTS or PTS onset thresholds, please see Southall *et al.* (2019) and NMFS (2018).

Recent studies with captive odontocete species (bottlenose dolphin, harbor porpoise, beluga, and false killer whale) have observed increases in hearing threshold levels when individuals received a warning sound prior to exposure to a relatively loud sound (Nachtigall and Supin, 2013, 2015; Nachtigall *et al.,* 2016a, 2016b, 2016c; Finneran, 2018; Nachtigall *et al.,* 2018). These studies suggest that captive animals have a mechanism to reduce hearing sensitivity prior to impending loud sounds. Hearing change was observed to be frequency dependent and Finneran (2018) suggests hearing attenuation occurs within the cochlea or auditory nerve. Based on these observations on captive odontocetes, the authors suggest that wild animals may have a mechanism to self-mitigate the impacts of noise exposure by dampening their hearing during prolonged exposures of loud sound or if conditioned to anticipate intense sounds (Finneran, 2018, Nachtigall *et al.,* 2018).

Behavioral Effects

Exposure of marine mammals to sound sources can result in, but is not limited to, no response or any of the following observable responses: increased alertness; orientation or attraction to a sound source; vocal modifications; cessation of feeding; cessation of social interaction; alteration of movement or diving behavior; habitat abandonment (temporary or permanent);

and in severe cases, panic, flight, stampede, or stranding, potentially resulting in death (Southall *et al.,* 2007). A review of marine mammal responses to anthropogenic sound was first conducted by Richardson (1995). More recent reviews address studies conducted since 1995 and focused on observations where the received sound level of the exposed marine mammal(s) was known or could be estimated (Nowacek *et al.,* 2007; DeRuiter *et al.,* 2012 and 2013; Ellison *et al.,* 2012; Gomez *et al.,* 2016). Gomez *et al.* (2016) conducted a review of the literature considering the contextual information of exposure in addition to received level and found that higher received levels were not always associated with more severe behavioral responses and vice versa. Southall *et al.* (2021) states that results demonstrate that some individuals of different species display clear yet varied responses, some of which have negative implications while others appear to tolerate high levels and that responses may not be fully predictable with simple acoustic exposure metrics (*e.g.,* received sound level). Rather, the authors state that differences among species and individuals along with contextual aspects of exposure (*e.g.,* behavioral state) appear to affect response probability. Behavioral responses to sound are highly variable and context-specific. Many different variables can influence an animal's perception of and response to (nature and magnitude) an acoustic event. An animal's prior experience with a sound or sound source affects whether it is less likely (habituation) or more likely (sensitization) to respond to certain sounds in the future (animals can also be innately predisposed to respond to certain sounds in certain ways) (Southall *et al.,* 2019). Related to the sound itself, the perceived nearness of the sound, bearing of the sound (approaching vs. retreating), the similarity of a sound to biologically relevant sounds in the animal's environment (*i.e.,* calls of predators, prey, or conspecifics), and familiarity of the sound may affect the way an animal responds to the sound (Southall *et al.,* 2007, DeRuiter *et al.,* 2013). Individuals (of different age, gender, reproductive status, *etc.*) among most populations will have variable hearing capabilities, and differing behavioral sensitivities to sounds that will be affected by prior conditioning, experience, and current activities of those individuals. Often, specific acoustic features of the sound and contextual variables (*i.e.,* proximity, duration, or recurrence of the sound or the current behavior that the marine mammal is engaged in or its prior experience), as well as entirely separate factors such as the physical presence of a nearby vessel, may be more relevant to the animal's response than the received level alone. Overall, the variability of responses to acoustic stimuli depends on the species receiving the sound, the sound source, and the social, behavioral, or environmental contexts of exposure (*e.g.,* DeRuiter *et al.,* 2012). For example, Goldbogen *et al.* (2013) demonstrated that individual behavioral state was critically important in determining response of blue whales to sonar, noting that some individuals engaged in deep (greater than 50 m) feeding behavior had greater dive responses than those in shallow feeding or non-feeding conditions. Some blue whales in the Goldbogen *et al.* (2013) study that were engaged in shallow feeding behavior demonstrated no clear changes in diving or movement even when received levels were high (~160 dB re 1μPa) for exposures to 3–4 kHz sonar signals, while deep feeding and non-feeding whales showed a clear response at exposures at lower received levels of sonar and pseudorandom noise. Southall *et al.* (2011) found that blue whales had a different response to sonar exposure depending on behavioral state, more pronounced when deep feeding/travel modes than when engaged in surface feeding.

With respect to distance influencing disturbance, DeRuiter *et al.* (2013) examined behavioral responses of Cuvier's beaked whales to mid-frequency sonar and found that whales responded strongly at low received levels (89–127 dB re 1μPa) by ceasing normal fluking and echolocation, swimming rapidly away, and extending both dive duration and subsequent non-foraging intervals when the sound source was 3.4–9.5 km away. Importantly, this study also showed that whales exposed to a similar range of received levels (78–106 dB *re 1μPa*) from distant sonar exercises (118 km away) did not elicit such responses, suggesting that context may moderate reactions. Thus, distance from the source is an important variable in influencing the type and degree of behavioral response and this variable is independent of the effect of received levels (*e.g.,* DeRuiter *et al.,* 2013; Dunlop *et al.,* 2017a, 2017b; Falcone *et al.,* 2017; Dunlop *et al.,* 2018; Southall *et al.,* 2019).

Ellison *et al.* (2012) outlined an approach to assessing the effects of sound on marine mammals that incorporates contextual-based factors. The authors recommend considering not just the received level of sound but also the activity the animal is engaged in at the time the sound is received, the nature and novelty of the sound (*i.e.,* is this a new sound from the animal's perspective), and the distance between the sound source and the animal. They submit that this ''exposure context,'' as described, greatly influences the type of behavioral response exhibited by the animal. Forney *et al.* (2017) also point out that an apparent lack of response (*e.g.,* no displacement or avoidance of a sound source) may not necessarily mean there is no cost to the individual or population, as some resources or habitats may be of such high value that animals may choose to stay, even when experiencing stress or hearing loss. Forney *et al.* (2017) recommend considering both the costs of remaining in an area of noise exposure such as TTS, PTS, or masking, which could lead to an increased risk of predation or other threats or a decreased capability to forage, and the costs of displacement, including potential increased risk of vessel strike, increased risks of predation or competition for resources, or decreased habitat suitable for foraging, resting, or socializing. This sort of contextual information is challenging to predict with accuracy for ongoing activities that occur over large spatial and temporal expanses. However, distance is one contextual factor for which data exist to quantitatively inform a take estimate, and the method for predicting Level B harassment in this rule does consider distance to the source. Other factors are often considered qualitatively in the analysis of the likely consequences of sound exposure where supporting information is available.

Behavioral change, such as disturbance manifesting in lost foraging time, in response to anthropogenic activities is often assumed to indicate a biologically significant effect on a population of concern. However, individuals may be able to compensate for some types and degrees of shifts in behavior, preserving their health and thus their vital rates and population dynamics. For example, New *et al.* (2013) developed a model simulating the complex social, spatial, behavioral and motivational interactions of coastal bottlenose dolphins in the Moray Firth, Scotland, to assess the biological significance of increased rate of behavioral disruptions caused by vessel traffic. Despite a modeled scenario in which vessel traffic increased from 70 to 470 vessels a year (a six-fold increase in vessel traffic) in response to the construction of a proposed offshore renewables' facility, the dolphins' behavioral time budget, spatial distribution, motivations and social structure remained unchanged. Similarly, two bottlenose dolphin populations in Australia were also modeled over 5 years against a number of disturbances (Reed *et al.,* 2020) and results indicate that habitat/noise disturbance had little overall impact on population abundances in either location, even in the most extreme impact scenarios modeled.

Friedlaender *et al.* (2016) provided the first integration of direct measures of prey distribution and density variables incorporated into across-individual analyses of behavior responses of blue whales to sonar and demonstrated a fivefold increase in the ability to quantify variability in blue whale diving behavior. These results illustrate that responses evaluated without such measurements for foraging animals may be misleading, which again illustrates the context-dependent nature of the probability of response.

The following subsections provide examples of behavioral responses that give an idea of the variability in behavioral responses that would be expected given the differential sensitivities of marine mammal species to sound, contextual factors, and the wide range of potential acoustic sources to which a marine mammal may be exposed. Behavioral responses that could occur for a given sound exposure should be determined from the literature that is available for each species, or extrapolated from closely related species when no information exists, along with contextual factors.

Avoidance and Displacement

Avoidance is the displacement of an individual from an area or migration path as a result of the presence of a sound or other stressors and is one of the most obvious manifestations of disturbance in marine mammals (Richardson *et al.,* 1995). For example, gray whales (E*schrichtius robustus*) and humpback whales are known to change direction—deflecting from customary migratory paths—in order to avoid noise from airgun surveys (Malme *et al.,* 1984; Dunlop *et al.,* 2018). Avoidance is qualitatively different from the flight response but also differs in the magnitude of the response (*i.e.,* directed movement, rate of travel, *etc.*). Avoidance may be short-term with animals returning to the area once the noise has ceased (*e.g.,* Malme *et al.,* 1984; Bowles *et al.,* 1994; Goold, 1996; Stone *et al.,* 2000; Morton and Symonds, 2002; Gailey *et al.,* 2007; Dähne *et al.,* 2013; Russel *et al.,* 2016). Longer-term displacement is possible, however, which may lead to changes in abundance or distribution patterns of the affected species in the affected region if habituation to the presence of the sound does not occur (*e.g.,* Blackwell *et al.,* 2004; Bejder *et al.,* 2006; Teilmann *et al.,* 2006; Forney *et al.,* 2017). Avoidance of marine mammals during the construction of offshore wind facilities (specifically, impact pile driving) has been documented in the literature with some significant variation in the temporal and spatial degree of avoidance and with most studies focused on harbor porpoises as one of the most common marine mammals in European waters (*e.g.,* Tougaard *et al.,* 2009; Dähne *et al.,* 2013; Thompson *et al.,* 2013; Russell *et al.,* 2016; Brandt *et al.,* 2018).

Available information on impacts to marine mammals from pile driving associated with offshore wind is limited to information on harbor porpoises and seals, as the vast majority of this research has occurred at European offshore wind projects where large whales and other odontocete species are uncommon. Harbor porpoises and harbor seals are considered to be behaviorally sensitive species (*e.g.,* Southall *et al.,* 2007) and the effects of wind farm construction in Europe on these species has been well documented. These species have received particular attention in European waters due to their abundance in the North Sea (Hammond *et al.,* 2002; Nachtsheim *et al.,* 2021). A summary of the literature on documented effects of wind farm construction on harbor porpoise and harbor seals is described below.

Brandt *et al.* (2016) summarized the effects of the construction of eight offshore wind projects within the German North Sea (*i.e.,* Alpha Ventus, BARD Offshore I, Borkum West II, DanTysk, Global Tech I, Meerwind Süd/Ost, Nordsee Ost, and Riffgat) between 2009 and 2013 on harbor porpoises, combining PAM data from 2010–2013 and aerial surveys from 2009–2013 with data on noise levels associated with pile driving. Results of the analysis revealed significant declines in porpoise detections during pile driving when compared to 25–48 hours before pile driving began, with the magnitude of decline during pile driving clearly decreasing with increasing distances to the construction site. During the majority of projects, significant declines in detections (by at least 20 percent) were found within at least 5–10 km of the pile driving site, with declines at up to 20–30 km of the pile driving site documented in some cases. Similar results demonstrating the long-distance displacement of harbor porpoises (18–25 km) and harbor seals (up to 40 km) during impact pile driving have also been observed during the construction at multiple other European wind farms (Tougaard *et al.,* 2009; Bailey *et al.,* 2010; Dähne *et al.,* 2013; Lucke *et al.,* 2012; Haleters *et al.,* 2015).

While harbor porpoises and seals tend to move several kilometers away from wind farm construction activities, the duration of displacement has been documented to be relatively temporary. In two studies at Horns Rev II using impact pile driving, harbor porpoise returned within 1–2 days following cessation of pile driving (Tougaard *et al.,* 2009, Brandt *et al.,* 2011). Similar recovery periods have been noted for harbor seals off England during the construction of four wind farms (Brasseur *et al.,* 2010; Carroll *et al.,* 2010; Hamre *et al.,* 2011; Hastie *et al.,* 2015; Russell *et al.,* 2016). In some cases, an increase in harbor porpoise activity has been documented inside wind farm areas following construction (*e.g.,* Lindeboom *et al.,* 2011). Other studies have noted longer term impacts after impact pile driving. Near Dogger Bank in Germany, harbor porpoises continued to avoid the area for over 2 years after construction began (Gilles *et al.,* 2009). Approximately 10 years after construction of the Nysted wind farm, harbor porpoise abundance had not recovered to the original levels previously seen, although the echolocation activity was noted to have been increasing when compared to the previous monitoring period (Teilmann and Carstensen, 2012). However, overall, there are no indications for a population decline of harbor porpoises in European waters (*e.g.,* Brandt *et al.,* 2016). Notably, where significant differences in displacement and return rates have been identified for these species, the occurrence of secondary project-specific influences such as use of mitigation measures (*e.g.,* bubble curtains, acoustic deterrent devices (ADDs)) or the manner in which species use the habitat in the project area are likely the driving factors of this variation.

NMFS notes the aforementioned studies from Europe involve installing much smaller piles than Dominion Energy proposes to install and, therefore, we anticipate noise levels from impact pile driving to be louder. For this reason, we anticipate that the greater distances of displacement observed in harbor porpoise and harbor seals documented in Europe are likely to occur off Virginia. However, we do not anticipate any greater severity of response due to harbor porpoise and harbor seal habitat use off Virginia or population-level consequences similar to European findings. In many cases, harbor porpoises and harbor seals are resident to the areas where European wind farms have been constructed. However, off Virginia, harbor porpoises are primarily transient (with higher abundances in winter when impact pile driving would not occur) and a very small percentage of the large harbor seal population are only seasonally present with no rookeries established. In summary, we anticipate that harbor porpoise and harbor seals will likely respond to pile driving by moving several kilometers away from the source but return to typical habitat use patterns when pile driving ceases.

Some avoidance behavior of other marine mammal species has been documented to be dependent on distance from the source. As described above, DeRuiter *et al.* (2013) noted that distance from a sound source may moderate marine mammal reactions in their study of Cuvier's beaked whales (an acoustically sensitive species), which showed the whales swimming rapidly and silently away when a sonar signal was 3.4–9.5 km away while showing no such reaction to the same signal when the signal was 118 km away even though the received levels were similar. Tyack *et al.* (1983) conducted playback studies of Surveillance Towed Array Sensor System (SURTASS) low frequency active (LFA) sonar in a gray whale migratory corridor off California. Similar to North Atlantic right whales, gray whales migrate close to shore (approximately +2 kms) and are low frequency hearing specialists. The LFA sonar source was placed within the gray whale migratory corridor (approximately 2 km offshore) and offshore of most, but not all, migrating whales (approximately 4 km offshore). These locations influenced received levels and distance to the source. For the inshore playbacks, not unexpectedly, the louder the source level of the playback (*i.e.,* the louder the received level), whale avoided the source at greater distances. Specifically, when the source level was 170 dB rms and 178 dB rms, whales avoided the inshore source at ranges of several hundred meters, similar to avoidance responses reported by Malme *et al.* (1983, 1984). Whales exposed to source levels of 185 dB rms demonstrated avoidance levels at ranges of +1 km. Responses to the offshore source broadcasting at source levels of 185 and 200 dB, avoidance responses were greatly reduced. While there was observed deflection from course, in no case did a whale abandon its migratory behavior.

The signal context of the noise exposure has been shown to play an important role in avoidance responses. In a 2007–2008 Bahamas study, playback sounds of a potential predator—a killer whale—resulted in a similar but more pronounced reaction in beaked whales (an acoustically sensitive species), which included longer inter-dive intervals and a sustained straight-line departure of more than 20 km from the area (Boyd *et al.,* 2008; Southall *et al.,* 2009; Tyack *et al.,* 2011). Dominion Energy does not anticipate, and NMFS is not proposing to authorize take of beaked whales and, moreover, the sounds produced by Dominion Energy do not have signal characteristics similar to predators. Therefore we would not expect such extreme reactions to occur. Southall *et al.* 2011 found that blue whales had a different response to sonar exposure depending on behavioral state, more pronounced when deep feeding/travel modes than when engaged in surface feeding.

One potential consequence of behavioral avoidance is the altered energetic expenditure of marine mammals because energy is required to move and avoid surface vessels or the sound field associated with active sonar (Frid and Dill, 2002). Most animals can avoid that energetic cost by swimming away at slow speeds or speeds that minimize the cost of transport (Miksis-Olds, 2006), as has been demonstrated in Florida manatees (Miksis-Olds, 2006). Those energetic costs increase, however, when animals shift from a resting state, which is designed to conserve an animal's energy, to an active state that consumes energy the animal would have conserved had it not been disturbed. Marine mammals that have been disturbed by anthropogenic noise and vessel approaches are commonly reported to shift from resting to active behavioral states, which would imply that they incur an energy cost.

Forney *et al.* (2017) detailed the potential effects of noise on marine mammal populations with high site fidelity, including displacement and auditory masking, noting that a lack of observed response does not imply absence of fitness costs and that apparent tolerance of disturbance may have population-level impacts that are less obvious and difficult to document. Avoidance of overlap between disturbing noise and areas and/or times of particular importance for sensitive species may be critical to avoiding population-level impacts because (particularly for animals with high site fidelity) there may be a strong motivation to remain in the area despite negative impacts. Forney *et al.* (2017) stated that, for these animals, remaining in a disturbed area may reflect a lack of alternatives rather than a lack of effects.

A flight response is a dramatic change in normal movement to a directed and rapid movement away from the perceived location of a sound source. The flight response differs from other avoidance responses in the intensity of the response (*e.g.,* directed movement, rate of travel). Relatively little information on flight responses of marine mammals to anthropogenic signals exist, although observations of flight responses to the presence of predators have occurred (Connor and Heithaus, 1996; Frid and Dill, 2002). The result of a flight response could range from brief, temporary exertion and displacement from the area where the signal provokes flight to, in extreme cases, beaked whale strandings (Cox *et al.,* 2006; D'Amico *et al.,* 2009). However, it should be noted that response to a perceived predator does not necessarily invoke flight (Ford and Reeves, 2008), and whether individuals are solitary or in groups may influence the response. Flight responses of marine mammals have been documented in response to mobile high intensity active sonar (*e.g.,* Tyack *et al.,* 2011; DeRuiter *et al.,* 2013; Wensveen *et al.,* 2019), and more severe responses have been documented when sources are moving towards an animal or when they are surprised by unpredictable exposures (Watkins 1986; Falcone *et al.,* 2017). Generally speaking, however, marine mammals would be expected to be less likely to respond with a flight response to either stationery pile driving (which they can sense is stationery and predictable) or significantly lower-level HRG surveys, unless they are within the area ensonified above behavioral harassment thresholds at the moment the source is turned on (Watkins, 1986; Falcone *et al.,* 2017).

Diving and Foraging

Changes in dive behavior in response to noise exposure can vary widely. They may consist of increased or decreased dive times and surface intervals as well as changes in the rates of ascent and descent during a dive (*e.g.,* Frankel and Clark, 2000; Costa *et al.,* 2003; Ng and Leung, 2003; Nowacek *et al.,* 2004; Goldbogen *et al.,* 2013a, 2013b). Variations in dive behavior may reflect interruptions in biologically significant activities (*e.g.,* foraging) or they may be of little biological significance. Variations in dive behavior may also expose an animal to potentially harmful conditions (*e.g.,* increasing the chance of ship-strike) or may serve as an avoidance response that enhances survivorship. The impact of a variation in diving resulting from an acoustic exposure depends on what the animal is doing at the time of the exposure, the type and magnitude of the response, and the context within which the response occurs (*e.g.,* the surrounding environmental and anthropogenic circumstances).

Nowacek *et al.* (2004) reported disruptions of dive behaviors in foraging North Atlantic right whales when exposed to an alerting stimulus, an action, they noted, that could lead to an increased likelihood of ship strike. The alerting stimulus was in the form of an 18 minute exposure that included three 2-minute signals played three times sequentially. This stimulus was designed with the purpose of providing signals distinct to background noise that serve as localization cues. However, the whales did not respond to playbacks of either right whale social sounds or vessel noise, highlighting the importance of the sound characteristics in producing a behavioral reaction. Although source levels for the proposed pile driving activities may exceed the received level of the alerting stimulus described by Nowacek *et al.* (2004), proposed mitigation strategies (further described in the Proposed Mitigation section) will reduce the severity of response to proposed pile driving activities. Converse to the behavior of North Atlantic right whales, Indo-Pacific humpback dolphins have been observed to dive for longer periods of time in areas where vessels were present and/or approaching (Ng and Leung, 2003). In both of these studies, the influence of the sound exposure cannot be decoupled from the physical presence of a surface vessel, thus complicating interpretations of the relative contribution of each stimulus to the response. Indeed, the presence of surface vessels, their approach, and speed of approach, seemed to be significant factors in the response of the Indo-Pacific humpback dolphins (Ng and Leung, 2003). Low frequency signals of the Acoustic Thermometry of Ocean Climate (ATOC) sound source were not found to affect dive times of humpback whales in Hawaiian waters (Frankel and Clark, 2000) or to overtly affect elephant seal dives (Costa *et al.,* 2003). They did, however, produce subtle effects that varied in direction and degree among the individual seals, illustrating the equivocal nature of behavioral effects and consequent difficulty in defining and predicting them.

Disruption of feeding behavior can be difficult to correlate with anthropogenic sound exposure, so it is usually inferred by observed displacement from known foraging areas, the cessation of secondary indicators of foraging (*e.g.,* bubble nets or sediment plumes), or changes in dive behavior. As for other types of behavioral response, the frequency, duration, and temporal pattern of signal presentation, as well as differences in species sensitivity, are likely contributing factors to differences in response in any given circumstance (*e.g.,* Croll *et al.,* 2001; Nowacek *et al.,* 2004; Madsen *et al.,* 2006a; Yazvenko *et al.,* 2007; Southall *et al.,* 2019b). An understanding of the energetic requirements of the affected individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal can facilitate the assessment of whether foraging disruptions are likely to incur fitness consequences (Goldbogen *et al.,* 2013; Farmer *et al.,* 2018; Pirotta *et al.,* 2018; Southall *et al.,* 2019; Pirotta *et al.,* 2021).

Impacts on marine mammal foraging rates from noise exposure have been documented, though there is little data regarding the impacts of offshore turbine construction specifically. Several broader examples follow, and it is reasonable to expect that exposure to noise produced during the 5-years the proposed rule would be effective could have similar impacts.

Visual tracking, passive acoustic monitoring, and movement recording tags were used to quantify sperm whale behavior prior to, during, and following exposure to air gun arrays at received levels in the range 140–160 dB at distances of 7–13 km, following a phase-in of sound intensity and full array exposures at 1–13 km (Madsen *et al.,* 2006a; Miller *et al.,* 2009). Sperm whales did not exhibit horizontal avoidance behavior at the surface. However, foraging behavior may have been affected. The sperm whales exhibited 19 percent less vocal (buzz) rate during full exposure relative to post exposure, and the whale that was approached most closely had an extended resting period and did not resume foraging until the air guns had ceased firing. The remaining whales continued to execute foraging dives throughout exposure; however, swimming movements during foraging dives were six percent lower during exposure than control periods (Miller *et al.,* 2009). Miller *et al.* (2009) noted that more data are required to understand whether the differences were due to exposure or natural variation in sperm whale behavior.

Balaenopterid whales exposed to moderate low-frequency signals similar to the ATOC sound source demonstrated no variation in foraging activity (Croll *et al.,* 2001), whereas five out of six North Atlantic right whales exposed to an acoustic alarm interrupted their foraging dives (Nowacek *et al.,* 2004). Although the received SPLs were similar in the latter two studies, the frequency, duration, and temporal pattern of signal presentation were different. These factors, as well as differences in species sensitivity, are likely contributing factors to the differential response. The source levels of both the proposed construction and HRG activities exceed the source levels of the signals described by Nowacek *et al.* (2004) and Croll *et al.* (2001), and noise generated by Dominion Energy's activities at least partially overlap in frequency with the described signals. Blue whales exposed to mid-frequency sonar in the Southern California Bight were less likely to produce low frequency calls usually associated with feeding behavior (Melcón *et al.,* 2012). However, Melcón *et al.* (2012) were unable to determine if suppression of low frequency calls reflected a change in their feeding performance or abandonment of foraging behavior and indicated that implications of the documented responses are unknown. Further, it is not known whether the lower rates of calling actually indicated a reduction in feeding behavior or social contact since the study used data from remotely deployed, passive acoustic monitoring buoys. Results from the 2010–2011 field season of a behavioral response study in Southern California waters indicated that, in some cases and at low received levels, tagged blue whales responded to mid-frequency sonar but that those responses were mild and there was a quick return to their baseline activity (Southall *et al.,* 2011; Southall *et al.,* 2012b, Southall *et al.,* 2019b).

Information on or estimates of the energetic requirements of the individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal will help better inform a determination of whether foraging disruptions incur fitness consequences. Foraging strategies may impact foraging efficiency, such as by reducing foraging effort and increasing success in prey detection and capture, in turn promoting fitness and allowing individuals to better compensate for foraging disruptions. Surface feeding blue whales did not show a change in behavior in response to mid-frequency simulated and real sonar sources with received levels between 90 and 179 dB *re 1* μ*Pa,* but deep feeding and non-feeding whales showed temporary reactions including cessation of feeding, reduced initiation of deep foraging dives, generalized avoidance responses, and changes to dive behavior (DeRuiter *et al.,* 2017; Goldbogen *et al.,* 2013b; Sivle *et al.,* 2015). Goldbogen *et al.* (2013b) indicate that disruption of feeding and displacement could impact individual fitness and health. However, for this to be true, we would have to assume that an individual whale could not compensate for this lost feeding opportunity by either immediately feeding at another location, by feeding shortly after cessation of acoustic exposure, or by feeding at a later time. There is no indication that individual fitness and health would be impacted, particularly since unconsumed prey would likely still be available in the environment in most cases following the cessation of acoustic exposure.

Similarly, while the rates of foraging lunges decrease in humpback whales due to sonar exposure, there was variability in the response across individuals, with one animal ceasing to forage completely and another animal starting to forage during the exposure (Sivle *et al.,* 2016). In addition, almost half of the animals that demonstrated avoidance were foraging before the exposure but the others were not; the animals that avoided while not feeding responded at a slightly lower received level and greater distance than those that were feeding (Wensveen *et al.,* 2017). These findings indicate the behavioral state of the animal and foraging strategies play a role in the type and severity of a behavioral response. For example, when the prey field was mapped and used as a covariate in examining how behavioral state of blue whales is influenced by mid-frequency sound, the response in blue whale deep-feeding behavior was even more apparent, reinforcing the need for contextual variables to be included when assessing behavioral responses (Friedlaender *et al.,* 2016).

Vocalizations and Auditory Masking

Marine mammals vocalize for different purposes and across multiple modes, such as whistling, production of echolocation clicks, calling, and singing. Changes in vocalization behavior in response to anthropogenic noise can occur for any of these modes and may result directly from increased vigilance (also see the *Potential Effects of Behavioral Disturbance on Marine Mammal Fitness* section) or a startle response, or from a need to compete with an increase in background noise (see Erbe *et al.,* 2016 review on communication masking), the latter of which is described more below.

For example, in the presence of potentially masking signals, humpback whales and killer whales have been observed to increase the length of their songs (Miller *et al.,* 2000; Fristrup *et al.,* 2003; Foote *et al.,* 2004) and blue whales increased song production (Di Iorio and Clark, 2009), while North Atlantic right whales have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al.,* 2007). In some cases, animals may cease or reduce sound production during production of aversive signals (Bowles *et al.,* 1994; Thode *et al.,* 2020; Cerchio *et al.,* 2014; McDonald *et al.,* 1995). Blackwell *et al.* (2015) showed that whales increased calling rates as soon as air gun signals were detectable before ultimately decreasing calling rates at higher received levels.

Sound can disrupt behavior through masking, or interfering with, an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g.,* those used for intraspecific communication and social interactions, prey detection, predator avoidance, or navigation) (Richardson *et al.,* 1995; Erbe and Farmer, 2000; Tyack, 2000; Erbe *et al.,* 2016). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may occur whether the sound is natural (*e.g.,* snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g.,* shipping, sonar, seismic exploration) in origin. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g.,* signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g.,* sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age, or TTS hearing loss), and existing ambient noise and propagation conditions. Masking these acoustic signals can disturb the behavior of individual animals, groups of animals, or entire populations. Masking can lead to behavioral changes including vocal changes (*e.g.,* Lombard effect, increasing amplitude, or changing frequency), cessation of foraging or lost foraging opportunities, and leaving an area, to both signalers and receivers, in an attempt to compensate for noise levels (Erbe *et al.,* 2016) or because sounds that would typically have triggered a behavior were not detected. In humans, significant masking of tonal signals occurs as a result of exposure to noise in a narrow band of similar frequencies. As the sound level increases, though, the detection of frequencies above those of the masking stimulus decreases also. This principle is expected to apply to marine mammals as well because of common biomechanical cochlear properties across taxa.

Therefore, when the coincident (masking) sound is man-made, it may be considered harassment when disrupting behavioral patterns. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which only occurs during the sound exposure. Because masking (without resulting in threshold shift) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

The frequency range of the potentially masking sound is important in determining any potential behavioral impacts. For example, low-frequency signals may have less effect on high-frequency echolocation sounds produced by odontocetes but are more likely to affect detection of mysticete communication calls and other potentially important natural sounds such as those produced by surf and some prey species. The masking of communication signals by anthropogenic noise may be considered as a reduction in the communication space of animals (*e.g.,* Clark *et al.,* 2009; Matthews *et al.,* 2016) and may result in energetic or other costs as animals change their vocalization behavior (*e.g.,* Miller *et al.,* 2000; Foote *et al.,* 2004; Parks *et al.,* 2007; Di Iorio and Clark, 2009; Holt *et al.,* 2009). Masking can be reduced in situations where the signal and noise come from different directions (Richardson *et al.,* 1995), through amplitude modulation of the signal, or through other compensatory behaviors (Houser and Moore, 2014). Masking can be tested directly in captive species (*e.g.,* Erbe, 2008), but in wild populations it must be either modeled or inferred from evidence of masking compensation. There are few studies addressing real-world masking sounds likely to be experienced by marine mammals in the wild (*e.g.,* Branstetter *et al.,* 2013; Cholewiak *et al.,* 2018).

The echolocation calls of toothed whales are subject to masking by high-frequency sound. Human data indicate low-frequency sound can mask high-frequency sounds (*i.e.,* upward masking). Studies on captive odontocetes by Au *et al.* (1974, 1985, 1993) indicate that some species may use various processes to reduce masking effects (*e.g.,* adjustments in echolocation call intensity or frequency as a function of background noise conditions). There is also evidence that the directional hearing abilities of odontocetes are useful in reducing masking at the high-frequencies these cetaceans use to echolocate, but not at the low-to-moderate frequencies they use to communicate (Zaitseva *et al.,* 1980). A study by Nachtigall and Supin (2008) showed that false killer whales adjust their hearing to compensate for ambient sounds and the intensity of returning echolocation signals.

Impacts on signal detection, measured by masked detection thresholds, are not the only important factors to address when considering the potential effects of masking. As marine mammals use sound to recognize conspecifics, prey, predators, or other biologically significant sources (Branstetter *et al.,* 2016), it is also important to understand the impacts of masked recognition thresholds (often called ''informational masking''). Branstetter *et al.* (2016) measured masked recognition thresholds for whistle-like sounds of bottlenose dolphins and observed that they are approximately 4 dB above detection thresholds (energetic masking) for the same signals. Reduced ability to recognize a conspecific call or the acoustic signature of a predator could have severe negative impacts. Branstetter *et al.* (2016) observed that if ''quality communication'' is set at 90 percent recognition the output of communication space models (which are based on 50 percent detection) would likely result in a significant decrease in communication range.

As marine mammals use sound to recognize predators (Allen *et al.,* 2014; Cummings and Thompson, 1971; Curé *et al.,* 2015; Fish and Vania, 1971), the presence of masking noise may also prevent marine mammals from responding to acoustic cues produced by their predators, particularly if it occurs in the same frequency band. For example, harbor seals that reside in the coastal waters off British Columbia are frequently targeted by mammal-eating killer whales. The seals acoustically discriminate between the calls of mammal-eating and fish-eating killer whales (Deecke *et al.,* 2002), a capability that should increase survivorship while reducing the energy required to attend to all killer whale calls. Similarly, sperm whales (Curé *et al.,* 2016; Isojunno *et al.,* 2016), long-finned pilot whales (Visser *et al.,* 2016), and humpback whales (Curé *et al.,* 2015) changed their behavior in response to killer whale vocalization playbacks; these findings indicate that some recognition of predator cues could be missed if the killer whale vocalizations were masked. The potential effects of masked predator acoustic cues depends on the duration of the masking noise and the likelihood of a marine mammal encountering a predator during the time that detection and recognition of predator cues are impeded.

Redundancy and context can also facilitate detection of weak signals. These phenomena may help marine mammals detect weak sounds in the presence of natural or manmade noise. Most masking studies in marine mammals present the test signal and the masking noise from the same direction. The dominant background noise may be highly directional if it comes from a particular anthropogenic source such as a ship or industrial site. Directional hearing may significantly reduce the masking effects of these sounds by improving the effective signal-to-noise ratio.

Masking affects both senders and receivers of acoustic signals and, at higher levels and longer duration, can potentially have long-term chronic effects on marine mammals at the population level as well as at the individual level. Low-frequency ambient sound levels have increased by as much as 20 dB (more than three times in terms of SPL) in the world's ocean from pre-industrial periods, with most of the increase from distant commercial shipping (Hildebrand, 2009; Cholewiak *et al.,* 2018). All anthropogenic sound sources, but especially chronic and lower-frequency signals (*e.g.,* from commercial vessel traffic), contribute to elevated ambient sound levels, thus intensifying masking.

In addition to making it more difficult for animals to perceive and recognize acoustic cues in their environment, anthropogenic sound presents separate challenges for animals that are vocalizing. When they vocalize, animals are aware of environmental conditions that affect the ''active space'' (or communication space) of their vocalizations, which is the maximum area within which their vocalizations can be detected before it drops to the level of ambient noise (Brenowitz, 2004; Brumm *et al.,* 2004; Lohr *et al.,* 2003). Animals are also aware of environmental conditions that affect whether listeners can discriminate and recognize their vocalizations from other sounds, which is more important than simply detecting that a vocalization is occurring (Brenowitz, 1982; Brumm *et al.,* 2004; Dooling, 2004; Marten and Marler, 1977; Patricelli *et al.,* 2006). Most species that vocalize have evolved with an ability to make adjustments to their vocalizations to increase the signal-to-noise ratio, active space, and recognizability/distinguishability of their vocalizations in the face of temporary changes in background noise (Brumm *et al.,* 2004; Patricelli *et al.,* 2006). Vocalizing animals can make adjustments to vocalization characteristics such as the frequency structure, amplitude, temporal structure, and temporal delivery (repetition rate), or ceasing to vocalize.

Many animals will combine several of these strategies to compensate for high levels of background noise. Anthropogenic sounds that reduce the signal-to-noise ratio of animal vocalizations, increase the masked auditory thresholds of animals listening for such vocalizations, or reduce the active space of an animal's vocalizations impair communication between animals. Most animals that vocalize have evolved strategies to compensate for the effects of short-term or temporary increases in background or ambient noise on their songs or calls. Although the fitness consequences of these vocal adjustments are not directly known in all instances, like most other trade-offs animals must make, some of these strategies likely come at a cost (Patricelli *et al.,* 2006; Noren *et al.,* 2017; Noren *et al.,* 2020). Shifting songs and calls to higher frequencies may also impose energetic costs (Lambrechts, 1996).

Marine mammals are also known to make vocal changes in response to anthropogenic noise. In cetaceans, vocalization changes have been reported from exposure to anthropogenic noise sources such as sonar, vessel noise, and seismic surveying (see the following for examples: Gordon *et al.,* 2003; Di Iorio and Clark, 2009; Hatch *et al.,* 2012; Holt *et al.,* 20098; Holt *et al.,* 2011; Lesage *et al.,* 1999; McDonald *et al.,* 2009; Parks *et al.,* 2007; Risch *et al.,* 2012; Rolland *et al.,* 2012), as well as changes in the natural acoustic environment (Dunlop *et al.,* 2014). Vocal changes can be temporary, or can be persistent. For example, model simulation suggests that the increase in starting frequency for the North Atlantic right whale upcall over the last 50 years resulted in increased detection ranges between right whales. The frequency shift, coupled with an increase in call intensity by 20 dB, led to a call detectability range of less than 3 km to over 9 km (Tennessen and Parks, 2016). Holt *et al.* (2009) measured killer whale call source levels and background noise levels in the one to 40 kHz band and reported that the whales increased their call source levels by one dB SPL for every one dB SPL increase in background noise level. Similarly, another study on St. Lawrence River belugas reported a similar rate of increase in vocalization activity in response to passing vessels (Scheifele *et al.,* 2005). Di Iorio and Clark (2009) showed that blue whale calling rates vary in association with seismic sparker survey activity, with whales calling more on days with surveys than on days without surveys. They suggested that the whales called more during seismic survey periods as a way to compensate for the elevated noise conditions.

In some cases, these vocal changes may have fitness consequences, such as an increase in metabolic rates and oxygen consumption, as observed in bottlenose dolphins when increasing their call amplitude (Holt *et al.,* 2015). A switch from vocal communication to physical, surface-generated sounds such as pectoral fin slapping or breaching was observed for humpback whales in the presence of increasing natural background noise levels, indicating that adaptations to masking may also move beyond vocal modifications (Dunlop *et al.,* 2010).

While these changes all represent possible tactics by the sound-producing animal to reduce the impact of masking, the receiving animal can also reduce masking by using active listening strategies such as orienting to the sound source, moving to a quieter location, or reducing self-noise from hydrodynamic flow by remaining still. The temporal structure of noise (*e.g.,* amplitude modulation) may also provide a considerable release from masking through comodulation masking release (a reduction of masking that occurs when broadband noise, with a frequency spectrum wider than an animal's auditory filter bandwidth at the frequency of interest, is amplitude modulated) (Branstetter and Finneran, 2008; Branstetter *et al.,* 2013). Signal type (*e.g.,* whistles, burst-pulse, sonar clicks) and spectral characteristics (*e.g.,* frequency modulated with harmonics) may further influence masked detection thresholds (Branstetter *et al.,* 2016; Cunningham *et al.,* 2014).

Masking is more likely to occur in the presence of broadband, relatively continuous noise sources such as vessels. Several studies have shown decreases in marine mammal communication space and changes in behavior as a result of the presence of vessel noise. For example, right whales were observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al.,* 2007) as well as increasing the amplitude (intensity) of their calls (Parks, 2009; Parks *et al.,* 2011). Clark *et al.* (2009) observed that right whales' communication space decreased by up to 84 percent in the presence of vessels. Cholewiak *et al.* (2018) also observed loss in communication space in Stellwagen National Marine Sanctuary for North Atlantic right whales, fin whales, and humpback whales with increased ambient noise and shipping noise. Although humpback whales off Australia did not change the frequency or duration of their vocalizations in the presence of ship noise, their source levels were lower than expected based on source level changes to wind noise, potentially indicating some signal masking (Dunlop, 2016). Multiple delphinid species have also been shown to increase the minimum or maximum frequencies of their whistles in the presence of anthropogenic noise and reduced communication space (for examples see: Holt *et al.,* 2009; Holt *et al.,* 2011; Gervaise *et al.,* 2012; Williams *et al.,* 2013; Hermannsen *et al.,* 2014; Papale *et al.,* 2015; Liu *et al.,* 2017). While masking impacts are not a concern from lower intensity, higher frequency HRG surveys, some degree of masking would be expected in the vicinity of turbine pile driving and concentrated support vessel operation. However, pile driving is an intermittent sound and would not be continuous throughout a day.

Habituation and Sensitization

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok *et al.,* 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. It is important to note that habituation is appropriately considered as a ''progressive reduction in response to stimuli that are perceived as neither aversive nor beneficial,'' rather than as, more generally, moderation in response to human disturbance having a neutral or positive outcome (Bejder *et al.,* 2009). The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure. Both habituation and sensitization require an ongoing learning process. As noted, behavioral state may affect the type of response. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson *et al.,* 1995; National Research Council (NRC), 2003; Wartzok *et al.,* 2003; Southall *et al.,* 2019b). Controlled experiments with captive marine mammals have shown pronounced behavioral reactions, including avoidance of loud sound sources (*e.g.,* Ridgway *et al.,* 1997; Finneran *et al.,* 2003; Houser *et al.,* 2013a,b; Kastelein *et al.,* 2018). Observed responses of wild marine mammals to loud impulsive sound sources (typically airguns or acoustic harassment devices) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds, 2002; see also Richardson *et al.,* 1995; Nowacek *et al.,* 2007; Tougaard *et al.,* 2009; Brandt *et al.,* 2011; Brandt *et al.,* 2012; Dähne *et al.,* 2013; Brandt *et al.,* 2014; Russell *et al.,* 2016; Brandt *et al.,* 2018). Stone (2015a) reported data from at-sea observations during 1,196 airgun surveys from 1994 to 2010. When large arrays of airguns (considered to be 500 in 3 or more) were firing, lateral displacement, more localized avoidance, or other changes in behavior were evident for most odontocetes. However, significant responses to large arrays were found only for the minke whale and fin whale. Behavioral responses observed included changes in swimming or surfacing behavior with indications that cetaceans remained near the water surface at these times. Behavioral observations of gray whales during an air gun survey monitored whale movements and respirations pre-, during-, and post-seismic survey (Gailey *et al.,* 2016). Behavioral state and water depth were the best 'natural' predictors of whale movements and respiration and after considering natural variation, none of the response variables were significantly associated with survey or vessel sounds. Many delphinids approach low-frequency airgun source vessels with no apparent discomfort or obvious behavioral change (*e.g.,* Barkaszi *et al.,* 2012), indicating the importance of frequency output in relation to the species' hearing sensitivity.

Physiological Responses

An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (*e.g.,* Seyle, 1950; Moberg, 2000). In many cases, an animal's first and sometimes most economical (in terms of energetic costs) response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

Neuroendocrine stress responses often involve the hypothalamus-pituitary-adrenal system. Virtually all neuroendocrine functions that are affected by stress—including immune competence, reproduction, metabolism, and behavior—are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance (*e.g.,* Moberg, 1987; Blecha, 2000). Increases in the circulation of glucocorticoids are also equated with stress (Romano *et al.,* 2004).

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and "distress" is the cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other functions. This state of distress will last until the animal replenishes its energetic reserves sufficiently to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well studied through controlled experiments and for both laboratory and free-ranging animals (*e.g.,* Holberton *et al.,* 1996; Hood *et al.,* 1998; Jessop *et al.,* 2003; Krausman *et al.,* 2004; Lankford *et al.,* 2005). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker, 2000; Romano *et al.,* 2002b) and, more rarely, studied in wild populations (*e.g.,* Lusseau and Bejder, 2007; Romano *et al.,* 2002a; Rolland *et al.,* 2012). For example, Rolland *et al.* (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales.

These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as "distress." In addition, any animal experiencing TTS would likely also experience stress responses (NRC, 2003, 2017).

Respiration naturally varies with different behaviors and variations in respiration rate as a function of acoustic exposure can be expected to co-occur with other behavioral reactions, such as a flight response or an alteration in diving. However, respiration rates in and of themselves may be representative of annoyance or an acute stress response. Mean exhalation rates of gray whales at rest and while diving were found to be unaffected by seismic surveys conducted adjacent to the whale feeding grounds (Gailey *et al.,* 2007). Studies with captive harbor porpoises show increased respiration rates upon introduction of acoustic alarms (Kastelein *et al.,* 2001; Kastelein *et al.,* 2006a) and emissions for underwater data transmission (Kastelein *et al.,* 2005). However, exposure of the same acoustic alarm to a striped dolphin under the same conditions did not elicit a response (Kastelein *et al.,* 2006a), again highlighting the importance in understanding species differences in the tolerance of underwater noise when determining the potential for impacts resulting from anthropogenic sound exposure.

Potential Effects of Disturbance on Marine Mammal Fitness

The different ways that marine mammals respond to sound are sometimes indicators of the ultimate effect that exposure to a given stimulus will have on the well-being (survival, reproduction, *etc.*) of an animal. There is little quantitative marine mammal data relating the exposure of marine mammals from sound to effects on reproduction or survival, though data exists for terrestrial species to which we can draw comparisons for marine mammals. Several authors have reported that disturbance stimuli may cause animals to abandon nesting and foraging sites (Sutherland and Crockford, 1993); may cause animals to increase their activity levels and suffer premature deaths or reduced reproductive success when their energy expenditures exceed their energy budgets (Daan *et al.,* 1996; Feare, 1976; Mullner *et al.,* 2004); or may cause animals to experience higher predation rates when they adopt risk-prone foraging or migratory strategies (Frid and Dill, 2002). Each of these studies addressed the consequences of animals shifting from one behavioral state (*e.g.,* resting or foraging) to another behavioral state (*e.g.,* avoidance or escape behavior) because of human disturbance or disturbance stimuli.

Attention is the cognitive process of selectively concentrating on one aspect of an animal's environment while ignoring other things (Posner, 1994). Because animals (including humans) have limited cognitive resources, there is a limit to how much sensory information they can process at any time. The phenomenon called "attentional capture" occurs when a stimulus (usually a stimulus that an animal is not concentrating on or attending to) "captures" an animal's attention. This shift in attention can occur consciously or subconsciously (for example, when an animal hears sounds that it associates with the approach of a predator) and the shift in attention can be sudden (Dukas, 2002; van Rij, 2007). Once a stimulus has captured an animal's attention, the animal can respond by ignoring the stimulus, assuming a "watch and wait" posture, or treat the stimulus as a disturbance and respond accordingly, which includes scanning for the source of the stimulus or "vigilance" (Cowlishaw *et al.,* 2004).

Vigilance is an adaptive behavior that helps animals determine the presence or absence of predators, assess their distance from conspecifics, or to attend cues from prey (Bednekoff and Lima, 1998; Treves, 2000). Despite those benefits, however, vigilance has a cost of time; when animals focus their attention on specific environmental cues, they are not attending to other activities such as foraging or resting. These effects have generally not been demonstrated for marine mammals, but studies involving fish and terrestrial animals have shown that increased vigilance may substantially reduce feeding rates (Saino, 1994; Beauchamp and Livoreil, 1997; Fritz *et al.,* 2002; Purser and Radford, 2011). Animals will spend more time being vigilant, which may translate to less time foraging or resting, when disturbance stimuli approach them more directly, remain at closer distances, have a greater group size (*e.g.,* multiple surface vessels), or when they co-occur with times that an animal perceives increased risk (*e.g.,* when they are giving birth or accompanied by a calf).

The primary mechanism by which increased vigilance and disturbance appear to affect the fitness of individual animals is by disrupting an animal's time budget and, as a result, reducing the time they might spend foraging and resting (which increases an animal's activity rate and energy demand while decreasing their caloric intake/energy). In a study of northern resident killer whales off Vancouver Island, exposure to boat traffic was shown to reduce foraging opportunities and increase traveling time (Holt *et al.,* 2021). A simple bioenergetics model was applied to show that the reduced foraging opportunities equated to a decreased energy intake of 18 percent while the increased traveling incurred an increased energy output of 3–4 percent, which suggests that a management action based on avoiding interference with foraging might be particularly effective.

On a related note, many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (24-hr cycle). Behavioral reactions to noise exposure (such as disruption of critical life functions, displacement, or avoidance of important habitat) are more likely to be significant for fitness if they last more than one diel cycle or recur on subsequent days (Southall *et al.,* 2007). Consequently, a behavioral response lasting less than one day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall *et al.,* 2007). It is important to note the difference between behavioral reactions lasting or recurring over multiple days and anthropogenic activities lasting or recurring over multiple days. For example, just because certain activities last for multiple days does not necessarily mean that individual animals will be either exposed to those activity-related stressors (*i.e.,* sonar) for multiple days or further exposed in a manner that would result in sustained multi-day substantive behavioral responses. However, special attention is warranted where longer-duration activities overlay areas in which animals are known to congregate for longer durations for biologically important behaviors.

As noted above, there are few studies that directly illustrate the impacts of disturbance on marine mammal populations. Lusseau and Bejder (2007) present data from three long-term studies illustrating the connections between disturbance from whale-watching boats and population-level effects in cetaceans. In Shark Bay, Australia, the abundance of bottlenose dolphins was compared within adjacent control and tourism sites over three consecutive 4.5-year periods of increasing tourism levels. Between the second and third time periods, in which tourism doubled, dolphin abundance decreased by 15 percent in the tourism area and did not change significantly in the control area. In Fiordland, New Zealand, two populations (Milford and Doubtful Sounds) of bottlenose dolphins with tourism levels that differed by a factor of seven were observed and significant increases in traveling time and decreases in resting time were documented for both. Consistent short-term avoidance strategies were observed in response to tour boats until a threshold of disturbance was reached (average 68 minutes between interactions), after which the response switched to a longer-term habitat displacement strategy. For one population, tourism only occurred in a part of the home range. However, tourism occurred throughout the home range of the Doubtful Sound population and once boat traffic increased beyond the 68-minute threshold (resulting in abandonment of their home range/preferred habitat), reproductive success drastically decreased (increased stillbirths) and abundance decreased significantly (from 67 to 56 individuals in a short period).

In order to understand how the effects of activities may or may not impact species and stocks of marine mammals, it is necessary to understand not only what the likely disturbances are going to be but how those disturbances may affect the reproductive success and survivorship of individuals and then how those impacts to individuals translate to population-level effects. Following on the earlier work of a committee of the U.S. National Research Council (NRC, 2005), New *et al.* (2014), in an effort termed the Potential Consequences of Disturbance (PCoD), outline an updated conceptual model of the relationships linking disturbance to changes in behavior and physiology, health, vital rates, and population dynamics. This framework is a four-step process progressing from changes in individual behavior and/or physiology, to changes in individual health, then vital rates, and finally to population-level effects. In this framework, behavioral and physiological changes can have direct (acute) effects on vital rates, such as when changes in habitat use or increased stress levels raise the probability of mother-calf separation or predation; indirect and long-term (chronic) effects on vital rates, such as when changes in time/energy budgets or increased disease susceptibility affect health, which then affects vital rates; or no effect to vital rates (New *et al.,* 2014). Since this general framework was outlined and the relevant supporting literature compiled, multiple studies developing state-space energetic models for species with extensive long-term monitoring (*e.g.,* southern elephant seals, North Atlantic right whales, Ziphiidae beaked whales, and bottlenose dolphins) have been conducted and can be used to effectively forecast longer-term, population-level impacts from behavioral changes. While these are very specific models with very specific data requirements that cannot yet be applied broadly to project-specific risk assessments for the majority of species, they are a critical first step towards being able to quantify the likelihood of a population level effect. Since New *et al.* (2014), several publications have described models developed to examine the long-term effects of environmental or anthropogenic disturbance of foraging on various life stages of selected species (*e.g.,* sperm whale, Farmer *et al.* (2018); California sea lion, McHuron *et al.* (2018); blue whale, Pirotta *et al.* (2018a); humpback whale, Dunlop *et al.* (2021)). These models continue to add to refinement of the approaches to the PCoD framework. Such models also help identify what data inputs require further investigation. Pirotta *et al.* (2018b) provides a review of the PCoD framework with details on each step of the process and approaches to applying real data or simulations to achieve each step.

Despite its simplicity, there are few complete PCoD models available for any marine mammal species due to a lack of data available to parameterize many of the steps. To date, no PCoD model has been fully parameterized with empirical data (Pirotta *et al.,* 2018a) due to the fact they are data intensive and logistically challenging to complete. Therefore, most complete PCoD models include simulations, theoretical modeling, and expert opinion to move through the steps. For example, PCoD models have been developed to evaluate the effect of wind farm construction on the North Sea harbor porpoise populations (*e.g.,* King *et al.,* 2015; Nabe-Nielsen *et al.,* 2018). These models include a mix of empirical data, expert elicitation (King *et al.,* 2015) and simulations of animals' movements, energetics, and/or survival (New *et al.,* 2014; Nabe-Nielsen *et al.,* 2018).

PCoD models may also be approached in different manners. Dunlop *et al.* (2021) modeled migrating humpback whale mother-calf pairs in response to seismic surveys using both a forwards and backwards approach. While a typical forwards approach can determine if a stressor would have population-level consequences, Dunlop *et al.* demonstrated that working backwards through a PCoD model can be used to assess the ''worst case'' scenario for an interaction of a target species and stressor. This method may be useful for future management goals when appropriate data becomes available to fully support the model. In another example, harbor porpoise PCoD model investigating the impact of seismic surveys on harbor porpoise included an investigation on underlying drivers of vulnerability. Harbor porpoise movement and foraging were modeled for baseline periods and then for periods with seismic surveys as well; the models demonstrated that temporal (*i.e.,* seasonal) variation in individual energetics and their link to costs associated with disturbances was key in predicting population impacts (Gallagher *et al.,* 2021).

Behavioral change, such as disturbance manifesting in lost foraging time, in response to anthropogenic activities is often assumed to indicate a biologically significant effect on a population of concern. However, as described above, individuals may be able to compensate for some types and degrees of shifts in behavior, preserving their health and thus their vital rates and population dynamics. For example, New *et al.* (2013) developed a model simulating the complex social, spatial, behavioral and motivational interactions of coastal bottlenose dolphins in the Moray Firth, Scotland, to assess the biological significance of increased rate of behavioral disruptions caused by vessel traffic. Despite a modeled scenario in which vessel traffic increased from 70 to 470 vessels a year (a six-fold increase in vessel traffic) in response to the construction of a proposed offshore renewables' facility, the dolphins' behavioral time budget, spatial distribution, motivations, and social structure remain unchanged. Similarly, two bottlenose dolphin populations in Australia were also modeled over five years against a number of disturbances (Reed *et al.,* 2020), and results indicated that habitat/noise disturbance had little overall impact on population abundances in either location, even in the most extreme impact scenarios modeled. By integrating different sources of data (*e.g.,* controlled exposure data, activity monitoring, telemetry tracking, and prey sampling) into a theoretical model to predict effects from sonar on a blue whale's daily energy intake, Pirotta *et al.* (2021) found that tagged blue whales' activity budgets, lunging rates, and ranging patterns caused variability in their predicted cost of disturbance. This method may be useful for future management goals when appropriate data becomes available to fully support the model. Harbor porpoise movement and foraging were modeled for baseline periods and then for periods with seismic surveys as well; the models demonstrated that the seasonality of the seismic activity was an important predictor of impact (Gallagher *et al.,* 2021).

Nearly all PCoD studies and experts agree that infrequent exposures of a single day or less are unlikely to impact individual fitness, let alone lead to population level effects (Booth *et al.,* 2016; Booth *et al.,* 2017; Christiansen and Lusseau, 2015; Farmer *et al.,* 2018; Wilson *et al.,* 2020; Harwood and Booth, 2016; King *et al.,* 2015; McHuron *et al.,* 2018; National Academies of Sciences, Engineering, and Medicine (NAS), 2017; New *et al.,* 2014; Pirotta *et al.,* 2018; Southall *et al.,* 2007; Villegas-Amtmann *et al.,* 2015). As described through this proposed rule, NMFS expects that any behavioral disturbance that would occur due to animals being exposed to construction activity would be of a relatively short duration, with behavior returning to a baseline state shortly after the acoustic stimuli ceases or the animal moves far enough away from the source. Given this, and NMFS' evaluation of the available PCoD studies, and the required mitigation discussed later, any such behavioral disturbance resulting from Dominion Energy's activities is not expected to impact individual animals' health or have effects on individual animals' survival or reproduction, thus no detrimental impacts at the population level are anticipated. Marine mammals may temporarily avoid the immediate area but are not expected to permanently abandon the area or their migratory or foraging behavior. Impacts to breeding, feeding, sheltering, resting, or migration are not expected nor are shifts in habitat use, distribution, or foraging success.

Potential Effects of Vessel Strike on Marine Mammals

Vessel collisions with marine mammals, also referred to as vessel strikes or ship strikes, can result in death or serious injury of the animal. Wounds resulting from ship strike may include massive trauma, hemorrhaging, broken bones, or propeller lacerations (Knowlton and Kraus, 2001). An animal at the surface could be struck directly by a vessel, a surfacing animal could hit the bottom of a vessel, or an animal just below the surface could be cut by a vessel's propeller. Superficial strikes may not kill or result in the death of the animal. Lethal interactions are typically associated with large whales, which are occasionally found draped across the bulbous bow of large commercial ships upon arrival in port. Although smaller cetaceans are more maneuverable in relation to large vessels than are large whales, they may also be susceptible to strike. The severity of injuries typically depends on the size and speed of the vessel (Knowlton and Kraus, 2001; Laist *et al.,* 2001; Vanderlaan and Taggart, 2007; Conn and Silber, 2013). Impact forces increase with speed as does the probability of a strike at a given distance (Silber *et al.,* 2010; Gende *et al.,* 2011).

The most vulnerable marine mammals are those that spend extended periods of time at the surface in order to restore oxygen levels within their tissues after deep dives (*e.g.,* the sperm whale). In addition, some baleen whales seem generally unresponsive to vessel sound, making them more susceptible to vessel collisions (Nowacek *et al.,* 2004). These species are primarily large, slow moving whales. Marine mammal responses to vessels may include avoidance and changes in dive pattern (NRC, 2003).

An examination of all known ship strikes from all shipping sources (civilian and military) indicates vessel speed is a principal factor in whether a vessel strike occurs and, if so, whether it results in injury, serious injury, or mortality (Knowlton and Kraus, 2001; Laist *et al.,* 2001; Jensen and Silber, 2003; Pace and Silber, 2005; Vanderlaan and Taggart, 2007; Conn and Silber, 2013). In assessing records in which vessel speed was known, Laist *et al.* (2001) found a direct relationship between the occurrence of a whale strike and the speed of the vessel involved in the collision. The authors concluded that most deaths occurred when a vessel was traveling in excess of 13 kts.

Jensen and Silber (2003) detailed 292 records of known or probable ship strikes of all large whale species from 1975 to 2002. Of these, vessel speed at the time of collision was reported for 58 cases. Of these 58 cases, 39 (or 67 percent) resulted in serious injury or death (19 of those resulted in serious injury as determined by blood in the water, propeller gashes or severed tailstock, and fractured skull, jaw, vertebrae, hemorrhaging, massive bruising or other injuries noted during necropsy and 20 resulted in death). Operating speeds of vessels that struck various species of large whales ranged from 2 to 51 kn. The majority (79 percent) of these strikes occurred at speeds of 13 kn or greater. The average speed that resulted in serious injury or death was 18.6 kn. Pace and Silber (2005) found that the probability of death or serious injury increased rapidly with increasing vessel speed. Specifically, the predicted probability of serious injury or death increased from 45 to 75 percent as vessel speed increased from 10 to 14 kn, and exceeded 90 percent at 17 kn. Higher speeds during collisions result in greater force of impact and also appear to increase the chance of severe injuries or death. While modeling studies have suggested that hydrodynamic forces pulling whales toward the vessel hull increase with increasing speed (Knowlton *et al.,* 1995; Clyne, 1999), this is inconsistent with Silber *et al.* (2010), which demonstrated that there is no such relationship (*i.e.,* hydrodynamic forces are independent of speed).

In a separate study, Vanderlaan and Taggart (2007) analyzed the probability of lethal mortality of large whales at a given speed, showing that the greatest rate of change in the probability of a lethal injury to a large whale as a function of vessel speed occurs between 8.6 and 15 kn. The chances of a lethal injury decline from approximately 80 percent at 15 kn to approximately 20 percent at 8.6 kn. At speeds below 11.8 kn, the chances of lethal injury drop below 50 percent, while the probability asymptotically increases toward 100 percent above 15 kn.

The Jensen and Silber (2003) report notes that the Large Whale Ship Strike Database represents a minimum number of collisions because the vast majority probably goes undetected or unreported. In contrast, Dominion Energy's personnel are likely to detect any strike that does occur because of the required personnel training and lookouts, along with the inclusion of Protected Species Observers (as described in the Proposed Mitigation section), and they are required to report all ship strikes involving marine mammals.

In the CVOW–C project area, NMFS has no documented vessel strikes of marine mammals by Dominion Energy during previous site characterization surveys. Given the comprehensive mitigation and monitoring measures (see the Proposed Mitigation and Proposed Monitoring and Reporting section) that would be required of Dominion Energy, NMFS believes that a vessel strike is not likely to occur.

Potential Effects to Marine Mammal Habitat

Dominion Energy's proposed construction activities could potentially affect marine mammal habitat through the introduction of impacts to the prey species of marine mammals (through noise, oceanographic processes, or reef effects), acoustic habitat (sound in the water column), water quality, and biologically important habitat for marine mammals.

Effects on Marine Mammal Prey

Sound may affect marine mammals through impacts on the abundance, behavior, or distribution of prey species (*e.g.,* crustaceans, cephalopods, fish, and zooplankton). Marine mammal prey varies by species, season, and location and, for some, is not well documented. Here, we describe studies regarding the effects of noise on known marine mammal prey.

Fish utilize the soundscape and components of sound in their environment to perform important functions such as foraging, predator avoidance, mating, and spawning (*e.g.,* Zelick *et al.,* 1999; Fay, 2009). The most likely effects on fishes exposed to loud, intermittent, low-frequency sounds are behavioral responses (*i.e.,* flight or avoidance). Short duration, sharp sounds (such as pile driving or air guns) can cause overt or subtle changes in fish behavior and local distribution. The reaction of fish to acoustic sources depends on the physiological state of the fish, past exposures, motivation (*e.g.,* feeding, spawning, migration), and other environmental factors. Key impacts to fishes may include behavioral responses, hearing damage, barotrauma (pressure-related injuries), and mortality. While it is clear that the behavioral responses of individual prey, such as displacement or other changes in distribution, can have direct impacts on the foraging success of marine mammals, the effects on marine mammals of individual prey that experience hearing damage, barotrauma, or mortality is less clear, though obviously population scale impacts that meaningfully reduce the amount of prey available could have more serious impacts.

Fishes, like other vertebrates, have a variety of different sensory systems to glean information from the ocean around them (Hawkins and Johnstone, 1978; Astrup and Mohl, 1993; Astrup, 1999; Popper *et al.,* 2003; Ladich and Popper, 2004; Nedwell *et al.,* 2004; Popper *et al.,* 2005; Braun and Grande, 2008; Ladich and Schulz-Mirbach, 2016; Mann, 2016; Carroll *et al.,* 2017). Depending on their hearing anatomy and peripheral sensory structures, which vary among species, fishes hear sounds using pressure and particle motion sensitivity capabilities and detect the motion of surrounding water (Fay *et al.,* 2008). Most marine fishes primarily detect particle motion using the inner ear and lateral line system while some fishes possess additional morphological adaptations or specializations that can enhance their sensitivity to sound pressure, such as a gas-filled swim bladder (Braun and Grande, 2008; Popper and Fay, 2011).

Hearing capabilities vary considerably between different fish species with data only available for just over 100 species out of the 34,000 marine and freshwater fish species (Eschmeyer and Fong, 2016). In order to better understand acoustic impacts on fishes, fish hearing groups are defined by species that possess a similar continuum of anatomical features, which result in varying degrees of hearing sensitivity (Popper and Hastings, 2009a). There are four hearing groups defined for all fish species (modified from Popper *et al.,* 2014) within this analysis, and they include: fishes without a swim bladder (*e.g.,* flatfish, sharks, rays, *etc.*); fishes with a swim bladder not involved in hearing (*e.g.,* salmon, cod, pollock, *etc.*); fishes with a swim bladder involved in hearing (*e.g.,* sardines, anchovy, herring, *etc.*); and fishes with a swim bladder involved in hearing and high-frequency hearing (*e.g.,* shad and menhaden). Most marine mammal fish prey species would not be likely to perceive or hear mid- or high-frequency sonars. While hearing studies have not been done on sardines and northern anchovies, it would not be unexpected for them to have hearing similarities to Pacific herring (up to 2–5 kHz) (Mann *et al.,* 2005). Currently, less data are available to estimate the range of best sensitivity for fishes without a swim bladder.

In terms of physiology, multiple scientific studies have documented a lack of mortality or physiological effects to fish from exposure to low- and mid-frequency sonar and other sounds (Jørgensen *et al.,* 2005; Kvadsheim and Sevaldsen, 2005; Popper *et al.,* 2007; Kane *et al.,* 2010; Halvorsen *et al.,* 2012; Watwood *et al.,* 2016; Juanes *et al.,* 2017; Popper *et al.,* 2016). Techer *et al.* (2017) exposed carp in floating cages for up to 30 days to low-power 23 and 46 kHz source without any significant physiological response. Other studies have documented either a lack of TTS in species whose hearing range cannot perceive sonar (such as Navy sonar), or for those species that could perceive sonar-like signals, any TTS experienced would be recoverable (Popper and Hastings, 2009a, 2009b; Halvorsen *et al.,* 2012; Ladich and Fay, 2013; Popper *et al.,* 2014; Smith, 2016). Only fishes that have specializations that enable them to hear sounds above about 2,500 Hz (2.5 kHz) such as herring (Mann *et al.,* 2005; Halvorsen *et al.,* 2012; Popper *et al.,* 2014; Mann, 2016) would have the potential to receive TTS or exhibit behavioral responses from exposure to mid-frequency sonar. In addition, any sonar induced TTS to fish whose hearing range could perceive sonar would only occur in the narrow spectrum of the source (*e.g.,* 3.5 kHz) compared to the fish's total hearing range (*e.g.,* 0.01 kHz to 5 kHz).

In terms of behavioral responses, Juanes *et al.* (2017) discuss the potential for negative impacts from anthropogenic noise on fish, but the author's focus was on broader based sounds, such as ship and boat noise sources. Watwood *et al.* (2016) also documented no behavioral responses by reef fish after exposure to mid-frequency active sonar. Doksaeter *et al.* (2009; 2012) reported no behavioral responses to mid-frequency sonar (such as naval sonar) by Atlantic herring; specifically, no escape reactions (vertically or horizontally) were observed in free swimming herring exposed to mid-frequency sonar transmissions. Based on the results by Doksaeter *et al.* (2009), Doksaeter *et al.* (2012), and Sivle *et al.* (2012), Sivle *et al.* (2014) created a model in order to report on the possible population-level effects on Atlantic herring from active sonar. The authors concluded that the use of sonar poses little risk to populations of herring regardless of season, even when the herring populations are aggregated and directly exposed to sonar. Finally, Bruintjes *et al.* (2016) commented that fish exposed to any short-term noise within their hearing range might initially startle, but would quickly return to normal behavior.

Pile-driving noise during construction is of particular concern as the very high sound pressure levels could potentially prevent fish from reaching breeding or spawning sites, finding food, and acoustically locating mates. A playback study in West Scotland revealed that there was a significant movement response to the pile-driving stimulus in both species at relatively low received sound pressure levels (sole: 144–156 dB re 1μPa Peak; cod: 140–161 dB re 1 μPa Peak, particle motion between 6.51×10^3 and 8.62×10^4 m/s^2 peak) (Mueller-Blenkle *et al.,* 2010). The swimming speed of sole increased significantly during the playback of construction noise when compared to the playbacks of before and after construction. While not statistically significant, cod also displayed a similar behavioral response during before, during, and after construction playbacks. However, cod demonstrated a specific and significant freezing response at the onset and cessation of the playback recording. In both species, indications were present displaying directional movements away from the playback source. During wind farm construction in the Eastern Taiwan Strait, Type 1 soniferous fish chorusing showed a relatively lower intensity and longer duration while Type 2 chorusing exhibited higher intensity and no changes in its duration. Deviation from regular fish vocalization patterns may affect fish reproductive success, cause migration, augmented predation, or physiological alterations.

Occasional behavioral reactions to activities that produce underwater noise sources are unlikely to cause long-term consequences for individual fish or populations. The most likely impact to fish from impact and vibratory pile driving activities at the project areas would be temporary behavioral avoidance of the area. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity. The duration of fish avoidance of an area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. In general, any behavioral impacts to prey species are expected to be minor, temporary, and localized given the relatively small areas being affected and the short duration of individual pile driving events.

SPLs of sufficient strength have been known to cause fish auditory impairment, injury and mortality. Popper *et al.* (2014) found that fish with or without air bladders could experience TTS at 186 dB SEL_{cum}. Mortality could occur for fish without swim bladders at >216 dB SEL_{cum}. Those with swim bladders or at the egg or larvae life stage, mortality was possible at >203 dB SEL_{cum}. Other studies found that 203 dB SEL_{cum} or above caused a physiological response in other fish species (Casper *et al.,* 2012, Halvorsen *et al.,* 2012a, Halvorsen *et al.,* 2012b, Casper *et al.,* 2013a, Casper *et al.,* 2013b). However, in most fish species, hair cells in the ear continuously regenerate and loss of auditory function likely is restored when damaged cells are replaced with new cells. Halvorsen *et al.* (2012a) showed that a TTS of 4–6 dB was recoverable within 24 hours for one species. Impacts would be most severe when the individual fish is close to the source and when the duration of exposure is long. Injury caused by barotrauma can range from slight to severe and can cause death, and is most likely for fish with swim bladders. Barotrauma injuries have been documented during controlled exposure to impact pile driving (Halvorsen *et al.,* 2012b; Casper *et al.,* 2013). As described in the Proposed Mitigation section below, Dominion Energy would utilize a sound attenuation device which would reduce potential for injury to marine mammal prey. Other fish that experience hearing loss as a result of exposure to impulsive sound sources may have a reduced ability to detect relevant sounds such as predators, prey, or social vocalizations. However, PTS has not been known to occur in fishes and any hearing loss in fish may be as temporary as the timeframe required to repair or replace the sensory cells that were damaged or destroyed (Popper *et al.,* 2005; Popper *et al.,* 2014; Smith *et al.,* 2006). It is not known if damage to auditory nerve fibers could occur, and if so, whether fibers would recover during this process.

Required soft-starts would allow prey and marine mammals to move away from the source prior to any noise levels that may physically injure prey and the use of the noise attenuation devices would reduce noise levels to the degree any mortality or injury of prey is also minimized. Use of bubble curtains, in addition to reducing impacts to marine mammals, for example, is a key mitigation measure in reducing injury and mortality of marine mammal prey. However, we recognize some mortality, physical injury and hearing impairment in marine mammal prey may occur but we anticipate the amount of prey impacted in this manner is minimal compared to overall availability. Any behavioral responses to pile driving by marine mammal prey are expected to be relatively brief. We expect that other impacts such as stress or masking would occur in fish that serve as marine mammals prey (Popper *et al.,* 2019); however, those impacts would be limited to the duration of impact pile driving if prey were to move out the area in response to noise, these impacts would be minimized.

In addition to fish, prey sources such as marine invertebrates could potentially be impacted by noise stressors as a result of the proposed activities. However, most marine invertebrates' ability to sense sounds is limited. Invertebrates appear to be able to detect sounds (Pumphrey, 1950; Frings and Frings, 1967) and are most sensitive to low-frequency sounds (Packard *et al.,* 1990; Budelmann and Williamson, 1994; Lovell *et al.,* 2005; Mooney *et al.,* 2010). Data on response of invertebrates such as squid, another marine mammal prey species, to anthropogenic sound is more limited (de Soto, 2016; Sole *et al.,* 2017b). Data suggest that cephalopods are capable of sensing the particle motion of sounds and detect low frequencies up to 1–1.5 kHz, depending on the species, and so are likely to detect air gun noise (Kaifu *et al.,* 2008; Hu *et al.,* 2009; Mooney *et* *al.,* 2010; Samson *et al.,* 2014). Sole *et al.* (2017) reported physiological injuries to cuttlefish in cages placed at-sea when exposed during a controlled exposure experiment to low-frequency sources (315 Hz, 139 to 142 dB re 1 μPa² and 400 Hz, 139 to 141 dB re 1 μPa²). Fewtrell and McCauley (2012) reported squids maintained in cages displayed startle responses and behavioral changes when exposed to seismic air gun sonar (136–162 re 1 μPa²·s). Jones *et al.* (2020) found that when squid (*Doryteuthis pealeii*) were exposed to impulse pile driving noise, body pattern changes, inking, jetting, and startle responses were observed and nearly all squid exhibited at least one response. However, these responses occurred primarily during the first eight impulses and diminished quickly, indicating potential rapid, short-term habituation. Packard *et al.* (1990) showed that cephalopods were sensitive to particle motion, not sound pressure, and Mooney *et al.* (2010) demonstrated that squid statocysts (specialized sensory organ inside the head called a statocyst that may help an animal determine its position in space (orientation) and maintain balance) act as an accelerometer through which particle motion of the sound field can be detected (Budelmann, 1992). Auditory injuries (lesions occurring on the statocyst sensory hair cells) have been reported upon controlled exposure to low-frequency sounds, suggesting that cephalopods are particularly sensitive to low-frequency sound (Andre *et al.,* 2011; Sole *et al.,* 2013). Behavioral responses, such as inking and jetting, have also been reported upon exposure to low-frequency sound (McCauley *et al.,* 2000b; Samson *et al.,* 2014). Squids, like most fish species, are likely more sensitive to low frequency sounds, and may not perceive mid- and high-frequency sonars.

With regard to potential impacts on zooplankton, McCauley *et al.* (2017) found that exposure to airgun noise resulted in significant depletion for more than half the taxa present and that there were two to three times more dead zooplankton after airgun exposure compared with controls for all taxa, within 1 km of the airguns. However, the authors also stated that in order to have significant impacts on *r*-selected species (*i.e.,* those with high growth rates and that produce many offspring) such as plankton, the spatial or temporal scale of impact must be large in comparison with the ecosystem concerned, and it is possible that the findings reflect avoidance by zooplankton rather than mortality (McCauley *et al.,* 2017). In addition, the results of this study are inconsistent with a large body of research that generally finds limited spatial and temporal impacts to zooplankton as a result of exposure to airgun noise (*e.g.,* Dalen and Knutsen, 1987; Payne, 2004; Stanley *et al.,* 2011). Most prior research on this topic, which has focused on relatively small spatial scales, has showed minimal effects (*e.g.,* Kostyuchenko, 1973; Booman *et al.,* 1996; Sætre and Ona, 1996; Pearson *et al.,* 1994; Bolle *et al.,* 2012).

A modeling exercise was conducted as a follow-up to the McCauley *et al.* (2017) study (as recommended by McCauley *et al.*), in order to assess the potential for impacts on ocean ecosystem dynamics and zooplankton population dynamics (Richardson *et al.,* 2017). Richardson *et al.* (2017) found that a full-scale airgun survey would impact copepod abundance within the survey area, but that effects at a regional scale were minimal (2 percent decline in abundance within 150 km of the survey area and effects not discernible over the full region). The authors also found that recovery within the survey area would be relatively quick (3 days following survey completion), and suggest that the quick recovery was due to the fast growth rates of zooplankton, and the dispersal and mixing of zooplankton from both inside and outside of the impacted region. The authors also suggest that surveys in areas with more dynamic ocean circulation in comparison with the study region and/or with deeper waters (*i.e.,* typical offshore wind locations) would have less net impact on zooplankton.

Notably, a recently described study produced results inconsistent with those of McCauley *et al.* (2017). Researchers conducted a field and laboratory study to assess if exposure to airgun noise affects mortality, predator escape response, or gene expression of the copepod *Calanus finmarchicus* (Fields *et al.,* 2019). Immediate mortality of copepods was significantly higher, relative to controls, at distances of 5 m or less from the airguns. Mortality one week after the airgun blast was significantly higher in the copepods placed 10 m from the airgun but was not significantly different from the controls at a distance of 20 m from the airgun. The increase in mortality, relative to controls, did not exceed 30 percent at any distance from the airgun. Moreover, the authors caution that even this higher mortality in the immediate vicinity of the airguns may be more pronounced than what would be observed in free-swimming animals due to increased flow speed of fluid inside bags containing the experimental animals. There were no sub-lethal effects on the escape performance or the sensory threshold needed to initiate an escape response at any of the distances from the airgun that were tested. Whereas McCauley *et al.* (2017) reported an SEL of 156 dB at a range of 509–658 m, with zooplankton mortality observed at that range, Fields *et al.* (2019) reported an SEL of 186 dB at a range of 25 m, with no reported mortality at that distance.

The presence of large numbers of turbines has been shown to impact meso- and sub-meso-scale water column circulation, which can affect the density, distribution, and energy content of zooplankton and thereby, their availability as marine mammal prey. The presence and operation of structures such as wind turbines are, in general, likely to result in local and broader oceanographic effects in the marine environment and may disrupt marine mammal prey, such as dense aggregations and distribution of zooplankton, through altering the strength of tidal currents and associated fronts, changes in stratification, primary production, the degree of mixing, and stratification in the water column (Chen *et al.,* 2021, Johnson *et al.,* 2021, Christiansen *et al.,* 2022, Dorrell *et al.,* 2022). However, the scale of impacts is difficult to predict and may vary from meters to hundreds of meters for local individual turbine impacts (Schultze *et al.,* 2020) to large-scale dipoles of surface elevation changes stretching hundreds of kilometers (Christiansen *et al.,* 2022).

Dominion Energy anticipates that some turbines would become operational as early as 2025 with all 176 turbines being operational by the end of 2027. As described above, there is scientific uncertainty around the scale of oceanographic impacts (meters to kilometers) associated with turbine operation. CVOW–C is located offshore of Virginia along the Mid-Atlantic Bight. The transition zone between the Mid-Atlantic Bight and South Atlantic Bight is located just south of the project area, off Cape Hatteras, North Carolina. This zone provides the project area with larval ichthyoplankton flow via prevailing currents. However, the project area does not include key foraging grounds for marine mammals with planktonic diets (*e.g.,* North Atlantic right whale) as all known prime foraging habitat is located much further north, off southern New England and north into Canada. This foraging area is approximately 630 km north of the project area, and it would be highly unlikely for this foraging area to be influenced by activities related to the CVOW–C proposed project.

Although the project area does not provide high-quality foraging habitat for plankton-feeding marine mammals, such as North Atlantic right whales, coastal Virginia provides seasonal high-quality foraging habitat for piscivorous marine mammals, such as humpback whales. Generally speaking and depending on the extent, impacts on prey could impact the distribution of marine mammals in an area, potentially necessitating additional energy expenditure to find and capture prey. However, at the temporal and spatial scales anticipated for this activity, any such impacts on prey are not expected to impact the reproduction or survival of any individual marine mammals. Although studies assessing the impacts of offshore wind development on marine mammals are limited, the repopulation of wind energy areas by harbor porpoises (Brandt *et al.,* 2016; Lindeboom *et al.,* 2011) and harbor seals (Lindeboom *et al.,* 2011; Russell *et al.,* 2016) following the installation of wind turbines is promising. Overall, any impacts to marine mammal foraging capabilities due to effects on prey aggregation from the turbine presence and operation at the CVOW–C project during the effective period of the proposed rule are likely to be limited and areas known to support North Atlantic right whale migration would not be affected by the operation of the CVOW–C project.

In general, impacts to marine mammal prey species are primarily expected to be relatively minor and temporary due to the relatively small areas being affected compared to available habitat and the duration of individual pile driving activities. Some mortality of prey inside the bubble curtain may occur; however, this would be very limited. NMFS does not expect HRG acoustic sources to impact fish and most sources are likely outside the hearing range of the primary prey species in the project area.

Overall, the combined impacts of sound exposure and oceanographic impacts on marine mammal habitat resulting from the proposed activities would not be expected to have measurable effects on populations of marine mammal prey species. Prey species exposed to sound might move away from the sound source, experience TTS, experience masking of biologically relevant sounds, or show no obvious direct effects; however, for Dominion Energy's activity, as described above, these impacts would not be expected to impact marine mammal foraging in a manner that would affect marine mammal reproduction or survival.

Acoustic Habitat

Acoustic habitat is the soundscape, which encompasses all of the sound present in a particular location and time, as a whole when considered from the perspective of the animals experiencing it. Animals produce sound for, or listen for sounds produced by, conspecifics (communication during feeding, mating, and other social activities), other animals (finding prey or avoiding predators), and the physical environment (finding suitable habitats, navigating). Soundscapes are also defined by, and acoustic habitat influenced by, the total contribution of anthropogenic sound. This may include incidental emissions from sources such as vessel traffic or may be intentionally introduced to the marine environment for data acquisition purposes (as in the use of air gun arrays) or for Navy training and testing purposes (as in the use of sonar and explosives and other acoustic sources). Together, sounds made by animals, generated by the geophysical environment (*e.g.,* produced by earthquakes, lightning, wind, rain, waves), or contributed from man-made sources, make up the natural contributions to the total acoustics of a place. These acoustic conditions, termed acoustic habitat, are one attribute of an animal's total habitat.

Anthropogenic noise varies widely in its frequency, content, duration, and loudness and these characteristics greatly influence the potential habitat-mediated effects to marine mammals (please also see the previous discussion on Masking), which may range from local effects for brief periods of time to chronic effects over large areas and for long durations. Depending on the extent of effects to habitat, animals may alter their communications signals (thereby potentially expending additional energy) or miss acoustic cues (either conspecific or adventitious). Problems arising from a failure to detect cues are more likely to occur when noise stimuli are chronic (*e.g.,* longer duration and spread over larger areas) and overlap with biologically relevant cues used for communication, orientation, and predator/prey detection (Francis and Barber, 2013). For more detail on these concepts, *e.g.,* Barber *et al.,* 2009; Pijanowski *et al.,* 2011; Francis and Barber, 2013; Lillis *et al.,* 2014.

The term ''listening area'' refers to the region of ocean over which sources of sound of any kind can be detected by an animal at the center of the space. Loss of ''communication space'' concerns the area over which a specific animal signal, used to communicate with conspecifics in biologically important contexts (*e.g.,* foraging, mating), can be heard, in noisier relative to quieter conditions (Clark *et al.,* 2009). Lost listening area concerns the more generalized contraction of the range over which animals would be able to detect a variety of signals of biological importance, including eavesdropping on predators and prey (Barber *et al.,* 2009). Such metrics do not, in and of themselves, document fitness consequences for the marine animals that live in chronically noisy environments. Long-term population-level consequences mediated through changes in the ultimate survival and reproductive success of individuals are difficult to study, and particularly so underwater. However, it is increasingly well documented that aquatic species rely on qualities of natural acoustic habitats, with researchers quantifying reduced detection of important ecological cues (*e.g.,* Slabbekoorn *et al.,* 2010; Francis and Barber, 2013) as well as survivorship consequences in several species (*e.g.,* Simpson *et al.,* 2014; Nedelec *et al.,* 2015).

Sound produced from construction activities in the CVOW–C project area may be widely dispersed or concentrated in small areas for varying periods. However, anthropogenic noise from construction activities in the project area would be intermittent and temporary. There would be breaks between noise-generating activities on active pile driving days. Similarly, there would likely be periods of days or weeks without construction-related underwater noise.

Although this proposed rulemaking primarily covers the noise produced from construction activities relevant to the CVOW–C project, operational noise was a consideration in NMFS' analysis of the project, as all 176 turbines would become operational within the effective dates (February 5, 2024–February 4, 2029), beginning no sooner than 2025 with all turbines expected to be operational by 2027. Once operational, offshore wind turbines are known to produce continuous, non-impulsive underwater noise, primarily below 1 kHz (Tougaard *et al.,* 2020; Stöber and Thomsen, 2021).

In both newer, quieter, direct-drive systems (such as what has been proposed for CVOW–C) and older generation, geared turbine designs, recent scientific studies indicate that operational noise from turbines is on the order of 110 to 125 dB re 1 µPa root-mean-square sound pressure level (SPL_{rms}) at an approximate distance of 50 m (Tougaard *et al.,* 2020). Recent measurements of operational sound generated from wind turbines (direct drive, 6 MW, jacket piles) at Block Island wind farm (BIWF) indicate average broadband levels of 119 dB at 50 m from the turbine, with levels varying with wind speed (HDR, Inc., 2019). Interestingly, measurements from BIWF turbines showed operational sound had less tonal components compared to European measurements of turbines with gear boxes.

Tougaard *et al.* (2020) further stated that the operational noise produced by WTGs is static in nature and lower than noise produced by passing ships. This is a noise source in this region to which marine mammals are likely already habituated. Furthermore, operational noise levels are likely lower than those ambient levels already present in active shipping lanes, such that operational noise would likely only be detected in very close proximity to the WTG (Thomsen *et al.,* 2006; Tougaard *et al.,* 2020). Similarly, recent measurements from a wind farm (3 MW turbines) in China found at above 300 Hz, turbines produced sound that was similar to background levels (Zhang *et al.,* 2021). Other studies by Jansen and de Jong (2016) and Tougaard *et al.* (2009) determined that, while marine mammals would be able to detect operational noise from offshore wind farms (again, based on older 2 MW models) for several kilometers, they expected no significant impacts on individual survival, population viability, marine mammal distribution, or the behavior of the animals considered in their study (harbor porpoises and harbor seals).

More recently, Stöber and Thomsen (2021) used monitoring data and modeling to estimate noise generated by more recently developed, larger (10 MW) direct-drive WTGs. Their findings, similar to Tougaard *et al.* (2020), demonstrate that there is a trend that operational noise increases with turbine size. Their study predicts broadband source levels could exceed 170 dB SPL_{rms} for a 10 MW WTG; however, those noise levels were generated based on geared turbines; newer turbines operate with direct drive technology. The shift from using gear boxes to direct drive technology is expected to reduce the levels by 10 dB. The findings in the Stöber and Thomsen (2021) study have not been experimentally validated, though the modeling (using largely geared turbines) performed by Tougaard *et al.* (2020) yields similar results for a hypothetical 10 MW WTG. Overall, noise from operating turbines would raise ambient noise levels in the immediate vicinity of the turbines; however, the spatial extent of increased noise levels would be limited. While Dominion Energy did not request and NMFS is not proposing to authorize take incidental to operation noise as noise levels are anticipated to dissipate quickly, NMFS proposes to require Dominion Energy to measure operational noise levels to confirm these assumptions

Water Quality

Impacts to the immediate substrate during installation of piles are anticipated, but these would be limited to minor, temporary suspension of sediments, which could impact water quality and visibility for a short amount of time but which would not be expected to have any effects on individual marine mammals. Given there are no UXO/MEC detonations proposed by Dominion Energy, we do not expect any direct or indirect effects of explosives and unexploded ordnance to marine mammals via sediment to occur. Furthermore, we do not expect any contamination of water from UXOs/MECs as none would be detonated during this project.

Equipment used by Dominion Energy within the project area, including ships and other marine vessels, potentially aircrafts, and other equipment, are also potential sources of chemical by-products. All equipment is required to be properly maintained in accordance with applicable legal requirements. All such operating equipment would be required to meet Federal water quality standards, where applicable.

Reef Effects

The presence of the WTG and OSS foundations for CVOW–C, scour protection, and cable protection will result in a conversion of the existing sandy bottom habitat to a hard bottom habitat with areas of vertical structural relief (Dominion Energy, 2022). This could potentially alter the existing habitat by creating an ''artificial reef effect'' that results in colonization by assemblages of both sessile and mobile animals within the new hard-bottom habitat (Wilhelmsson *et al.,* 2006; Reubens *et al.,* 2013; Bergström *et al.,* 2014; Coates *et al.,* 2014).

Artificial structures can create increased habitat heterogeneity important for species diversity and density (Langhamer, 2012). The WTG and OSS foundations will extend through the water column, which may serve to increase settlement of meroplankton or planktonic larvae on the structures in both the pelagic and benthic zones (Boehlert and Gill, 2010). Fish and invertebrate species are also likely to aggregate around the foundations and scour protection which could provide increased prey availability and structural habitat (Boehlert and Gill, 2010; Bonar *et al.,* 2015).

Numerous studies have documented significantly higher fish concentrations including species like cod and pouting (*Trisopterus luscus*), flounder (*Platichthys flesus*), eelpout (*Zoarces viviparus*), and eel (*Anguilla anguilla*) near in-water structures than in surrounding soft bottom habitat (Langhamer and Wilhelmsson, 2009; Bergström *et al.,* 2013; Reubens *et al.,* 2013). In the German Bight portion of the North Sea, fish were most densely congregated near the anchorages of jacket foundations, and the structures extending through the water column were thought to make it more likely that juvenile or larval fish encounter and settle on them (Rhode Island Coastal Resources Management Council (RI–CRMC), 2010; Krone *et al.,* 2013). In addition, fish can take advantage of the shelter provided by these structures while also being exposed to stronger currents created by the structures, which generate increased feeding opportunities and decreased potential for predation (Wilhelmsson *et al.,* 2006). The presence of the foundations and resulting fish aggregations around the foundations is expected to be a long-term habitat impact, but the increase in prey availability could potentially be beneficial for some marine mammals.

Estimated Take of Marine Mammals

This section provides an estimate of the number of incidental takes proposed for authorization, which will inform both NMFS' consideration of ''small numbers'' and the negligible impact determination.

Dominion Energy's activities are expected to result in the incidental take, by harassment only, of marine mammals; no serious injury or mortality is anticipated or proposed for authorization. Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines ''harassment'' as any act of pursuit, torment, or annoyance, which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

Authorized takes would primarily be by Level B harassment, as noise from impact and vibratory pile driving and

HRG surveys could result in behavioral disturbance. Impacts such as masking and TTS can contribute to behavior disturbances. There is also some potential for auditory injury (Level A harassment) of mysticetes (fin whales, humpback whales, minke whales, sei whales), high frequency cetaceans (harbor porpoises), and phocids (gray seals and harbor seals) due to their hearing sensitivities and the nature of the activities. As described below, the larger distances to the PTS thresholds, when considering marine mammal weighting functions, demonstrate this potential. For mid-frequency hearing sensitivities, when thresholds and weighting and the associated PTS zone sizes are considered, the potential for PTS from the noise produced by the project is negligible. While NMFS is proposing to authorize Level A harassment and Level B harassment, the proposed mitigation and monitoring measures are expected to minimize the amount and severity of such taking to the extent practicable (see Proposed Mitigation).

As described previously, no serious injury or mortality is anticipated or proposed to be authorized incidental to Dominion Energy's specified activities. Pile driving and HRG surveys inherently are not considered to have the potential to cause marine mammal mortality or serious injury. While, in general, vessel strikes have the potential to result in mortality or serious injury to marine mammals, given the factors discussed previously and the mitigation and monitoring measures required by this proposed rule, the probability of a vessel strike is so low as to be discountable. Hence, no mortality or serious injury is anticipated or proposed to be authorized. Below we describe how the proposed take numbers are estimated.

For acoustic impacts, we estimate take by considering: (1) acoustic thresholds above which the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and (4) the number of days of activities. We note that while these factors can contribute to a basic calculation to provide an initial prediction of potential takes, additional information that can qualitatively inform take estimates is also sometimes available (*e.g.,* previous monitoring results or average group size). Below, we describe the factors considered here in more detail and present the proposed take estimates.

In this case, as described below, there are multiple lines of data with which to address density or occurrence and, for each species and activity, the largest value resulting from the three take estimation methods described below (*i.e.,* density-based, PSO-based, or mean group size) was carried forward as the amount of requested take, by Level B harassment. The amount of requested take, by Level A harassment, reflects the density-based exposure estimates and, for some species and activities, consideration of the effectiveness of mitigation measures to avoid or minimize the potential for injury.

Below, we describe the acoustic thresholds NMFS uses, discuss the marine mammal density and occurrence/group size information used, and then describe the modeling and methodologies applied to estimate take for each of Dominion Energy's proposed construction activities. NMFS has carefully considered all information and analysis presented by the applicant as well as all other applicable information and, based on the best available science, concurs that the applicant's estimates of the types and amounts of take for each species and stock are reasonable and is what NMFS is proposing to authorize. NMFS notes the take estimates described herein for foundation installation can be considered conservative as the estimates do not reflect the implementation of mitigation (other than sound attenuation device use) and monitoring measures for any marine mammal species or stock, with the exception of North Atlantic right whale. In the case of North Atlantic right whales, NMFS has determined that the potential for Level A harassment (PTS) has been reduced to a *de minimis* likelihood due to the proposed enhanced mitigation measures. The amount of take by Level B harassment that is proposed to be authorized for North Atlantic right whales does not consider the implementation of the enhanced mitigation measures.

Marine Mammal Acoustic Thresholds

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

Level B Harassment

Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source or exposure context (*e.g.,* frequency, predictability, duty cycle, duration of the exposure, signal-to-noise ratio, distance to the source, ambient noise, and the receiving animals (hearing, motivation, experience, demography, behavior at time of exposure, life stage, depth) and can be difficult to predict (*e.g.,* Southall *et al.,* 2007, 2021; Ellison *et al.,* 2012). Based on what the available science indicates and the practical need to use a threshold based on a metric that is both predictable and measurable for most activities, NMFS typically uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS generally predicts that marine mammals are likely to be behaviorally harassed in a manner considered to be Level B harassment when exposed to underwater anthropogenic noise above the received root-mean-square sound pressure levels (RMS SPL) of 120 dB (referenced to 1 micropascal (re 1 μPa)) for continuous (*e.g.,* vibratory pile-driving, drilling) and above the received RMS SPL 160 dB re: 1 μPa for non-explosive impulsive (*e.g.,* seismic airguns) or intermittent (*e.g.,* scientific sonar) sources. Generally speaking, Level B harassment take estimates based on these behavioral harassment thresholds are expected to include any likely takes by TTS as, in most cases, the likelihood of TTS occurs at distances from the source less than those at which behavioral harassment is likely. TTS of a sufficient degree can manifest as behavioral harassment, as reduced hearing sensitivity and the potential reduced opportunities to detect important signals (conspecific communication, predators, prey) may result in changes in behavior patterns that would not otherwise occur.

Dominion Energy's construction activities include the use of continuous (*e.g.,* vibratory pile driving) and intermittent (*e.g.,* impact pile driving, HRG acoustic sources) sources, and, therefore, the 120 and 160 dB *re 1 μPa* (rms) thresholds are applicable.

Level A Harassment

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

These thresholds are provided in Table 9 below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS' 2018 Technical Guidance, which may be accessed at: *www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance.*

TABLE 9—ONSET OF PERMANENT THRESHOLD SHIFT (PTS)

[NMFS, 2018]

Hearing group	PTS onset thresholds* (received level)	
	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	*Cell 1:* $L_{p,0\text{-pk,flat}}$: 219 dB; $L_{E,p,\ LF,24h}$: 183 dB	*Cell 2:* $L_{E,p,\ LF,24h}$: 199 dB.
Mid-Frequency (MF) Cetaceans	*Cell 3:* $L_{p,0\text{-pk,flat}}$: 230 dB; $L_{E,p,\ MF,24h}$: 185 dB	*Cell 4:* $L_{E,p,\ MF,24h}$: 198 dB.
High-Frequency (HF) Cetaceans	*Cell 5:* $L_{p,0\text{-pk,flat}}$: 202 dB; $L_{E,p,HF,24h}$: 155 dB	*Cell 4:* $L_{E,p,\ HF,24h}$: 198 dB.
Phocid Pinnipeds (PW) (Underwater)	*Cell 7:* $L_{p,0\text{-pk.flat}}$: 218 dB; $L_{E,p,PW,24h}$: 185 dB	*Cell 8:* $L_{E,p,PW,24h}$: 201 dB.

* Dual metric thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds are recommended for consideration.

Note: Peak sound pressure level ($L_{p,0\text{-pk}}$) has a reference value of 1 μPa, and weighted cumulative sound exposure level ($L_{E,p}$) has a reference value of 1μPa²s. In this Table, thresholds are abbreviated to be more reflective of International Organization for Standardization standards (ISO, 2017). The subscript "flat" is being included to indicate peak sound pressure are flat weighted or unweighted within the generalized hearing range of marine mammals (*i.e.,* 7 Hz to 160 kHz). The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW pinnipeds) and that the recommended accumulation period is 24 hours. The weighted cumulative sound exposure level thresholds could be exceeded in a multitude of ways (*i.e.,* varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these thresholds will be exceeded.

As Dominion Energy has not requested, and NMFS has not proposed to authorize any take related to the detonation of UXOs/MECs, the acoustic (*i.e.,* PTS onset and TTS onset for underwater explosives) and the pressure thresholds (*i.e.,* lung and gastrointestinal tract injuries) are not discussed or included in this proposed action.

Acoustic and Exposure Modeling Methods

As described above, underwater noise associated with the construction of offshore components of CVOW–C would predominantly result from installation of the WTG monopile and the OSS jacket foundations using a dual-vibratory and impact pile driving approach while noise from cable landfall construction activities (*i.e.,* temporary cofferdam and temporary goal post installation and removal) will primarily result from either impact pile driving (for the temporary goal posts) or vibratory pile driving (for the temporary cofferdams). Acoustic modeling was performed for some activities for which there was a pile driving component, including WTG and OSS foundation installation and temporary cofferdam installation and removal. The basic modeling approach is to characterize the sounds produced by the source, determine how the sounds propagate within the surrounding water column, and then estimate species-specific exposure probability by considering the range- and depth-dependent sound fields in relation to animal movement in simulated representative construction scenarios.

Animat exposure modeling was only performed for foundation installation. For other proposed activities planned by Dominion Energy (*i.e.,* temporary cofferdam installation and removal, temporary goal post installation and removal, HRG surveys), take was estimated using a "static" approach, as detailed later in the Static Method section.

Dominion Energy employed Tetra Tech, Inc. (Tetra Tech) to conduct the acoustic modeling and Marine Acoustics, Inc. (MAI) for the animal movement modeling to better understand both the sound fields produced during foundation and cofferdam installation and to estimate any potential exposures (see the Acoustic Modeling report in Appendix A of Dominion Energy's ITA application). Dominion Energy also collaborated with the Institute for Technical and Applied Physics (iTAP) for information related to vibratory pile driving of foundation piles. Tetra Tech also performed the acoustic analysis related to temporary cofferdam installation via vibratory pile driving. Acoustic source modeling of vibratory pile driving related to cofferdam installation and removal was used in conjunction with static methods to yield estimated and requested take values. The approach undertaken by Tetra Tech to determine the sound source of impact pile driving of WTG foundations was originally applied to the CVOW Pilot Project, and subsequently modified based on newly available data and the additional availability of research studies. This revised approach is summarized here; more detail can be found in the Acoustic Modeling report in Appendix A of Dominion Energy's ITA application.

Acoustic Source Modeling

Based on a literature review of pile driving measurement reports, theoretical modeling reports, and peer-reviewed research papers (see the references in Attachment Z–2 in Appendix A of Dominion Energy's COP (2023)), Tetra Tech developed an empirical modeling approach for calculating the acoustic source of impact pile driving foundation installation activities proposed for the CVOW–C project. A collaboration between Dominion Energy and iTAP assessed the estimated acoustic source levels produced from vibratory pile driving of foundation piles based on empirical data collected and assessed from the CVOW Pilot Project and other European offshore wind farms. These two modeling approaches are discussed separately here.

Foundation Impact Pile Driving Source Level Empirical Model

An empirical model developed by Tetra Tech was used to determine the peak sound level (L_{pk}) and sound exposure level (SEL) sound source levels for the foundation pile driving scenarios. To feed into the model, Tetra Tech obtained sound levels from relevant scenarios for a variety of pile diameter sizes, driven with hammers of varying energies, and collected or analyzed at different ranges from the impacted pile. This empirical model was implemented by using the following steps:

1. Normalizing the received sound pressure levels to a common received range, assuming a transmission loss of *15LogR,* where R is the distance ratio;
2. Scaling the source levels to an energy of 4,000 kJ, assuming a relationship between the hammer energy and radiated sound as 10 times the base 10 logarithm of the ratio of hammer energy to the referenced hammer energy (as in the scaling laws outlined in von Pein *et al.,* 2022); and
3. Calculating a linear regression of the adjusted source levels (which has been normalized for range and hammer energy) as a function of the base 10 logarithm of the pile diameters, which is then used to predict the broadband SEL and peak sound levels for the planned energy and diameter.

Pile driving sound source levels were represented using three different sound metrics: L_{pk}, SEL, and sound pressure level (SPL). One-third octave band levels from 12.5 Hz to 20 kHz were derived from surrogate spectra taken from published data for piles of similar diameters, and adjusted based on the empirical model above. For the L_{pk} underwater acoustic modeling scenario (evaluating a single pile-driving strike), the pile driving sound source was represented as a point source at a mid-water depth. To estimate SEL, the monopile and pin pile driving scenarios were modeled using a vertical array of point sources spaced at 1 m intervals and assuming a specific number of strikes for each type of pile (see Formula 2 in Attachment Z–1 of Appendix A in the application). The SPL scenario was set up in an identical manner to the SEL scenario, with the primary difference being that the model did not incorporate the total number of pile driving strikes needed for each of the monopile and pin pile scenarios within a 24-hour period. Instead, only a single pile driving strike was incorporated.

Information on the impact pile driving scenarios and source levels for WTGs, OSSs, and goal posts can be found in Table Z–7 of Appendix A of Dominion Energy's ITA application. These impact modeling scenarios assumed no sound attenuation. For all WTG monopile modeling (*i.e.,* Scenarios 1–3 including standard driving and hard-to-drive installation approaches), a SEL source level of 226 was assumed. For OSS modeling using pin piles, 214 dB was assumed. For goal post installation, a SEL source level of 183 dB was assumed (California Department of Transportation (CALTRANS), 2015).

Foundation Vibratory Pile Driving Source Level Empirical Model

Limited empirical data exists for the installation of foundation piles by vibratory driving, with most being measured by iTAP (see Remmers and Bellmann (2021) in Appendix A of the application (Attachment Z–3)). Current datasets contain a variety of different information, including ranges of water depths from several meters to depths of 40 m, different sediment types, and measured receiver distances from several meters away from the source up to 750 m away.

To predict the expected underwater noise levels during vibratory pile driving of 2.4 m pin piles for the OSS and 9.5 m monopiles, iTAP used the limited empirical data from several existing offshore wind farms from different pile diameters. All data were normalized to a distance from the source of 750 m assuming a propagation loss of *15LogR,* where *R* is the distance ratio. Given this normalization, uncertainties of <3 dB were expected. The data were plotted as a function of the pile diameter and then fit with a statistical regression curve (see the figure in Remmers and Bellmann (2021) Attachment Z–3 in Appendix A of Dominion Energy's application). Using the resulting regression, iTAP predicted noise levels of 151 dB SPL for 2.4 m pin piles and 159 dB SPL for 9.5 m monopiles, at a range of 750 m from the driven piles (Remmers and Bellmann (2021)). Based on possible influences of friction between the head of the vibratory hammer and the top of the piles, iTAP states that these results at 750 m from the piles may be overestimating the source level for vibratory pile driving.

For vibratory installation of cofferdams, adjusted one-third-octave band source levels (with a broadband source level of 195 dB SEL) obtained from similar offshore construction projects and then adjusted to account for the estimated force needed to drive cofferdam sheet piles (see Schultz-von Glahn *et al.,* 2006).

Acoustic Propagation Modeling

To predict acoustic levels at range during foundation installation (impact and vibratory pile driving) and temporary cofferdam installation and removal (vibratory pile driving), Tetra Tech used sound propagation models, discussed below. For the installation and removal of goal posts and HRG surveys, Dominion Energy assumed a practical spreading loss rate (*15logR*). Below we describe the more sophisticated sound propagation modeling methodology.

Tetra Tech utilized a software called dBSea, which was developed by Marshall Day Acoustics (*https://www.dbsea.co.uk/*), to predict the underwater noise in similar environments to what might be encountered at the CVOW–C project site. Per Attachment Z–1 of the COP, Tetra Tech used different ''solvers'' (*i.e.,* algorithms) for the low and high-frequency ranges, including:

- *dBSeaPE (Parabolic Equation Method):* The dBSeaPE solver makes use of the range-dependent acoustic model (RAM) parabolic equation method, a versatile and robust method of marching the sound field out in range from the sound source. This method is one of the most widely used in the underwater acoustics community, offers excellent performance in terms of speed and accuracy in a range of challenging scenarios, and was used for low frequencies.
- *dBSeaRay (Ray Tracing Method):* The dBSeaRay solver forms a solution by tracing rays from the source to the receiver. Many rays leave the source covering a range of angles, and the sound level at each point in the receiving field is calculated by coherently summing the components from each ray. This is currently the only computationally efficient method at high frequencies.

Each model utilizes imported environmental data and manually placed noise sources in the aquatic environment, which could consist of either equipment in the standard dBSea database or a user-specific database (*i.e.,* the empirically determined source levels and spectra, discussed above). The software then allows the user to include properties specific to the project site including bathymetry, seabed, and water column characteristics (*e.g.,* sound speed profiles, temperature, salinity, and current). Tetra Tech also incorporated variables for each pile to account for the soft-start of impact pile driving of foundation piles and pile penetration progression.

For the CVOW–C project's modeled environment using dBSea, bathymetry data was obtained by Tetra Tech from the National Geophysical Data Center and U.S. Coastal Relief Model (NOAA Satellite and Information Service, 2020) and consisted of a horizontal resolution of 3 arc seconds (defined as 90 m (295.28 ft)). The data covered an area consisting of 138 km × 144 km (452,755.91 ft × 472,440.94 ft) with a maximum depth of 459 m (1,505.91 ft). Sound sources were placed near the middle of the bathymetry area. The bathymetry data was imported into the dBSea model and extents were set for displaying the received sound levels. Relatedly, sediment data was also included into the model as bottom sedimentation has the potential to directly impact the sound propagation. Dominion Energy's site assessment surveys revealed the project area primarily consists of a predominantly sandy seabed. While not reiterated here, Appendix A of Dominion Energy's application contains the tables that include the geoacoustic properties of the sub-bottom sediments for modeling scenarios involving the more offshore WTG and OSS foundations (see Table Z–5) and for the nearshore temporary cofferdams (see Table Z–6).

Given that the sound speed profile in an aquatic environment varies throughout the year, Tetra Tech calculated seasonal sound speed profiles based on the proposed installation schedule presented for the CVOW–C project. Dominion Energy would only install WTG and OSS foundations between May 1st and October 31st, annually, hence an average sound speed profile was calculated for this time period. Sound speed profile data was obtained from the NOAA Sound Speed Manager software incorporating World Ocean Atlantic 2009 extension algorithms. A sensitivity analysis was performed on the monthly sound speed information to determine the most conservative sound modeling results. The average sound speed profile obtained from this dataset was directly included into the dBSea model (see Figure 3 in Attachment Z–1 in Dominion Energy's application (Appendix A)). This same approach was undertaken for temporary cofferdam installation.

The scenarios for WTG monopile and OSS jacket pin pile installation were modeled using a vertical array (based on third-octave band sound characteristics that was adjusted for site-specific parameters, including expected hammer energy and the number of hammers strikes needed per each scenario) of point sources spaced at 1-m intervals. Each of the third octave band center frequencies from 12.5 Hz up to 20 kHz, of the source spectra, was modeled. In order to more closely match expected sound propagation characteristics of the source signal, a constant 15 dB/decade roll-off filter is applied to the modeled spectra after the second spectral peak. The spectra source levels for impact driving of monopile and pin piles can be found in Figure 10 of the CVOW–C ITA application. The vibratory pile driving spectra, which is available in Figure 11 of the ITA application, used reference information from iTAP (Gerke and Bellmann, 2012), the California Department of Transportation (CALTRANS, 2015), and from measurements of vibratory driving collected by Tetra Tech. Based on the description above, Tetra Tech determined an appropriate sound speed profile to input into dBSea by pulling the average sound speed profile for the construction period (May 1st to October 31st), following the schedule provided by Dominion Energy. No information was pulled for November 1st through April 30th, as no pile driving is planned due to seasonal restrictions regarding the North Atlantic right whale. The monthly sound speed profile for the planned WTG and OSS foundation construction period is found in Figure 12 in the CVOW–C ITA application.

The sound level estimates are calculated from the generated three-dimensional sound fields and then, at each sampling range, the maximum received level that occurs within the water column is used as the received level at that range. The dBSea model allows for a maximum received level-over-depth approach (*i.e.,* the maximum received level that occurs within the water column at each calculation point). These maximum-over-depth (R_{max}) values are then compared to predetermined threshold levels to determine exposure and acoustic ranges to Level A harassment and Level B harassment threshold isopleths. However, the ranges to a threshold typically differ among radii from a source and also might not be continuous along a radii because sound levels may drop below threshold at some ranges and then exceed threshold at farther ranges. Both the R_{max} (the maximum range in the model at which the sound level was calculated) and $R_{95\%}$ (excludes ends of protruding areas or small isolated acoustic foci not representative of the nominal ensonified zone) were calculated for each of the relevant regulatory thresholds. The difference between R_{max} and $R_{95\%}$ depends on the source directivity and the heterogeneity of the acoustic environment. To minimize the influence of these inconsistencies, 5 percent of the farthest such footprints were excluded from the model data. The resulting range, $R_{95\%}$, was chosen to identify the area over which marine mammals may be exposed above a given threshold because, regardless of the shape of the maximum-over-depth footprint, the predicted range encompasses at least 95 percent of the horizontal area that would be exposed to sound at or above the specified threshold. The difference between R_{max} and $R_{95\%}$ depends on the source directivity and the heterogeneity of the acoustic environment.

Here we note that Tetra Tech and MAI did not calculate or provide exposure ranges to the Level A harassment SEL_{cum} thresholds in the ITA application as provided by other offshore wind developers in their ITA application. Instead, Dominion Energy chose to utilize acoustic ranges ($R_{95\%}$) values in its analysis, which NMFS concurs is also a reasonable approach and likely results in somewhat comparatively larger zones. Dominion Energy's application, and this proposed rule, include the $R_{95\%}$ ranges as these are representative of the expected underwater acoustic footprints during foundation and cofferdam installation.

Temporary cofferdams followed a similarly described approach. To estimate the distances to the harassment isopleths from the vibratory installation of sheet piles, it was assumed that the vibratory pile driver would use approximately 1,800 kilonewtons of vibratory force over 60 minutes. Given the close proximity of all temporary cofferdams in the nearshore environment and the relatively same installation depth (3.3. m), a single representative location (*i.e.,* the centermost cofferdam) was used for the modeling analysis.

As previously described above, unique environmental inputs can be included into dBSea to provide a more project-specific output. Tetra Tech input bathymetry data, which was obtained from the National Geophysical Data Center (NGDC) and the U.S. Coastal Relief Model (NOAA Satellite and Information Service, 2020) with a horizontal resolution of 3 arc seconds (approximately 90 m). The bathymetry data were sampled through the creation of a fan of radials at specifically given angular spacings, which was in turn used to determine depth points as each of the modeling transects.

Sediment data was included as determined to be specific to the CVOW–C project area (*i.e.,* predominately sand), which were informed due to past geotechnical surveys completed in support of the adjacent CVOW Pilot Project. The sediment layers incorporated into the dBSea model can be found in Table 28 of Dominion Energy's ITA application.

To determine the appropriate sound speed profile, Tetra Tech looked toward Dominion Energy's construction schedule, which states that temporary cofferdams would be installed and removed from Q1 to Q4 of 2024, but most likely between May 1st and October 31st. As this period is the same period of time where the 2024 foundation installation activities would be occurring, Tetra Tech incorporated the same average sound speed profile used for WTG and OSS foundation installation (see Figure 12 in Dominion Energy's ITA application). As no pile driving of any type is planned to occur from November to April, these months were not incorporated into the sound speed profile analysis. As was previously described for foundation installation, the speed of sound profile information was obtained using the NOAA Sound Speed Manager software, which incorporated the World Ocean Atlantic 2009 extension algorithms.

To calculate the ranges to the defined acoustic thresholds, Tetra Tech utilized a maximum received level-over-depth approach where the maximum received sound level that occurs within the water column at each sampling point was used. Tetra Tech calculated both the R_{max} and the $R_{95\%}$ for each of the marine mammal regulatory thresholds.

Animal Movement Modeling

To estimate the probability of exposure of animals to sound above NMFS' harassment thresholds during foundation installation, MAI integrated the sound fields generated from the source and propagation models described above with marine mammal species-typical behavioral parameters (*e.g.,* dive parameters, swimming speed, and course/direction changes). Animal movement modeling was performed for all marine mammal species determined to potentially occur within the CVOW–C project area to estimate the amount of potential acoustic exposures above NMFS' Level A (PTS) harassment and Level B (behavioral) harassment thresholds. Animat modeling was conducted for four scenarios (three for WTGs, one for OSS) that were determined to be representative of the types of construction activities expected at three different locations (two for WTGs (one shallow (21 m (69 ft)) and one deep (37 m (121 ft)) location) and one for OSSs (28 m (92 ft))). These locations were selected to appropriately observe the range of effects of sound propagation. The modeled areas are shown in Figure Z–4 in Dominion Energy's Underwater Acoustic Assessment (Appendix A in the application).

MAI's animat modeling was conducted using the Acoustic Integration Model (AIM; Frankel *et al.,* 2002), which is a Monte Carlo based statistical model in which multiple iterations of realistic predictions of acoustic source use as well as animal distribution and movement patterns are conducted to provide statistical predictions of estimated effects from exposure to underwater sound transmissions. By using AIM, each acoustic source and receiver were modeled using the same concept as animats. For each species, separate AIM simulations were developed and iterated for each modeling scenario and activity location. During the simulations, animats were randomly distributed of the model simulation area and the predicted received sound level was estimated every 30 seconds to create a history over a 24-hour period. Animats were also pre-programmed to move every 30 seconds based upon species-specific behaviors. At the end of each 30 second interval, the received sound level (in dB RMS) for each animat was recorded.

Animats that exceed NMFS' acoustic thresholds were identified and the range for the exceedances determined. The output of the simulation is the exposure history for each animat within the simulation, and the combined history of all animats gives a probability density function of exposure during the project. The number of animals expected to exceed the regulatory thresholds is determined by scaling the probability of exposure by the species-specific density of animals in the area. By programming animats to behave like marine species that may be exposed to foundation installation noise during pile driving, the animats are exposed to the sound fields in a manner similar to that expected for real animals.

Static Take Estimate Method

Take estimates from cable landfall construction activities (cofferdam and goal post installation and removal) and HRG surveys were calculated based on a static method (*i.e.,* animal movement modeling was not conducted for these activities). Take estimates produced using the static method are the product of density, ensonified area, and number of days of pile driving work. Specifically, take estimates are calculated by multiplying the expected densities of marine mammals in the activity area(s) by the area of water likely to be ensonified above the NMFS defined threshold levels in a single day (24-hour period). Next that product is multiplied by the number of days pile driving is likely to occur. A summary of this method is illustrated in the following formula:

$$Estimated\ Take = D \times ZOI \times \#\ of\ days$$

Where:

D = average species density (per 100 km²); and

ZOI = maximum daily ensonified area to relevant thresholds.

This methodology was utilized for impact pile driving associated with goal posts, vibratory pile driving associated with temporary cofferdams, and active acoustic source use from HRG surveys as no exposure modeling was conducted.

Density and Occurrence

In this section, we provide the information about the presence, density, or group dynamics of marine mammals that will inform the take calculations. As noted above, depending on the species and activity type and as described in the take estimation section for each activity type, the requested amount of take, and which NMFS proposes to authorize, is based on the highest estimate of take resulting from full consideration of density models, average group sizes, or site-specific survey data.

Dominion Energy applied the Duke University Marine Geospatial Ecology Laboratory marine mammal habitat-based density models (*https://seamap.env.duke.edu/models/Duke/EC/*) to estimate take from WTG and OSS foundation installation, temporary goal post installation and removal, temporary cofferdam installation and removal, and HRG surveys.

The Duke habitat-based density models delineate species' density into 5 × 5 km (3.1 × 3.1 mi) grid cells (as opposed to the 10 × 10 km (6.2 × 6.2 mi) grid cells previously used in past Roberts *et al.* datasets for all species, with exception for the North Atlantic right whale). Although the density grid cells are 25 km² (9.7 mi²), the values are still reported per 100 km² (38.6 mi²). Based on the area across which different specified activities are conducted (*i.e.,* WTG and OSS foundation installation, nearshore cable landfall activities, and HRG surveys), appropriate averaged density estimates are applied to exposure and/or take calculations for each area.

For foundation installation, densities were extracted from grid cells within the Lease Area and those extending 8.9

km (5.53 mi) beyond the Lease Area boundaries. The grid cells within the 8.9 km perimeter area were incorporated to account for the largest ensonified area to the Level B harassment threshold; thereby representing the furthest extent where potential impacts to marine mammals could be expected. The density in the grid cells selected were averaged for each month to provide a mean monthly density for each marine mammal species and/or stock. In some cases, the density models combine multiple species (*i.e.,* long-finned and short-finned pilot whales, gray and harbor seals) or stocks (*i.e.,* Southern migratory coastal and the Western North Atlantic offshore bottlenose dolphin stocks), or it may not be possible to derive monthly/seasonal densities for some species so annual densities were used instead (*i.e.,* pantropical spotted dolphins, pilot whale *spp.*).

Group Size and PSO Data Considerations

The exposure estimates from the animal movement modeling or static methods described above directly informed the take estimates. In some cases, adjustments to the density-based exposure estimates may be necessary to fully account for all animals that could be taken during the specified activities. This could consist of an adjustment based on species group size or observations or acoustic detections provided in monitoring reports.

For some species, observational data from Protected Species Observers (PSOs) aboard HRG survey vessels indicate that the density-based exposure estimates may be insufficient to account for the number of individuals or type of species that may be encountered during the planned activities. As an example, pantropical spotted dolphins have been included in the requested take request based on prior PSO observation data, obtained via the 2020–2021 monitoring report from under previously issued (and subsequently modified) HRG IHAs to Dominion Energy occurring in and around the Lease Area (see RPS Group (RPS) (2018), AIS, Inc. (2020), and RPS (2021)). For other less-common species, the predicted densities from Roberts and Halpin (2022) are very low and the resulting density-based exposure estimate was less than a single animal or a typical group size for the species. In such cases, the mean group size was considered as an alternative to the density-based take estimates to account for potential impacts on a group during an activity.

Regardless of methodology used (*i.e.,* density-based, group size, PSO data), Dominion Energy requested, and NMFS proposes to authorize, take based on the highest amount of exposures estimated from any given method. Below we present the results of the methodologies described above, including distances to NMFS thresholds and take estimates associated with each activity.

WTG and OSS Foundation Installation

Here, we present the construction scenarios Dominion Energy applied to its analysis, which NMFS is carrying forward in this proposed rule, and the resulting acoustic ranges to Level A harassment and Level B harassment thresholds, exposure estimates, and take estimates from WTG and OSS foundation installation following the aforementioned modeling methodologies.

To complete the project, Dominion Energy has proposed four foundation installation construction schedules (three for WTG installation and one for OSS installation), as construction schedules cannot be fully predicted due to uncontrollable environmental factors (*e.g.,* weather) and installation schedules include variability (*e.g.,* due to drivability). Since three locations had been identified where OSSs would be constructed, the modeling relied on a single site that would result in the further propagation distance. This site was determined to be representative of all three OSS locations.

For the monopile scenarios, two types of pile driving conditions are expected for each monopile installed: a standard pile driving situation (Scenario 1) and a hard-to-drive (Scenario 2) situation. During the installation of one monopile for WTG foundations per day, either a standard or hard-to-drive scenario may be necessary, which would determine the duration of vibratory driving and the number of impact hammer strikes needed. In situations where two monopile WTGs would be installed per day (*i.e.,* Scenario 3), Dominion Energy assumed that only one monopile would consist of a hard-to-drive scenario and the other would always be a standard. Dominion Energy has committed to not installing two hard-to-drive foundations in a single day. For OSS jacket foundations, a single installation approach (*i.e.,* Scenario 4; impact pile driving only) is expected for the installation of up to two pin piles per day.

Dominion Energy has assumed that a maximum of two monopiles may be installed per day or that a maximum of two pin piles would be installed per day. No concurrent pile driving would occur. Due to the risk of pile run, Dominion Energy expects to utilize a joint vibratory-impact pile driving installation approach on all WTG and OSS foundation piles. All scenarios, including associated pile driving details, expected to occur can be found in Table 10 below.

TABLE 10—WTG AND OSS FOUNDATION INSTALLATION SCENARIOS

Installation scenario	Foundation installed [c]	Installation details	Duration of installation activity [a]
Scenario 1: Standard Driving	9.5 m diameter monopile foundation (1 pile per day).	Vibratory pile driving	60 minutes.
		Impact pile driving	3,240 hammer strikes (4,000 kJ).
Scenario 2: Hard-to-drive	9.5 m diameter monopile foundation (1 pile per day).	Vibratory pile driving	30 minutes.
		Impact pile driving	3,720 hammer strikes (4,000 kJ).
Scenario 3: One standard and one hard-to-drive [b].	9.5 m diameter monopile foundations (2 piles per day).	Vibratory pile driving	90 minutes.
		Impact pile driving	6,960 hammer strikes (4,000 kJ).
Scenario 4: OSS Jacket Foundation	2.8 m diameter pin piles (2 piles per day).	Vibratory pile driving	120 minutes.
		Impact pile driving	15,120 hammer strikes (3,000 kJ).

[a] The hammer energy of 4,000 kJ represents the maximum hammer energy; however, Dominion Energy anticipates the energy will be less than this.
[b] Two hard-to-drive piles would never be installed on the same day.
[c] Dominion Energy may build up to two foundations per day, consisting of either WTG monopiles or pin piles per jacket foundations. However, on some days, only one monopile may be built per day and would consist of a single standard driven pile or a hard-to-drive pile.

As described above, underwater noise associated with the construction of offshore components of CVOW–C would predominantly result from vibratory and impact pile driving monopile and jacket foundations. As previously described, Dominion Energy employed Tetra Tech to conduct acoustic modeling and MAI to conduct animal movement exposure modeling to better understand sound fields produced during these activities and to estimate exposures. For installation of foundation piles, animal movement modeling was used to estimate exposures.

Presented below are the acoustic ranges to the Level A harassment and Level B harassment thresholds for WTG installation in the deeper environment (Table 11), WTG installation in the shallower water (Table 12), and OSS installation in the single representative location (Table 13). All ranges shown are assuming 10 dB of sound attenuation as Dominion Energy would employ a noise attenuation system during all vibratory and impact pile driving of monopile and jacket foundations. Although three attenuation levels were evaluated and Dominion Energy has not yet finalized its mitigation strategy, Dominion Energy and NMFS both anticipate that the noise attenuation system ultimately chosen will be capable of reliably reducing source levels by 10 dB. Therefore, modeling results assuming 10–dB attenuation are carried forward in this analysis for WTG and OSS foundation installation. See the Proposed Mitigation section for more information regarding the justification for the 10 dB assumption.

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Table 11 – Acoustic Ranges ($R_{95\%}$), In Meters, To Level A Harassment (PTS) and Level B Harassment Thresholds For The Deep WTG Location For Marine Mammal Function Hearing Groups, Assuming An Average Sound Speed Profile and 10 dB of Sound Attenuation

Foundation Installation Parameters					Distance to Marine Mammal Thresholds (m)													
					Level A Harassment (PTS)												Level B Harassment (Behavioral)	
					LFC			MFC			HFC			PP			All species	
Installation Scenario	Pile Installed	Installation Approach	Maximum Hammer Energy	Installation duration (minutes)	219 $L_{p, pk}$	183 $L_{E, 24hr}$	199 $L_{E, 24hr}$	230 $L_{p, pk}$	185 $L_{E, 24hr}$	198 $L_{E, 24hr}$	202 $L_{p, pk}$	155 $L_{E, 24hr}$	173 $L_{E, 24hr}$	218 $L_{p, pk}$	185 $L_{E, 24hr}$	201 $L_{E, 24hr}$	160 L_p	120 L_p
Scenario 1: Standard driving	9.5 m diameter monopile (1 pile per day)	Impact	4,000 kJ	85	132	4,396	–[a]	29	170	–[a]	663	2,139	–[a]	141	1,267	–[a]	6,182	–[a]
		Vibratory	n/a	60	–[a]	–[a]	141	–[a]	–[a]	0	–[a]	–[a]	103	–[a]	–[a]	12	–[a]	8,866
Scenario 2: Hard-to-drive	9.5 m diameter monopile (1 pile per day)	Impact	4,000 kJ	99	132	4,980	–[a]	29	187	–[a]	663	2,304	–[a]	141	1,358	–[a]	6,182	–[a]
		Vibratory	n/a	30	–[a]	–[a]	113	–[a]	–[a]	0	–[a]	–[a]	87	–[a]	–[a]	3	–[a]	8,866
Scenario 3: One standard and one hard-to-drive	9.5 m diameter monopile (2 piles per day)	Impact	4,000 kJ	184	132	5,663	–[a]	29	226	–[a]	663	2,884	–[a]	141	1,756	–[a]	6,182	–[a]
		Vibratory	n/a	90	–[a]	–[a]	158	–[a]	–[a]	0	–[a]	–[a]	125	–[a]	–[a]	31	–[a]	8,866

Note: LFC = low-frequency cetaceans; MFC = mid-frequency cetaceans; HFC = high-frequency cetaceans; PP = phocid pinnipeds; Lp = root-mean square sound pressure (dB re 1 µPa); L_E = sound exposure level (dB re 1 µPa2 ·s); $L_{p,pk}$ = peak sound pressure (dB re 1 µPa)

a - Dashes (–) indicate a value that was not calculated by Tetra Tech during the acoustic modeling analysis.

Table 12 – Acoustic Ranges ($R_{95\%}$), In Meters, To Level A Harassment (PTS) and Level B Harassment Thresholds For The Shallow WTG Location For Marine Mammal Function Hearing Groups, Assuming An Average Sound Speed Profile and 10 dB of Sound Attenuation

Foundation Installation Parameters					Distance to Marine Mammal Threshold (m)													
					Level A Harassment (PTS)												Level B Harassment (Behavioral)	
					LFC			MFC			HFC			PP			All species	
Installation Scenario	Pile Installed	Installation Approach	Maximum Hammer Energy	Installation duration (minutes)	219 $L_{p,pk}$	183 $L_{E,24hr}$	199 $L_{E,24hr}$	230 $L_{p,pk}$	185 LE, 24hr	198 $L_{E,24hr}$	202 $L_{p,pk}$	155 $L_{E,24hr}$	173 $L_{E,24hr}$	218 $L_{p,pk}$	185 $L_{E,24hr}$	201 $L_{E,24hr}$	160 L_p	120 L_p
Scenario 1: Standard driving	9.5 m diameter monopile (1 pile per day)	Impact	4,000 kJ	85	128	3,138	–[a]	26	99	–[a]	607	1,659	–[a]	138	1,059	–[a]	5,503	–[a]
		Vibratory	n/a	60	–[a]	–[a]	107	–[a]	–[a]	0	–[a]	–[a]	93	–[a]	–[a]	31	–[a]	6,485
Scenario 2: Hard-to-drive	9.5 m diameter monopile (1 pile per day)	Impact	4,000 kJ	99	128	3,363	–[a]	26	108	–[a]	607	1,888	–[a]	138	1,171	–[a]	5,503	–[a]
		Vibratory	n/a	30	–[a]	–[a]	88	–[a]	–[a]	0	–[a]	–[a]	67	–[a]	–[a]	21	–[a]	6,485
Scenario 3: One standard and one hard-to-drive	9.5 m diameter monopile (2 piles per day)	Impact	4,000 kJ	184	128	4,152	–[a]	26	134	–[a]	607	2,314	–[a]	138	1,464	–[a]	5,503	–[a]
		Vibratory	n/a	90	–[a]	–[a]	135	–[a]	–[a]	0	–[a]	–[a]	110	–[a]	–[a]	36	–[a]	6,485

Note: LFC = low-frequency cetaceans; MFC = mid-frequency cetaceans; HFC = high-frequency cetaceans; PP = phocid pinnipeds; Lp = root-mean square sound pressure (dB re 1 µPa); L_E = sound exposure level (dB re 1 µPa2 ·s); $L_{p,pk}$ = peak sound pressure (dB re 1 µPa)

a - Dashes (–) indicate a value that was not calculated by Tetra Tech during the acoustic modeling analysis.

Table 13 – Acoustic Ranges ($R_{95\%}$), In Meters, To Level A Harassment (PTS) and Level B Harassment Thresholds For The Shallow OSS Location For Marine Mammal Function Hearing Groups, Assuming An Average Sound Speed Profile and 10 dB of Sound Attenuation

Foundation Installation Parameters					Distance to Marine Mammal Thresholds (m)														
					Level A Harassment (PTS)												Level B Harassment (Behavioral)	
					LFC			MFC			HFC			PP			All species	
Installation Scenario	Pile Installed	Installation Approach	Maximum Hammer Energy	Installation duration (minutes)	219 $L_{p,pk}$	183 $L_{E,24hr}$	199 $L_{E,24hr}$	230 $L_{p,pk}$	185 $L_{E,24hr}$	198 $L_{E,24hr}$	202 $L_{p,pk}$	155 $L_{E,24hr}$	173 $L_{E,24hr}$	218 $L_{p,pk}$	185 $L_{E,24hr}$	201 $L_{E,24hr}$	160 L_p	120 L_p
Scenario 4: OSS jacket foundation	2.8 m diameter pin pile	Impact	3,000 kJ	410	0	2,680	–[a]	0	48	–[a]	197	1,435	–[a]	0	1,283	–[a]	2,172	–[a]
		Vibratory	n/a	120	–[a]	–[a]	75	–[a]	–[a]	0	–[a]	–[a]	68	–[a]	–[a]	0	–[a]	3,601

Note: LFC = low-frequency cetaceans; MFC = mid-frequency cetaceans; HFC = high-frequency cetaceans; PP = phocid pinnipeds; Lp = root-mean square sound pressure (dB re 1 µPa); L_E = sound exposure level (dB re 1 µPa2 ·s); $L_{p,pk}$ = peak sound pressure (dB re 1 µPa)

a - Dashes (–) indicate a value that was not calculated by Tetra Tech during the acoustic modeling analysis.

Dominion Energy provided seasonal density estimates during the time of year when WTG and OSS foundations would be installed following the methodology provided in the *Density and Occurrence* section above. The resulting densities used in the exposure estimate calculations for foundation installation are provided in Table 14.

Table 14 – Mean Seasonal Density Estimates For WTG and OSS Foundation Installation (Inclusive of the 8.9 Km Perimeter Applied for the Largest Level B Harassment Zone From Vibratory Pile Driving)

Marine Mammal Hearing Group and Species		Stock	Mean Density (Individual/km^2)			
			Spring (May)	Summer (June to August)	Fall (September to October)[c]	Annual Density
LFC	North Atlantic right whale*	Western North Atlantic	0.00015	0.00004	0.00005	–
	Fin whale*	Western North Atlantic	0.00069	0.00036	0.00019	–
	Humpback whale	Gulf of Maine	0.00136	0.00023	0.00040	–
	Minke whale	Canadian East Coast	0.00519	0.00028	0.00011	–
	Sei whale*	Nova Scotia	0.00021	0.00001	0.00004	–
MFC	Sperm whale*	North Atlantic	0.00003	0.00000	0.00000	–
	Pygmy sperm whale	Western North Atlantic	n/a[a]	n/a[a]	n/a[a]	–
	Atlantic spotted dolphin	Western North Atlantic	0.00507	0.05873	0.03822	–
	Atlantic white-sided dolphin	Western North Atlantic	n/a[a]	n/a[a]	n/a[a]	–
	Bottlenose dolphin[d]	Southern Migratory Coastal	0.13098	0.13509	0.13852	–
		Western North Atlantic, Offshore	0.07352	0.07415	0.06439	–

	Clymene dolphin	Western North Atlantic	n/a[a]	n/a[a]	n/a[a]	–
	Common dolphin	Western North Atlantic	0.05355	0.00559	0.00103	–
	False killer whale	Western North Atlantic	n/a[a]	n/a[a]	n/a[a]	–
	Melon-headed whale	Western North Atlantic	n/a[a]	n/a[a]	n/a[a]	–
	Long-finned pilot whale[e]	Western North Atlantic	–[b]	–[b]	–[b]	0.00098
	Short-finned pilot whale[e]	Western North Atlantic	–[b]	–[b]	–[b]	0.00098
	Pantropical spotted dolphin	Western North Atlantic	–[b]	–[b]	–[b]	0.00008
	Risso's dolphin	Western North Atlantic	0.00084	0.00042	0.00021	–
HFC	Harbor porpoise	Western North Atlantic	0.00315	0.00000	0.00000	–
PP	Gray seal	Western North Atlantic	0.01828	0.00001	0.00047	–
	Harbor seal	Western North Atlantic	0.01828	0.00001	0.00047	–

*Note: LFC = low-frequency cetaceans; MFC = mid-frequency cetaceans; HFC = high-frequency cetaceans; PP = phocid pinnipeds; * denotes species listed under the Endangered Species Act.*

a - These species were added to the list of marine mammal species that could potentially be harassed by project activities after the animat analysis was completed so no exposure estimates were calculated. Instead, a standard group size of animals was used instead for any analysis pertaining to this species.

b - For these species, monthly densities were not available. Instead, annual densities were used.

c - As no foundation installation is planned to occur in November or December, the relevant values were not included.

d - Within the Roberts and Halpin (2022) data, bottlenose dolphin densities are reported as a single "bottlenose dolphin" group and are not identified by stock. Given that the WTG and OSS foundation installation would be occurring beyond the 20-m isobath, where the stocks are split, estimated take was assumed to come from the offshore stock.

e - Pilot whale spp. Are reported as a single group (Globicephala spp.) and are not species-specific. Because of this, Dominion Energy assumed that the density was a collective pilot whale group and could be attributed to either the short-finned or long-finned species.

MAI set the modeled marine mammal animats to populate each of the model areas with the representative nominal densities provided. During the modeling, some of the obtained densities were higher than the real-world density, as to ensure that the results of the animat model simulations were not unduly influenced by the spontaneous placement of some of the simulated marine mammals and to provide additional statistical robustness within the modeling exercise. To obtain the final exposure estimates, the modeled results were normalized by the ratio of the modeled animat density to the real-world seasonal densities. The exposure estimates were derived based on the history of exposure within the modeling exercise for each marine mammal species or species group. The modeled sound exposure level (SEL) received by each animat over the duration of the construction activity period (*e.g.,* estimated 3 hours of driving on a single monopile) and the peak sound pressure level were used to calculate the potential for an individual animat to have experienced PTS, in accordance with the NOAA Fisheries (2018) physiological acoustic thresholds for marine mammals. If an animat was not predicted to have experienced PTS, then the sound energy received by each individual animat over the 24-hour modeled period was used to assess the potential risk of biologically significant behavioral reactions. The modeled RMS sound pressure levels were used to estimate the potential for behavioral responses, in accordance with the NOAA Fisheries (2005b) behavioral criteria.

For the monopile WTG installation, the exposure calculations assumed 176 WTG monopiles would be installed over two years, but also took into account the need for Dominion Energy to possibly re-pile for up to seven WTG foundations (equating to a total of 183 modeled piling events for WTGs). For the jacket foundations using pin piles for the OSSs, the modeling assumed that up to 12 pin piles (four per OSS for up to three total OSSs) would be installed over two years. Both of these were modeled in accordance with the schedule provided by Dominion Energy.

Overall, for Year 1 (2024), it was assumed that up to a maximum of 95 monopiles and all 12 pin piles would be installed. For Year 2, it was assumed that a maximum of 88 monopiles (which does account for the seven possible re-piling events that may be necessary) would be installed. As construction of the WTGs and OSSs are only anticipated to occur in the first two years of the project (2024 and 2025), animats were only calculated for these. Although schedule delays due to weather or other unforeseen activities may require Dominion Energy to not complete all piling in Year 2, but instead push a limited number of piles to Year 3 (2026), no modeling was completed for 2026. This is because any piles not completed in 2025 (Year 2) would be pushed to 2026 (Year 3), which means that the current analysis has accounted for the total scenario as the analysis for foundation installation activities in Year 2 would be less than estimated here and instead would shift some to Year 3. Please see Table 15 for the derived exposure estimates during WTG and OSS foundation installation over two years (2024 and 2025).

The exposure estimates for both the installation of WTGs and OSSs over two years (2024 and 2025) were then adjusted, for some species, based on group size characteristics known through the scientific literature and received sighting reports from previous projects and/or surveys. As indicated below, when density-based take calculations were lower than one, estimates were adjusted upwards based on group size, when density-based take calculations were too low based on PSO observations. The species-specific requested and proposed take estimates are listed below:

- North Atlantic right whale: Level B take for foundation installation adjusted for group size of 1 individual for months with monthly density <0.01 per 100 km^2 (Roberts and Halpin, 2022) when construction may occur (May–October) and 2 individuals for months with monthly density >0.01 when construction may occur (May–October);
- Fin whale: Adjusted based on protected species observer (PSO) data (max daily number × days of activity);
- Humpback whale: Adjusted based on PSO data (max daily number × days of activity);
- Sperm whale: Adjusted based on 1 group size per year (3 per Barkaszi *et al.,* 2019);
- Atlantic white-sided dolphin: Adjusted based on 1 group size per year (15 per Reeves *et al.,* 2002);
- Pantropical spotted dolphin: Adjusted based on 1 group size per year (20 per Reeves *et al.,* 2002);
- Short-beaked common dolphin: Adjusted based on 1 group size (20 individuals per group) per day (Dominion Energy, 2021);
- Clymene dolphin: Adjusted based on 1 group size (5 per AIS, Inc. (2020));
- False killer whale: Adjusted based on 1 group size per year (4 per RPS (2021));
- Melon-headed whale: Adjusted based on 1 group size per year (5 per RPS (2018)); and
- Pygmy sperm whale: Adjusted based on 1 group size per year (1 per RPS (2021)).

In Table 15, we present the calculated exposure estimates and the maximum amount of take proposed for authorization during foundation installation of WTGs and OSSs during the proposed five-year effective period for the CVOW–C project. As demonstrated by the exposure modeling results, which do not consider mitigation other than the use of a sound attenuation device(s), the potential for Level A harassment is very low. However, there may be some situations where pile driving cannot be stopped due to safety concerns related to pile instability.

As previously discussed, only 176 WTG and 3 OSS (using a maximum of 12 pin piles) foundations would be permanently installed for the CVOW–C project; however, Dominion Energy has considered the possibility that some piles may be started but not fully installed at some locations due to installation feasibility issues. Conservatively, Dominion Energy has estimated up to 7 additional pile driving events may be needed in the event this occurs. Per Dominion Energy's estimated construction schedule, it is anticipated that all of these foundation installation activities would occur in Year 1 (2024) and Year 2 (2025); therefore, the take estimates below reflect the foundation pile driving activities associated with 183 WTG foundations and 3 OSSs, to account for the seven additional re-piling events that may occur if monopiles were started in one location but then needed to be re-driven at another WTG position.

Table 15 – Exposures Estimates and Maximum Amount of Take Proposed For Authorization By Level A Harassment and Level B Harassment From Vibratory and Impact Pile Driving Associated With 183 WTG[f] and 3 OSS Total Installation Events, Assuming 10 dB of Noise Attenuation

Marine Mammal Hearing Group and Species		Stock	Estimated Exposures				Takes Proposed For Authorization			
			2024		2025		2024		2025[e]	
			Level A Harassment	Level B Harassment	Level A Harassment	Level B Harassment	Level A Harassment	Level B Harassment	Level A Harassment	Level B Harassment
LFC	North Atlantic right whale*, [c]	Western North Atlantic	1[c]	3	1[c]	2	0	6	0	6
	Fin whale*	Western North Atlantic	4	21	3	19	4	112	3	90
	Humpback whale	Gulf of Maine	4	18	4	14	4	29	4	104
	Minke whale	Canadian East Coast	8	53	7	48	8	53	7	48
	Sei whale*	Nova Scotia	1	3	1	2	1	3	1	2
MFC	Sperm whale*	North Atlantic	0	1	0	1	0	3	0	3
	Pygmy sperm whale[g]	Western North Atlantic	n/a[a]	n/a[a]	n/a[a]	n/a[a]	0	1	0	1
	Atlantic spotted dolphin	Western North Atlantic	0	2,108	0	1,896	0	2,108	0	1,896
	Atlantic white-sided dolphin[d]	Western North Atlantic	n/a[h]	n/a[h]	n/a[h]	n/a[h]	0	15	0	15

	Bottlenose dolphin [a]	Southern Migratory Coastal	0	0	0	0	0	0	0	0
		Western North Atlantic, Offshore	0	4,290	0	3,602	0	4,290	0	3,602
	Clymene dolphin [g]	Western North Atlantic	n/a[h]	n/a[h]	n/a[h]	n/a[h]	0	5	0	5
	Common dolphin	Western North Atlantic	0	594	0	559	0	1,720	0	1,380
	False killer whale[g]	Western North Atlantic	n/a[h]	n/a[h]	n/a[h]	n/a[h]	0	4	0	4
	Melon-headed whale[g]	Western North Atlantic	n/a[h]	n/a[h]	n/a[h]	n/a[h]	0	5	0	5
	Pilot whale *spp.*	Western North Atlantic	0	61	0	50	0	61	0	50
	Pantropical spotted dolphin	Western North Atlantic	0	4	0	4	0	20	0	20
	Risso's dolphin	Western North Atlantic	0	25	0	23	0	25	0	23
HFC	Harbor porpoise	Western North Atlantic	1	23	1	20	1	23	1	20
PP	Gray seal[b]	Western North Atlantic	1	62	1	53	1	62	1	53
	Harbor seal[b]	Western North Atlantic	1	62	1	53	1	62	1	53

*Note: LFC = low-frequency cetaceans; MFC = mid-frequency cetaceans; HFC = high-frequency cetaceans; PP = phocid pinnipeds; * denotes species listed under the Endangered Species Act.*

a - Given foundation installation would be confined to an area beyond the 20-m isobath, all of the estimated take has been allocated to the offshore stock.

b - The take request for pinnipeds was allocated to an even 50 percent split to each harbor seal and gray seal.

c - Although Level A harassment exposure estimates were calculated for North Atlantic right whales, Dominion Energy has not requested, nor does NMFS propose to authorize, any take by Level A harassment for this species as the proposed enhanced mitigation measures would reduce these to 0.

d - Atlantic white-sided dolphins are not expected, but due to shifts in habitat use, have been included in the take request based on a standard group size annually. We note that animat/exposure modeling was not done for this species.

e - In the event that the construction schedule is delayed in 2025, some WTGs may need to be constructed in 2026 instead, which would reduce the number of WTGs constructed in 2025 but it would not change the maximum number of takes of marine mammals proposed for authorization in this proposed rule. Instead, the values shown here for 2025 would be reduced with the remaining take carried over into 2026.

f - This analysis conservatively assumes 183 independent piling events for WTG monopile foundations would occur, although only 176 permanent WTGs would be installed.

g - While these species were not originally included in Dominion Energy's request, given recorded sightings/detections of these species during previous Dominion Energy IHAs in the same general area, NMFS has included these as species that may be harassed (by Level B harassment only) during the five-year effective period of this proposed rulemaking.

h - This species was incorporated after the animat analysis was completed so no take was estimated. Instead, a standard group size of animals was used instead for any analysis pertaining to this species.

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Additionally, as previously discussed above in the *Detailed Description of Specified Activities* section, Dominion Energy's construction schedule may shift during the project due to bad weather or other uncontrollable and unforeseen events, which may require foundation installation to shift and occur in 2026 instead. However, in this situation, the maximum amount of take proposed for authorization would not change; instead, some of the take that would have occurred in 2025 would instead occur in 2026, which means that the take of marine mammals during 2025 would be less than predicted here, as those takes would be shifted into 2026.

Cable Landfall Construction

Dominion Energy has proposed to install and remove both temporary goal posts comprised of steel pipe piles (to guide the placement of casing pipes installed using a trenchless installation method that does not produce noise levels with the potential to result in marine mammal harassment) and temporary cofferdams comprised of steel sheet piles at cable landfall locations.

Temporary Cofferdams

Dominion Energy would install and remove up to nine temporary cofferdams adjacent to the firing range at the State Military Reservation in Virginia Beach using a vibratory hammer. Dominion Energy assumed that a maximum of six days would be needed to install and remove a single cofferdam (3 days to install and 3 days to remove). Vibratory pile driving would occur for up to 60 minutes per day (1 hour) and up to 20 sheet piles could be installed per day (each cofferdam would necessitate 30 to 40 sheet piles, depending on the final chosen configuration). Table 16 includes details for the cofferdam scenario.

TABLE 16—TEMPORARY COFFERDAM SCENARIO

Installation scenario	Foundation installed	Installation details	Sound source level (dB re: 1 µPa at 1 m)	Duration of installation activity for a single pile
Cofferdam Installation	Sheet piles	Vibratory pile driving	195 SEL RMS	60 minutes.

Underwater noise associated with the construction of temporary cofferdams would only result from vibratory pile driving of steel sheet piles. As already described previously, Dominion Energy employed Tetra Tech to conduct the acoustic modeling to better understand the sound fields produced during these activities. These results also utilized information provided by iTAP (see Remmers and Bellmann (2021) Attachment Z–3 in Appendix A of Dominion Energy's application).

Following a similar approach to the one described for foundation installation, Tetra Tech calculated the ranges to the defined acoustic thresholds using a maximum received level-over-depth approach where the maximum received sound level that occurs within the water column at each sampling point was used. Tetra Tech calculated both the R_{max} and the $R_{95\%}$ for each of the marine mammal regulatory thresholds. The results of this analysis are presented below in Table 17 and are presented in terms of the $R_{95\%}$ range, based on the cofferdam modeling scenario found in Table 16 above. Given the nature of vibratory pile driving and the very small distances to Level A harassment thresholds (0–108 m; assuming 10 dB of sound attenuation), which accounts for one hour of vibratory pile driving per day, vibratory driving is not expected to result in Level A harassment. As Dominion Energy did not request any Level A harassment incidental to the installation and/or removal of sheet piles for temporary cofferdams, and based on these small distances, NMFS is not proposing to authorize any in this proposed action.

TABLE 17—ACOUSTIC RANGES ($R_{95\%}$), IN METERS, TO LEVEL A HARASSMENT (PTS) AND LEVEL B HARASSMENT THRESHOLDS FROM VIBRATORY PILE DRIVING DURING SHEET PILE INSTALLATION FOR MARINE MAMMAL FUNCTION HEARING GROUPS, ASSUMING AN AVERAGE SOUND SPEED PROFILE

Activity	Pile parameters	Approach used	Distance to marine mammal thresholds				
			Level A harassment (PTS)				Level B harassment (behavior)
			LFC (199 SEL)	MFC (198 SEL)	HFC (173 SEL)	PP (201 SEL)	All (120 SPL RMS)
Temporary Cofferdams.	2.8 m diameter Pin pile.	Vibratory Pile Driving	108	0	0	0	3,097

Note: LFC = low-frequency cetaceans; MFC = mid-frequency cetaceans; HFC = high-frequency cetaceans; PP = phocid pinnipeds.

dBSea was used to derive the acoustic ranges to the Level B harassment threshold, assuming no sound attenuation, around the cable landfall site. This included the ensonified area that was truncated by any land, which yielded an area (approximately 1 km^2) smaller than the radius of a circle (assuming 3,097 m). For the vibratory pile driving for temporary cofferdams associated with the sheet pile installation and removal, the daily ensonified area was 29.04 km^2 (11.21 mi^2), based on the acoustic range to the Level B harassment threshold (3,097 m), with a total ensonified area of 4,980 km^2 (1,922.8 mi^2) over 54 days of installation.

Density data from Roberts and Halpin (2022) were mapped within the boundary of the CVOW–C project area using geographic information system (GIS) software (Environmental Systems Research Institute (ESRI), 2017). To estimate marine mammal density around the temporary cofferdams, the greatest ensonified area was intersected with the density grid cells for each individual species to select all of those grid cells that the ensonified area intersects, representing the furthest extent where potential impacts to marine mammals could be expected. Maximum monthly densities (*i.e.,* the maximum density found in each grid cell) were averaged by season (spring (May), summer (June through August), and fall (September through October)). Since the timing of landfall construction activities may vary somewhat from the proposed schedule, the highest average seasonal density from May through October (Dominion Energy's planned construction period for temporary cofferdams) for each species was selected and used to estimate exposures from temporary cofferdam installation and removal (Table 18).

TABLE 18—HIGHEST AVERAGE SEASONAL MARINE MAMMAL DENSITIES FOR NEARSHORE TRENCHLESS INSTALLATION (TEMPORARY COFFERDAM AND TEMPORARY GOAL POST INSTALLATION) ACTIVITIES

Marine mammal hearing group and species	Stock	Highest average seasonal density (individual/100 km^2)
LFC:		
North Atlantic right whale *	Western North Atlantic	0.024
Fin whale *	Western North Atlantic	0.041
Humpback whale	Gulf of Maine	0.054
Minke whale	Canadian East Coast	0.124
Sei whale *	Nova Scotia	0.015
MFC:		
Sperm whale *	North Atlantic	0.001
Pygmy sperm whale	Western North Atlantic	[a] n/a
Atlantic spotted dolphin	Western North Atlantic	2.370
Atlantic white-sided dolphin	Western North Atlantic	0.325
Bottlenose dolphin	Southern Migratory Coastal	17.054
Clymene dolphin	Western North Atlantic	[a] n/a
Common dolphin	Western North Atlantic	1.808
False killer whale	Western North Atlantic	[a] n/a
Melon-headed whale	Western North Atlantic	[a] n/a
Pilot whale *spp*	Western North Atlantic	0.065
Pantropical spotted dolphin	Western North Atlantic	0.007
Risso's dolphin	Western North Atlantic	0.030
HFC:		
Harbor porpoise	Western North Atlantic	0.438
PP:		
Gray seal	Western North Atlantic	1.775
Harbor seal	Western North Atlantic	1.775

Note: LFC = low-frequency cetaceans; MFC = mid-frequency cetaceans; HFC = high-frequency cetaceans; PP = phocid pinnipeds; * denotes species listed under the Endangered Species Act.

[a] These species were added to the list of species that could be potentially impacted by the project after the adequate and complete date. However, given the rare occurrence of these species in the project area, proposed take was included only for foundation installation, and not for nearshore cable landfall activities.

For some species where little density information is available (*i.e.,* pilot whales), the annual density was used instead. Given overlap with the pinniped density models as the Roberts and Halpin (2022) dataset does not distinguish between some species, a collective ''pinniped'' density was used for both harbor and gray seal species and later split for the take estimates and request (Roberts *et al.,* 2016). This approach was the same as described in the WTG and OSS Foundation Installation section. Refer back to Table 18 for the densities used for temporary cofferdam installation and removal.

Given that use of the vibratory hammer during cofferdam installation and removal may occur on up to six days per cofferdam (three days for installation and three days for removal), a max total of 54 days was assumed necessary for all nine cofferdams. To calculate exposures, the highest average seasonal marine mammal densities were multiplied by the daily ensonified area (29.04 km^2) for installation and removal of sheet piles for temporary cofferdams. To yield the total estimated take for the activity, the per day take was multiplied by the ensonified area by the total number of days for the activity. To do this, the ensonified area was overlaid over the Roberts and Halpin (2022) densities to come up with a per day take which was then multiplied by 54 to account for the total number of days. This produced the results shown in Table 19. The product is then rounded, to generate an estimate of the total number of instances of harassment expected for each species over the duration of the work.

Given the small distances to the Level A harassment isopleths, Level A harassment incidental to this activity is not anticipated, even absent mitigation, although mitigation measures are proposed that would further reduce the risk. Therefore, Dominion Energy is not requesting and NMFS is not proposing to authorize Level A harassment related to cofferdam installation and removal.

Calculated take estimates for temporary cofferdams were then adjusted, for some species, based on group size characteristics known through the scientific literature and received sighting reports from previous projects and/or surveys. These group size estimates for cofferdam installation and removal are described below and were incorporated into the estimated take to yield the requested and proposed take estimate:

- Atlantic spotted dolphin: Adjusted based on 1 group size per day (20 per Dominion Energy, 2020, Jefferson *et al.,* 2015);
- Bottlenose dolphin (Combined Southern Migratory Coastal, Western North Atlantic Offshore): Adjusted based on 1 group size per day (15 per Jefferson *et al.,* 2015); and
- Common dolphin (short-beaked): Adjusted based on 1 group size per day (20 per Dominion Energy, 2021).

Given that take by Level B harassment was precautionarily proposed for authorization during two years of foundation installation for Clymene dolphins, false killer whales, melon-headed whales, and pygmy sperm whales, and given the nearshore nature of cable landfall activities, no take (and therefore, no group size adjustments) have been accounted for nearshore cable landfall activities.

Additionally, beyond group size adjustments, some slight modifications were performed for some species, including for harbor seals, gray seals, short- and long-finned pilot whales, and bottlenose dolphins. More specifically, the takes requested were accrued based on a 50/50 split for both pinniped species, as the Roberts and Halpin (2022) data does not differentiate the density by specific pinniped species. The density for pilot whales represents a single group (*Globicephala spp.*) and is not species-specific. Due to the minimal occurrence of both short-finned and long-finned pilot whales to occur in this area due to the shallow water, the requested take was allocated to a collective group, although short-finned pilot whales are more commonly seen in southern waters. Bottlenose dolphin stocks were split by the 20-m isobath cutoff, and then allocated specifically to the coastal stock of bottlenose dolphins (migratory southern coastal) due to the nearshore nature of these activities.

Below we present the estimated take and maximum amount of take proposed for authorization during temporary cofferdam installation and removal during the proposed five-year effective period for the CVOW–C project (Table 19). No take by Level A harassment is expected, nor has it been requested by Dominion Energy or proposed for authorization by NMFS. The proposed take for authorization accounts for three days for installation and 3 days for removal, for a total of six days for each of nine cofferdams (54 days total). To be conservative, Dominion Energy has requested take, by Level B harassment, based on the highest exposures predicted by the density-based take estimates, with some slight modifications to account for group sizes for some species.

Although North Atlantic right whales do migrate in coastal waters and have been seen off Virginia Beach, Virginia, they are not expected to occur in the nearshore waters where work would be occurring. The amount of work considered here is limited and would be conducted during a time when North Atlantic right whales are less likely to be migrating in this area. The distance to the Level B harassment isopleth (3.1 km) for installation and removal of the sheet piles associated with the cofferdams and the maximum distance to the Level A isopleth (0.11 km) remain in shallow waters in the nearshore environment and for a very short period of time (approximately one hour daily); thus, it is unlikely that right whales (or most species of marine mammals considered here) would be exposed to vibratory pile driving during cofferdam installation and removal at levels close to the 120 dB Level B harassment threshold or to the Level A harassment thresholds. Hence, Dominion Energy did not request take of North Atlantic right whales incidental to this activity and NMFS is not proposing to authorize it.

We note that these would be the maximum number of animals that may be harassed during vibratory pile driving for nearshore temporary cofferdams as the analysis conservatively assumes each exposure is a different animal. This is unlikely to be the case for all species shown here but is the most comprehensive assessment of the level of impact from this activity.

TABLE 19—DENSITY-BASED ESTIMATED AND MAXIMUM AMOUNT OF TAKE PROPOSED FOR AUTHORIZATION BY LEVEL B HARASSMENT FROM VIBRATORY PILE DRIVING ASSOCIATED WITH TEMPORARY COFFERDAM INSTALLATION AND REMOVAL

Marine mammal hearing group and species	Stock	Density-based estimated take	Takes of marine mammals proposed for authorization
		Level B harassment	
LFC:			
North Atlantic right whale *	Western North Atlantic	0.376	0
Fin whale *	Western North Atlantic	0.643	1
Humpback whale	Gulf of Maine	0.847	1
Minke whale	Canadian East Coast	1.945	2
Sei whale *	Nova Scotia	0.235	0
MFC:			
Sperm whale *	North Atlantic	0.016	0
Pygmy sperm whale	Western North Atlantic	[d] n/a	[d] n/a
Atlantic spotted dolphin	Western North Atlantic	37.169	240
Atlantic white-sided dolphin [c]	Western North Atlantic	5.097	5
Bottlenose dolphin	Southern Migratory Coastal	267.462	180
	Western North Atlantic, Offshore	[a] n/a	[a] n/a
Clymene dolphin	Western North Atlantic	[d] n/a	[d] n/a
Common dolphin	Western North Atlantic	28.355	240
False killer whale	Western North Atlantic	[d] n/a	[d] n/a
Melon-headed whale	Western North Atlantic	[d] n/a	[d] n/a
Pilot whale *spp*	Western North Atlantic	1.019	1
Pantropical spotted dolphin	Western North Atlantic	0.110	0
Risso's dolphin	Western North Atlantic	0.470	0
HFC:			
Harbor porpoise	Western North Atlantic	6.869	7
PP:			
Gray seal [b]	Western North Atlantic	13.919	14
Harbor seal [b]	Western North Atlantic	13.919	14

Note: LFC = low-frequency cetaceans; MFC = mid-frequency cetaceans; HFC = high-frequency cetaceans; PP = phocid pinnipeds; * denotes species listed under the Endangered Species Act.

[a] Given cofferdam installation and removal would be confined to an area below the 20-m isobath, all of the estimated take has been allocated to the coastal stock.

[b] The take request for pinnipeds was allocated to an even 50 percent split to each harbor seal and gray seal.

[c] Atlantic white-sided dolphins are not expected, but due to shifts in habitat use, have been included in the take request based on a standard group size annually. We note that animat/exposure modeling was not done for this species.

[d] Given take by Level B harassment was precautionarily proposed for authorization during two years of foundation installation for these species, no take has been calculated for cable landfall construction activities.

Temporary Goal Posts

To facilitate nearshore, trenchless installation for the export cables to shore, Direct Steerable Pipe Tunneling equipment utilizing a steerable tunnel boring machine would excavate ground while goal posts are used to guide steel casing pipes behind the tunnel boring machine using a pipe thruster. Of all the equipment planned for use during the tunneling and boring activities (*i.e.,* pipe thrusting machine, pumps, motors, powerpacks, and drill mud processing system), only the impact hammer is expected to cause harassment to marine mammals as other equipment either produces low source levels. The pipe thrusting machine does not vibrate or produce any noise as it only pushes the casing pipes so no harassment to marine mammals is expected to occur from the use of this equipment. Each temporary goal post, which would be installed via impact pile driving, would consist of 1.07 m (42 in) diameter steel pipe piles. Up to two steel pipes could be installed per day for a total duration of 130 minutes per goal post. The strike rate would require approximately 260 strikes per pile with a strike duration between 0.5 and 2 seconds. Up to 12 goal posts would be needed for each of the nine Direct Pipe (temporary cofferdam) locations, equating to a total of 108 piles necessary for the goal posts. Removal of the pipe piles would occur at a rate of 2 per day over 54 days to remove all 108 piles. Unlike installation, removal of pipe piles is not expected to cause take of marine mammals as mechanical and/or hydraulic equipment is used that does not produce noise. Because of this, the analysis described below only pertains to the installation of goal posts.

Tetra Tech applied the Level A harassment cumulative PTS criteria to a specific tab (for impact pile driving) spreadsheet (called the User Spreadsheet) that reflects NOAA Fisheries' 2018 Revisions to Technical Guidance (NOAA Fisheries, 2018a). The User Spreadsheet relies on overriding default values, calculating individual adjustment factors, and using the difference between levels with and without weighting functions for each of the five categories of hearing groups. The new adjustment factors in the spreadsheets allow for the calculation of cumulative sound exposure level (SEL_{cum}) distances and peak sound exposure (PK) distances and account for the accumulation (Safe Distance Methodology) using the source characteristics (duty cycle and speed) after Silve *et al.* (2014).

To calculate the distance to the acoustic threshold for Level B harassment of marine mammals, Tetra Tech utilizing a spread calculation to estimate the horizontal distance to the 160 dB re 1 μPa isopleth:

$$SPL(r) = SL - PL(r)$$

Where:

SPL = sound pressure level (dB re 1 μPa);

r = range (m), SL = source level (dB re 1 µPa m); and

PL = propagation loss as a function of distance (calculated as $20Log_{10}(r)$).

We note that while these methodologies provided by NOAA Fisheries are able to calculate the maximum distances to the Level A harassment and Level B harassment thresholds, these calculations do not allow for the inclusion of site-specific environmental parameters, as was described for activities analyzed through dBSea.

The results of this analysis are presented below in Table 20 and are presented in terms of the $R_{95\%}$ range. Table 20 demonstrates the maximum distances to both the regulatory thresholds for Level A harassment and Level B harassment for each marine mammal hearing group. Given the very small distances to the Level A harassment thresholds (4.5–152 m; assuming 10 dB of sound attenuation), which accounts for 130 minutes (approximately 2.2 hours) of impact pile driving per day, impact driving is not expected to result in Level A harassment. As Dominion Energy did not request any Level A harassment incidental to the installation and/or removal of steel pipe piles for temporary goal posts, and based on these small distances, NMFS is not proposing to authorize any in this proposed action.

TABLE 20—RANGES, IN METERS, TO LEVEL A HARASSMENT (PTS) AND LEVEL B HARASSMENT THRESHOLDS FROM IMPACT PILE DRIVING DURING STEEL PIPE PILE INSTALLATION OF GOAL POSTS FOR MARINE MAMMAL FUNCTION HEARING GROUPS

Activity	Pile parameters	Approach used	Distance to marine mammal thresholds (in meters)				
			Level A harassment (PTS onset)				Level B harassment (behavioral)
			LFC (183 dB SEL_{cum})	MFC (185 dB SEL_{cum})	HFC (155 dB SEL_{cum})	PP (185 dB SEL_{cum})	All (160 dB RMS)
Temporary Goal Posts	1.07 m diameter Steel Pipe Piles.	Impact Pile Driving	590.9	21.0	703.8	316.2	1,450

Note: LFC = low-frequency cetaceans; MFC = mid-frequency cetaceans; HFC = high-frequency cetaceans; PP = phocid pinnipeds.

Given the small distances to Level A harassment isopleths, Level A harassment incidental to this activity is not anticipated, even absent mitigation, although mitigation measures are proposed that would further reduce the risk. Therefore, Dominion Energy is not requesting and NMFS is not proposing to authorize Level A harassment related to goal post installation. The acoustic ranges to the Level B harassment threshold, assuming no sound attenuation, were used to calculate the ensonified area around the cable landfall site. The Ensonified Area is calculated as the following:

Ensonified Area = *pi x r*^{2},

Where:

r is the linear acoustic range distance from the source to the isopleth to the Level B harassment thresholds.

To accurately account for the greatest level of impact (via behavioral harassment) to marine mammals, Tetra Tech applied the evaluated maximum Level B harassment distance (1,450 m) as the basis for determining potential takes. To get an accurate value of the total ensonified area within the aquatic environment, the isopleth was overlaid on a map to determine if any truncation by land would occur due to the nearshore proximity of the goal posts. For the vibratory pile driving for temporary cofferdams associated with the sheet pile installation and removal, it was assumed that the daily ensonified area was 4.98 km^2 (1.92 mi^2), or a total ensonified area of 268.92 km^2 (103.83 mi^2) over 54 days of installation and removal. The daily ensonified area that resulted from this analysis (4.98 km^2) was carried forward into the take estimates as the daily ensonified area.

In the same approach as was undertaken by the temporary cofferdams, the greatest ensonified area was intersected with the density grid cells for each individual species to select all of those grid cells that the ensonified area intersects to estimate the marine mammal density relevant to the temporary goal posts. Maximum monthly densities (*i.e.,* the maximum density found in each grid cell) were averaged by season. Since the timing of landfall construction activities may vary somewhat from the proposed schedule, the highest average seasonal density from May through October (Dominion Energy's planned construction period for temporary goal posts) for each species was selected and used to estimate exposures from temporary goal post installation. For some species where little density information is available (*i.e.,* pilot whale *spp,* pantropical spotted dolphins), the annual density was used instead. Given overlap with the pinniped density models as the Roberts and Halpin (2022) dataset does not distinguish between some species, a collective ''pinniped'' density was used for both harbor and gray seal species and later split for the take estimates and request (Roberts *et al.,* 2016). This approach was the same as described in the temporary cofferdams. Furthermore, given the densities are the same as what was calculated for temporary cofferdams, we reference the reader back to Table 18 above.

To calculate exposures, the highest average seasonal marine mammal densities from Table 18 were multiplied by the daily ensonified area (4.98 km^2) for installation and removal of steel pipe piles for temporary goal posts. Given that use of the impact hammer during goal post installation may occur at a rate of 2 pipe piles per day for a total of 54 days (based on 108 total steel pipe piles), the daily estimated take was multiplied by 54 to produce the results shown in Table 21. The product is then rounded, to generate an estimate of the total number of instances of harassment expected for each species over the duration of the work. Again, as previously noted, no take was calculated for the removal of goal posts due to the equipment planned for use.

The take estimates for Level B harassment related to temporary goal post installation were then adjusted, for some species, based on group size characteristics known through the scientific literature and received sighting reports from previous projects and/or surveys. These group size estimates for temporary goal post installation are described below and were incorporated into the estimated take to yield the requested and proposed take estimate:

- Atlantic spotted dolphin: Adjusted based on 1 group size per day (20 per Dominion Energy, 2020; Jefferson *et al.,* 2015);
- Bottlenose dolphin (Southern Migratory Coastal Stock): Adjusted based on 1 group size per day (15 per Jefferson *et al.,* 2015); and
- Short-beaked common dolphin: Adjusted based on 1 group size per day (20 per Dominion Energy, 2021).

Given that take by Level B harassment was precautionarily proposed for authorization during two years of foundation installation for Clymene dolphins, false killer whales, melon-headed whales, and pygmy sperm whales, and given the nearshore nature of cable landfall activities, no take (and therefore, no group size adjustments) have been accounted for nearshore cable landfall activities.

Additionally, beyond group size adjustments, some slight modifications were performed for some species, including for harbor seals, gray seals, short- and long-finned pilot whales, and bottlenose dolphins. More specifically, the takes requested were accrued based on a 50/50 split for both pinniped species, as the Roberts and Halpin (2022) data does not differentiate the density by specific pinniped species. The density for pilot whales represents a single group (*Globicephala spp.*) and is not species-specific. Due to the occurrence of both short-finned and long-finned pilot whales to occur in this area, the requested take was allocated to a collective group, although short-finned pilot whales are commonly seen in southern waters. Bottlenose dolphin stocks were split by the 20-m isobath cutoff, and then allocated specifically to the coastal stock of bottlenose dolphins (migratory southern coastal) due to the nearshore nature of these activities. Lastly, due to the size of the Level B harassment isopleth (1,450 m), Dominion Energy has proposed a 1,500 m (1,640.4 ft) shutdown zone to exceed this distance. However, given the proximity to land, large whales are not anticipated to occur this close to nearshore activities. Because of the proposed mitigation zone and the nearshore location of the temporary goal posts, Dominion Energy has requested, and NMFS has proposed, to adjust the proposed takes for large whales (*i.e.,* mysticetes and sperm whales) to zero.

Below we present the estimated take and maximum amount of take proposed for authorization during temporary goal post installation during the proposed five-year effective period for the CVOW–C project (Table 21). No take by Level A harassment is expected, nor has it been requested by Dominion Energy or proposed for authorization by NMFS. These proposed take estimates take into account 54 days total for temporary goal post activities, including installation and removal, at a rate of 2 steel pipe piles installed per day over 130 minutes.

TABLE 21—DENSITY-BASED ESTIMATED AND MAXIMUM AMOUNT OF TAKE BY LEVEL B HARASSMENT FROM IMPACT PILE DRIVING ASSOCIATED WITH TEMPORARY GOAL POST INSTALLATION

Marine mammal hearing group and species	Stock	Density-based estimated take	Requested take of marine mammals
		Level B harassment	
LFC:			
North Atlantic right whale *	Western North Atlantic	0.065	0
Fin whale *	Western North Atlantic	0.110	0
Humpback whale	Gulf of Maine	0.145	0
Minke whale	Canadian East Coast	0.333	0
Sei whale *	Nova Scotia	0.040	0
MFC:			
Sperm whale *	North Atlantic	0.003	0
Pygmy sperm whale	Western North Atlantic	[d] n/a	[d] n/a
Atlantic spotted dolphin	Western North Atlantic	6.373	360
Atlantic white-sided dolphin [c]	Western North Atlantic	0.874	1
Bottlenose dolphin	Southern Migratory Coastal	45.862	270
	Western North Atlantic, Offshore	[a] n/a	[a] n/a
Clymene dolphin	Western North Atlantic	[d] n/a	[d] n/a
Common dolphin	Western North Atlantic	4.862	360
False killer whale	Western North Atlantic	[d] n/a	[d] n/a
Melon-headed whale	Western North Atlantic	[d] n/a	[d] n/a
Pilot whale *spp.*	Western North Atlantic	0.175	0
Pantropical spotted dolphin	Western North Atlantic	0.019	0
Risso's dolphin	Western North Atlantic	0.081	0
HFC:			
Harbor porpoise	Western North Atlantic	1.178	1
PP:			
Gray seal [b]	Western North Atlantic	2.387	2
Harbor seal [b]	Western North Atlantic	2.387	2

Note: LFC = low-frequency cetaceans; MFC = mid-frequency cetaceans; HFC = high-frequency cetaceans; PP = phocid pinnipeds; * denotes species listed under the Endangered Species Act.

[a] Given temporary goal post installation would be confined to an area below the 20-m isobath, all of the estimated take has been allocated to the coastal stock.

[b] The take request for pinnipeds was allocated to an even 50 percent split to each harbor seal and gray seal.

[c] Atlantic white-sided dolphins are not expected, but due to shifts in habitat use, have been included in the take request based on a standard group size annually. We note that animat/exposure modeling was not done for this species.

[d] Given take by Level B harassment was precautionarily proposed for authorization during two years of foundation installation for these species, no take has been calculated for cable landfall construction activities.

We note that these would be the maximum number of animals that may be harassed during impact pile driving for nearshore temporary goal posts as the analysis conservatively assumes each exposure is a different animal. This is unlikely to be the case for all species shown here but is the most comprehensive assessment of the level of impact from this activity.

HRG Surveys

Dominion Energy's proposed HRG survey activities includes the use of impulsive (*i.e.,* boomers and sparkers) and non-impulsive (*i.e.,* CHIRP SBPs) sources. Refer back to Table 4 for a representative list of the acoustic sources and their operational parameters. Authorized takes would be by Level B harassment only, in the form of disruption of behavioral patterns for individual marine mammals resulting from exposure to noise from certain HRG acoustic sources. Based primarily on the characteristics of the signals produced by the acoustic sources planned for use, Level A harassment is neither anticipated, even absent mitigation, nor proposed to be authorized. Consideration of the anticipated effectiveness of the mitigation measures (*i.e.,* pre-start clearance and shutdown measures), discussed in detail below in the Proposed Mitigation section, further strengthens the conclusion that Level A harassment is not a reasonably expected outcome of the survey activity. Therefore, the potential for Level A harassment is not evaluated further in this document. Dominion Energy did not request, and NMFS is not proposing to authorize, take by Level A harassment incidental to HRG surveys. Please see Dominion Energy's application for the CVOW–C project for details of a quantitative exposure analysis (*i.e.,* calculated distances to Level A harassment isopleths and Level A harassment exposures). No serious injury or mortality is anticipated to result from HRG survey activities.

Specific to HRG surveys, in order to better consider the narrower and directional beams of the sources, NMFS has developed a tool for determining the sound pressure level (SPL_{rms}) at the 160-dB isopleth for the purposes of estimating the extent of Level B harassment isopleths associated with HRG survey equipment (NMFS, 2020). This methodology incorporates frequency-dependent absorption and some directionality to refine estimated ensonified zones. Tetra Tech used NMFS' methodology with additional modifications to incorporate a seawater absorption formula and account for energy emitted outside of the primary beam of the source. For sources that operate with different beamwidths, the maximum beam width was used, and the lowest frequency of the source was used when calculating the frequency-dependent absorption coefficient (see Table 4).

NMFS considers the data provided by Crocker and Fratantonio (2016) to represent the best available information on source levels associated with HRG equipment and, therefore, recommends that source levels provided by Crocker and Fratantonio (2016) be incorporated in the method described above to estimate ranges to the Level A harassment and Level B harassment isopleths. In cases when the source level for a specific type of HRG equipment is not provided in Crocker and Fratantonio (2016), NMFS recommends that either the source levels provided by the manufacturer be used, or, in instances where source levels provided by the manufacturer are unavailable or unreliable, a proxy from Crocker and Fratantonio (2016) be used instead. Tetra Tech utilized the following criteria for selecting the appropriate inputs into the NMFS User Spreadsheet Tool (NMFS, 2018):

(1) For equipment that was measured in Crocker and Fratantonio (2016), the reported source level for the most likely operational parameters was selected.

(2) For equipment not measured in Crocker and Fratantonio (2016), the best available manufacturer specifications were selected. Use of manufacturer specifications represent the absolute maximum output of any source and do not adequately represent the operational source. Therefore, they should be considered an overestimate of the sound propagation range for that equipment.

(3) For equipment that was not measured in Crocker and Fratantonio (2016) and did not have sufficient manufacturer information, the closest proxy source measured in Crocker and Fratantonio (2016) was used.

The Dura-spark measurements and specifications provided in Crocker and Fratantonio (2016) were used for all sparker systems proposed for the HRG surveys. These included variants of the Dura-spark sparker system and various configurations of the GeoMarine Geo-Source sparker system. The data provided in Crocker and Fratantonio (2016) represent the most applicable data for similar sparker systems with comparable operating methods and settings when manufacturer or other reliable measurements are not available. Crocker and Fratantonio (2016) provide S-Boom measurements using two different power sources (CSP–D700 and CSP–N). The CSP–D700 power source was used in the 700 joules (J) measurements but not in the 1,000 J measurements. The CSP–N source was measured for both 700 J and 1,000 J operations but resulted in a lower source level; therefore, the single maximum source level value was used for both operational levels of the S-Boom.

Table 22 identifies all the representative survey equipment that operates below 180 kHz (*i.e.,* at frequencies that are audible and have the potential to disturb marine mammals) that may be used in support of planned survey activities, and are likely to be detected by marine mammals given the source level, frequency, and beamwidth of the equipment. This table also provides all operating parameters used to calculate the distances to threshold for marine mammals.

TABLE 22—SUMMARY OF REPRESENTATIVE HRG SURVEY EQUIPMENT WITH OPERATING PARAMETERS TO CALCULATE HARASSMENT DISTANCES FOR MARINE MAMMALS

Equipment classification	Survey equipment	Operating frequency (kHz)	Source level (SL_{RMS}) (dB re 1μPa)
Multibeam Echosounder	R2Sonics 2026	170–450	191
Synthetic Aperture Sonar, combined bathymetric/sidescan.	Kraken Aquapix [a]	337	N/A
Sidescan Sonar	Edgetech 4200 dual frequency [a]	300 and 600	N/A
Parametric SBP	Innomar SES–2000 Medium 100	2–22	241
Non-Parametric SBP	Edgetech 216 CHIRP	2–16	193
	Edgetech 512 CHIRP	0.5–12	177

TABLE 22—SUMMARY OF REPRESENTATIVE HRG SURVEY EQUIPMENT WITH OPERATING PARAMETERS TO CALCULATE HARASSMENT DISTANCES FOR MARINE MAMMALS—Continued

Equipment classification	Survey equipment	Operating frequency (kHz)	Source level (SL_{RMS}) (dB re 1μPa)
Medium Penetration SBP	GeoMarine Dual 400 Sparker 800 J	0.25–4	200
	Applied Acoustics S-Boom (Triple Plate Boomer 1000 J).	0.5–3.5	203

Note: dB re 1 μPa m—decibels referenced to 1 MicroPascal at 1 meter; kHz—kilohertz.
[a] Operating frequencies are above marine mammal hearing thresholds.

Results of modeling using the methodology described above indicated that, of the HRG equipment planned for use by Dominion Energy that has the potential to result in Level B harassment of marine mammals, sound produced by the GeoMarine Dual 400 sparker would propagate furthest to the Level B harassment isopleth (100 m (328 ft); Table 23). For the purposes of take estimation, it was conservatively assumed that sparker would be the dominant acoustic source for all survey days (although, again, this may not always be the case). Thus, the range to the isopleth corresponding to the threshold for Level B harassment for and the boomer and sparkers (100 m) was used as the basis of take calculations for all marine mammals. This is a conservative approach, as the actual sources used on individual survey days, or during a portion of a survey day, may produce smaller distances to the Level B harassment isopleth.

TABLE 23—SUMMARY OF REPRESENTATIVE HRG SURVEY EQUIPMENT DISTANCES TO THE LEVEL B HARASSMENT THRESHOLD

Equipment classification	Survey equipment	Distance (m) to Level B harassment threshold
Multibeam Echosounder	R2Sonics 2026	0.3
Synthetic Aperture Sonar, combined bathymetric/sidescan	Kraken Aquapix [a]	N/A
Sidescan Sonar	Edgetech 4200 dual frequency [a]	N/A
Parametric SBP	Innomar SES–2000 Medium 100	0.7
Non-Parametric SBP	Edgetech 216 CHIRP	10.2
	Edgetech 512 CHIRP	2.4
Medium Penetration SBP	GeoMarine Dual 400 Sparker 800 J	100.0
	Applied Acoustics S-Boom (Triple Plate Boomer 1000 J)	21.9

Note: dB re 1 μPa m—decibels referenced to 1 MicroPascal at 1 meter; kHz—kilohertz
[a] Operating frequencies are above marine mammal hearing thresholds.

To estimate densities for the HRG surveys occurring both within the Lease Area and within the Export Cable Routes for the CVOW–C project based on the Roberts and Halpin (2022) dataset the relevant density models using GIS (ESRI, 2017) were overlaid to the CVOW–C project and survey area. The boundary of the CVOW–C HRG project area corresponds to the Lease Area and Export Cable Routes, for which the area was not increased due to an additional perimeter, as was done for foundation installation. For each survey segment, the average densities (*i.e.,* the average density of each grid cell) was averaged by season over the survey duration (spring, summer, fall, and winter) for the entire HRG survey area. The average seasonal density within the HRG survey area was then selected for inclusion into the take calculations. Refer to Table 25 for the densities used for HRG surveys.

As previously stated, of the HRG equipment planned for use by Dominion Energy that has the potential to result in Level B harassment of marine mammals, sound produced by the GeoMarine Dual 400 sparker would propagate furthest to the Level B harassment isopleth (100 m). This maximum range to the Level B harassment threshold and the estimated trackline distance traveled per day by a given survey vessel (*i.e.,* 58 km (36 mi); Table 24), assuming a travel speed of 1.3 kts (1.49 miles per hour), were then used to calculate the daily ensonified area, or zone of influence (ZOI) around the survey vessel.

TABLE 24—SURVEY DURATIONS AND DAILY/ANNUAL TRACKLINE DISTANCES PLANNED TO OCCUR DURING THE PROPOSED CVOW–C PROJECT

Survey year	Survey segment	Number of active survey vessel days	Estimated distances per day (km)	Annual line kilometers
2024	Pre-lay surveys	65		3,770
2025	As-built surveys and pre-lay surveys	249		14,442
2026	As-built surveys	58	58	3,364
2027	Post-construction surveys	368		21,344

TABLE 24—SURVEY DURATIONS AND DAILY/ANNUAL TRACKLINE DISTANCES PLANNED TO OCCUR DURING THE PROPOSED CVOW–C PROJECT—Continued

Survey year	Survey segment	Number of active survey vessel days	Estimated distances per day (km)	Annual line kilometers
2028	Post-construction surveys	368		21,344

The ZOI is a representation of the maximum extent of the ensonified area around a HRG sound source over a 24-hr period. The ZOI for each piece of equipment operating at or below 180 kHz was calculated per the following formula:

Mobile Source ZOI = $(Distance/day \times 2r) + pi \times r^2$

Where:

Distance/day is the maximum distance a survey vessel could travel in a 24-hour period; and

r is the linear distance from the source to the harassment threshold.

The largest daily ZOI (111.6 km^2 (4.48 mi^2)), associated with the proposed use of the sparker, was applied to all planned survey days.

As previously described, this assumes a total length of surveys that will occur within the CVOW–C project area as 64,264 km^2 (24,812.5 mi^2). As Dominion Energy is not sure of the exact geographic locations of the survey effort, these values cannot discreetly be broken up between the Lease Area and the Export Cable Routes. However, the values presented in Table 24 provide a comprehensive accounting of the total annual survey effort anticipated to occur.

For HRG surveys, density data from Roberts and Halpin (2022) were mapped within the boundary of the CVOW–C project area using GIS software (ESRI, 2017). The boundary of the CVOW–C HRG project area corresponds to the Lease Area and Export Cable Routes, for which the area was not increased due to an additional perimeter, as was done for foundation installation. For each survey segment, the average densities (*i.e.,* the average density of each grid cell) was averaged by season over the survey duration (spring, summer, fall, and winter) for the entire HRG survey area. The average seasonal density within the HRG survey area was then selected for inclusion into the take calculations. The potential Level B density-based harassment exposures are estimated by multiplying the average seasonal density of each species within the survey area by the daily ZOI. That product was then multiplied by the number of planned survey days in each sector during the approximately 5-year construction timeframe (refer back to Table 5 and 24) and the product was rounded to the nearest whole number. As described above, this is a conservative estimate as it assumes the HRG source that results in the greatest isopleth distance to the Level B harassment threshold would be operated at all times during the entire survey, which may not ultimately occur. These density values are found in Table 25.

TABLE 25—HIGHEST AVERAGE SEASONAL MARINE MAMMAL DENSITIES FOR HRG SURVEY ACTIVITIES

Marine mammal hearing group and species	Stock	Highest average seasonal density (individual/ 100 km^2)
LFC:		
North Atlantic right whale *	Western North Atlantic	0.095
Fin whale *	Western North Atlantic	0.080
Humpback whale	Gulf of Maine	0.103
Minke whale	Canadian East Coast	0.344
Sei whale *	Nova Scotia	0.038
MFC:		
Sperm whale *	North Atlantic	0.002
Pygmy sperm whale	Western North Atlantic	[a] n/a
Atlantic spotted dolphin	Western North Atlantic	4.649
Atlantic white-sided dolphin	Western North Atlantic	0.678
Bottlenose dolphin	Combined Southern Migratory Coastal, Western North Atlantic Offshore.	24.157
Clymene dolphin	Western North Atlantic	[a] n/a
Common dolphin	Western North Atlantic	6.599
False killer whale	Western North Atlantic	[a] n/a
Melon-headed whale	Western North Atlantic	[a] n/a
Pilot whale *spp*	Western North Atlantic	0.065
Pantropical spotted dolphin	Western North Atlantic	0.007
Risso's dolphin	Western North Atlantic	0.057
HFC:		
Harbor porpoise	Western North Atlantic	1.477
PP:		
Gray seal	Western North Atlantic	5.402
Harbor seal	Western North Atlantic	5.402

Note: LFC = low-frequency cetaceans; MFC = mid-frequency cetaceans; HFC = high-frequency cetaceans; PP = phocid pinnipeds; * denotes species listed under the Endangered Species Act.

[a] This species was incorporated after the animat analysis was completed so no take was estimated. Instead, a standard group size of animals was used instead for any analysis pertaining to this species.

For most species or species groups, monthly densities are available, though in some cases insufficient data are available or we are unable to differentiate species groups by individual *genus* (*e.g.,* gray and harbor seals). In these situations, additional adjustments are necessary and are described here. For pinnipeds, the density values derived from the Roberts and Halpin (2022) data were considered unrealistic given a reduced summer occurrence near the CVOW–C project area in the summer (Hayes *et al.,* 2021). Based on information found in Hayes *et al.* (2021), a conservative density estimate of 0.00001 animals/km^2 was used to represent the summer density of both pinniped species within the modeled CVOW–C project area and Lease Area plus the 8.9 km perimeter. Any take by Level B harassment derived from these densities would be further split by an even percentage (50/50) for each species. For bottlenose dolphins, due to specific environmental characteristics that were used to partition the Southern Migratory Coastal and Western North Atlantic Offshore stocks, both the coastal and the offshore stocks were divided based on the location of the 20-m isobath. Information by Hayes *et al.* (2021) indicates a boundary between the two stocks at the 20-m isobath located north of Cape Hatteras, North Carolina. Therefore, all bottlenose dolphins whose grid cells were less than the 20-m isobath in the CVOW–C modeling area or within the 8.9 km of the Lease Area were allocated to the Southern Migratory Coastal stock. All density grid cells greater than the 20-m isobath from the CVOW–C modeling area or within the 8.9 km of the Lease Area were allocated to the offshore stock. The number of marine mammals expected to be incidentally taken per day is then calculated by estimating the number of each species predicted to occur within the daily ensonified area (animals/km^2), incorporating the maximum seasonal estimated marine mammal densities as described above. Estimated numbers of each species taken per day across all survey sites are then multiplied by the total number of survey days annually. The product is then rounded, to generate an estimate of the total number of instances of harassment expected for each species over the duration of the survey. A summary of this method is illustrated in the following formula:

$$Estimated\ Take = D \times ZOI \times \#\ of\ days$$

Where:

D is the average seasonal density for each species; and

ZOI is the maximum daily ensonified area to the harassment threshold.

The take estimates were then adjusted, for some species, based on group size and sighting reports from previous projects and/or surveys. These group size estimates for HRG surveys are described below and were incorporated into the estimated take to yield the requested and proposed take estimate:

- Atlantic white-sided dolphin: Adjusted based on 1 group size per year (15 per Reeves *et al.,* 2002);
- Risso's dolphin: Adjusted based on 1 group size per year (25 per Dominion Energy, 2021; Jefferson *et al.,* 2015);
- Bottlenose dolphin (Combined Southern Migratory Coastal, Western North Atlantic Offshore): Adjusted based on 1 group size per day (15 per Jefferson *et al.,* 2015);
- Pantropical spotted dolphins: Adjusted based on 1 group size per day (20 individuals);
- Common dolphins: Adjusted based on 1 group size per day (20 individuals);
- Common dolphins: Adjusted based on 1 group size per year (20 individuals); and
- Pilot whale *spp.:* Adjusted based on 1 group size per year (20 individuals).

Given the very small zone sizes associated with HRG surveys, no take in addition to that requested, and proposed to be authorized, for foundation installation (which has much larger sizes) is proposed to be authorized for the following species: false killer whales, melon-headed whales, and pygmy sperm whales. Clymene dolphins are from the Stenella *sp.* so shutdown would be waived for this species given their prevalence to bow-ride. Because of this, no take (and therefore, no group size adjustments) have been accounted for these species from HRG survey activities.

Similar to other activities, the density-based exposure estimates were adjusted due to the manner in which density data is presented in the Duke models for harbor seals, gray seals, short- and long-finned pilot whales, and bottlenose dolphins. More specifically, the takes requested were split 50/50 for both pinniped species, as the Roberts and Halpin (2022) data does not differentiate the density by specific pinniped species. The density for pilot whales represents a single group (*Globicephala spp.*) and is not species-specific. Due to the occurrence of both short-finned and long-finned pilot whales to occur in this area, the requested take was allocated to a collective group, although short-finned pilot whales are commonly seen in southern waters. Due to an inability to spatial resolution at the current state of the survey planning, bottlenose dolphin stocks were combined into a single group for both the coastal stock of bottlenose dolphins (Migratory Southern Coastal) and the offshore stock (Western North Atlantic Offshore).

Below we present the maximum amount of take proposed for authorization during HRG surveys occurring during the proposed five-year effective period for the CVOW–C project (Table 26). No take by Level A harassment is expected, nor has it been requested by Dominion Energy or proposed for authorization by NMFS. We note that these would be the maximum number of animals that may be harassed during HRG surveys as the analysis conservatively assumes each exposure is a different animal. This is unlikely to be the case for all species shown here but is the most comprehensive assessment of the level of impact from this activity.

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Table 26 – Density-based Estimated and Take Proposed For Authorization, By Level B Harassment, From HRG Surveys Over 5-years

Marine Mammal Hearing Group and Species		Stock	Annual Density-based Estimated Take From HRG Surveys						Annual Take Proposed For Authorization From HRG Surveys					
			2024	2025	2026	2027	2028	2029	2024	2025	2026	2027	2028	2029[a]
LFC	North Atlantic right whale*	Western North Atlantic	0.318	1.217	0.283	1.798	1.798	0	0	1	0	2	2	0
	Fin whale*	Western North Atlantic	0.378	1.448	0.337	2.140	2.140	0	0	1	0	2	2	0
	Humpback whale	Gulf of Maine	0.454	1.738	0.405	2.569	2.569	0	0	2	0	3	3	0
	Minke whale	Canadian East Coast	0.786	3.012	0.702	4.452	4.452	0	1	3	1	4	4	0
	Sei whale*	Nova Scotia	0.144	0.550	0.128	0.813	0.813	0	0	1	0	1	1	0
MFC	Sperm whale*	North Atlantic	0.008	0.029	0.007	0.043	0.043	0	0	0	0	0	0	0
	Pygmy sperm whale	Western North Atlantic	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]
	Atlantic spotted dolphin	Western North Atlantic	13.618	52.168	12.152	77.100	77.100	0	1,300	4,980	1,160	7,360	7,360	0
	Atlantic white-sided dolphin	Western North Atlantic	2.397	9.182	2.139	13.571	13.571	0	15	15	15	15	15	0

	Bottlenose dolphin	Southern Migratory Coastal and Western North Atlantic - Offshore	109.021	417.634	97.280	617.227	617.227	0	975	3,735	870	5,520	5,520	0
	Clymene dolphin	Western North Atlantic	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]
	Common dolphin	Western North Atlantic	22.730	87.072	20.282	128.685	128.685	0	1,300	4,980	1,160	7,360	7,360	0
	False killer whale	Western North Atlantic	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]
	Melon-headed whale	Western North Atlantic	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]
	Pilot whale *spp.*	Western North Atlantic	0.491	1.883	0.439	2.783	2.783	0	20	20	20	20	20	0
	Pantropical spotted dolphin	Western North Atlantic	0.053	0.203	0.047	0.300	0.300	0	20	20	20	20	20	0
	Risso's dolphin	Western North Atlantic	0.280	1.072	0.250	1.584	1.584	0	25	25	25	25	25	0
HFC	Harbor porpois	Western North	5.278	20.218	4.710	29.881	29.881	0	5	20	5	30	30	0

	e	Atlantic												
PP	Gray seal	Western North Atlantic	5.070	19.422	4.524	28.704	28.704	0	5	19	5	29	29	0
	Harbor seal	Western North Atlantic	5.070	19.422	4.524	28.704	28.704	0	5	19	5	29	29	0

*Note: LFC = low-frequency cetaceans; MFC = mid-frequency cetaceans; HFC = high-frequency cetaceans; PP = phocid pinnipeds; * denotes species listed under the Endangered Species Act.*

Note: - indicates no group size adjustment was used.

a - Although the proposed rule, if promulgated, would have an effective period for five full years (from early 2024 to early 2029), no work is anticipated to occur in 2029 which means no take has been requested or proposed for 2029.

b - Given take by Level B harassment was precautionarily proposed for authorization during two years of foundation installation for these species, no take has been calculated for HRG survey activities.

Total Proposed Takes Across All Activities

The amount of Level A harassment and Level B harassment proposed to be authorized for all activities considered in this proposed rule (WTG and OSS foundation installation, cable landfall construction, and HRG surveys) are presented in Table 27. The mitigation and monitoring measures provided in the Proposed Mitigation and Proposed Monitoring and Reporting sections are activity-specific and are designed to minimize acoustic exposures to marine mammal species.

The take numbers NMFS proposes for authorization (Table 27) are considered the maximum number that could occur (*i.e.,* there are multiple reasons that there could be fewer) for the following key reasons:

• The proposed take accounts for 183 pile driving events when only 176 foundations may be installed. It could be that no piles will require the need to be re-driven.

• The amount of Level A harassment proposed to be authorized considered the maximum of up to two monopiles per day being installed and use of acoustic ranges which does not account for animal movement.

• The amount of take, by Level A harassment, proposed to be authorized does not account for the likelihood that marine mammals would avoid a stimulus when possible before the individual accumulates enough acoustic energy to potentially cause auditory injury.

• All take estimates assume all piles are installed in the month with the highest average seasonal and/or annual densities for each marine mammal species and/or stock based on the construction schedule.

• Dominion Energy assumed the maximum number of temporary cofferdams (up to nine) and goal posts (up to 108) would be installed when, during construction, fewer piles may be installed and, in the case of cofferdams, may not be installed at all (Dominion Energy may use a gravity-cell structure in lieu of cofferdams which would not generate noise levels that would result in marine mammal harassment).

• The amount of take, by Level B harassment, proposed to be authorized does not account for the effectiveness of the proposed monitoring and mitigation measures, with the exception of use of noise attenuation device, for any species.

The Year 1 take estimates include HRG surveys, vibratory and impact installation of WTG and OSS foundations, the impact installation and removal of temporary goal posts, and the vibratory installation and removal of temporary cofferdams. Year 2 includes HRG surveys and the vibratory and impact installation of WTG and OSS foundations. Years 3, 4, and 5 each include HRG surveys. Dominion Energy has noted that Year 3 may include some installation of foundation piles for WTGs if they fall behind their construction schedule. However, if this occurs, this would just reduce the number of WTGs installed in Year 2. Exact durations for HRG surveys in each construction are not given although estimates are provided above and are repeated here: 65 days in 2024, 249 days in 2025, 58 days in 2026, and 368 days in each of 2027 and 2028. These estimates are based on the effort of two concurrently operating survey vessels.

Table 27 shows the estimated take of each species for each year based on the planned distribution of activities. Tables 28 and 29 show the total take over five years and the maximum take proposed for authorization in any one year, respectively.

Table 27 – Proposed Level A Harassment and Level B Harassment Takes For All Activities Over 5 Years (2024-2029)

Marine Mammal Hearing Group and Species		Stock	Total Annual Take											
			2024[c]		2025[c]		2026		2027		2028		2029[a]	
			Level A harassm cnt	Level B harassm cnt	Level A harassm cnt	Level B harassm cnt	Level A harassm cnt	Level B harassm cnt	Level A harassm cnt	Level B harassm cnt	Level A harassm cnt	Level B harassm cnt	Level A harassm cnt	Level B harassm cnt
LFC	North Atlantic right whale*	Wester n North Atlantic	0	6	0	7	0	0	0	2	0	2	0	0
	Fin whale*	Wester n North Atlantic	4	113	3	91	0	0	0	2	0	2	0	0
	Humpb ack whale	Gulf of Maine	4	130	4	106	0	0	0	3	0	3	0	0
	Minke whale	Canadia n East Coast	8	56	7	51	0	1	0	4	0	4	0	0
	Sei whale*	Nova Scotia	1	3	1	3	0	0	0	1	0	1	0	0
MFC	Sperm whale*	North Atlantic	0	3	0	3	0	0	0	0	0	0	0	0
	Pygmy sperm whale[b]	Wester n North Atlantic	0	1	0	1	0	0	0	0	0	0	0	0
	Atlantic spotted dolphin	Wester n North Atlantic	0	4,008	0	6,876	0	1,160	0	7,360	0	7,360	0	0
	Atlantic	Wester	0	36	0	30	0	15	0	15	0	15	0	0

	white-sided dolphin	n North Atlantic												
	Bottlenose dolphin	Western North Atlantic - Offshore	0	4,290	0	3,602	0	0	0	0	0	0	0	0
		Southern Migratory Coastal	0	450	0	0	0	0	0	0	0	0	0	0
		Southern Migratory Coastal and Western North Atlantic - Offshore	0	975	0	3,735	0	870	0	5,520	0	5,520	0	0
	Clymene dolphin[b]	Western North Atlantic	0	5	0	5	0	0	0	0	0	0	0	0
	Common Dolphin	Western North Atlantic	0	3,620	0	6,360	0	1,160	0	7,360	0	7,360	0	0
	False killer whale[b]	Western North Atlantic	0	4	0	4	0	0	0	0	0	0	0	0
	Melon-	Wester	0	5	0	5	0	0	0	0	0	0	0	0

	headed whale[b]	n North Atlantic												
	Pilot whale *spp.*	Western North Atlantic	0	82	0	70	0	20	0	20	0	20	0	0
	Pantropical spotted dolphin	Western North Atlantic	0	40	0	40	0	20	0	20	0	20	0	0
	Risso's dolphin	Western North Atlantic	0	50	0	48	0	25	0	25	0	25	0	0
HFC	Harbor porpoise	Gulf of Maine/ Bay of Fundy	1	36	1	40	0	5	0	30	0	30	0	0
PP	Gray seal	Western North Atlantic	1	83	1	72	0	5	0	29	0	29	0	0
	Harbor seal	Western North Atlantic	1	83	1	72	0	5	0	29	0	29	0	0

*Note: LFC = low-frequency cetaceans; MFC = mid-frequency cetaceans; HFC = high-frequency cetaceans; PP = phocid pinnipeds; * denotes species listed under the Endangered Species Act.*

a - Although the proposed rule, if promulgated, would have an effective period for five full years (from early 2024 to early 2029), no work is anticipated to occur in 2029 which means no take has been requested or proposed for 2029.

b - While these species were not originally included in Dominion Energy's request, given recorded sightings/detections of these species during previous Dominion Energy IHAs in the same general area, NMFS has included these as species that may be harassed (by Level B harassment only) during the five-year effective period of this proposed rulemaking.

c - Either 2024 Or 2025 represent the maximum amount of take that would be authorized annually, specific to each species and/or stock.

Table 28 – Total 5-Year Takes Of Marine Mammals (By Level A Harassment And Level B Harassment) Proposed to be Authorized For All Activities (2024-2029)

Marine Mammal Hearing Group and Species		Stock	NMFS Stock Abundance	5-Year Totals		
				Proposed Level A Harassment	Proposed Level B Harassment	5-year Total (Level A + Level B)
LFC	North Atlantic right whale*	Western North Atlantic	338[a]	0	17	17
	Fin whale*	Western North Atlantic	6,802	7	208	215
	Humpback whale	Gulf of Maine	1,396	8	242	250
	Minke whale	Canadian East Coast	21,968	15	116	131
	Sei whale*	Nova Scotia	6,292	2	8	10
MFC	Sperm whale*	North Atlantic	4,349	0	6	6
	Pygmy sperm whale[b]	Western North Atlantic	7,750	0	2	2
	Atlantic spotted dolphin	Western North Atlantic	39,921	0	26,764	26,764
	Atlantic white-sided dolphin	Western North Atlantic	93,233	0	111	111
	Bottlenose dolphin	Western North Atlantic - Offshore	62,851	0	7,892	7,892
		Southern Migratory Coastal	6,639	0	450	450
		Southern Migratory Coastal and Western North Atlantic - Offshore	69,490	0	16,620	16,620

	Clymene dolphin[b]	Western North Atlantic	4,237	0	10	10
	Common dolphin	Western North Atlantic	172,974	0	25,860	25,860
	False killer whale[b]	Western North Atlantic	1,791	0	8	8
	Melon-headed whale[b]	Western North Atlantic	n/a	0	10	10
	Pilot whale *spp.*	Western North Atlantic	39,215	0	212	212
	Pantropical spotted dolphin	Western North Atlantic	6,593	0	140	140
	Risso's dolphin	Western North Atlantic	35,215	0	173	173
HFC	Harbor porpoise	Gulf of Maine/Bay of Fundy	95,543	2	141	143
PP	Gray seal	Western North Atlantic	27,300	2	218	220
	Harbor seal	Western North Atlantic	61,336	2	218	220

*Note: LFC = low-frequency cetaceans; MFC = mid-frequency cetaceans; HFC = high-frequency cetaceans; PP = phocid pinnipeds; * denotes species listed under the Endangered Species Act.*

a - NMFS notes that, even using the maximum estimate presented in the 2021 North Atlantic Right whale Report Card (Pettis et al., 2022; n=350; nmin=336 with 95 percent confidence interval +/- 14), the total percentage of this species that would be taken by Level B harassment only over the five-year period of the proposed rule would be two percent of the overall population of North Atlantic right whales. While NMFS acknowledges the estimate found on the North Atlantic Right Whale Consortium's website (https://www.narwc.org/report-cards.html), we have used the value presented in the draft 2022 SARs (88 FR 4162, January 24, 2023, https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports; nbest=338) as the best available science for this proposed action.

b - While these species were not originally included in Dominion Energy's request, given recorded sightings/detections of these species during previous Dominion Energy IHAs in the same general area, NMFS has included these as species that may be harassed (by Level B harassment only) during the five-year effective period of this proposed rulemaking.

In making the negligible impact determination and the small numbers finding, NMFS assesses the greatest number of proposed take of marine mammals that could occur within any one year, which in the case of this rule is based on the predicted take in either Year 1 (2024) or Year 2 (2025), depending on the species and/or stock. In this calculation, the maximum estimated number of Level A harassment takes in any one year is summed with the maximum estimated number of Level B harassment takes in any one year for each species to yield the highest number of estimated take that could occur in any year. We recognize that certain activities could shift within the 5-year effective period of the rule; however, the rule allows for that flexibility and the takes are not expected to exceed those shown in Table 29 in any one year.

Table 29 – Maximum Number Of Takes (Level A Harassment and Level B Harassment) Proposed to be Authorized That Could Occur In Any One Year Relative To Stock Population Size

Marine Mammal Hearing Group and Species		Stock	NMFS Stock Abundance	Maximum Annual Take Proposed for Authorization[d]			
				Maximum Level A Harassment In Any One Year	Maximum Level B Harassment In Any One Year	Maximum Annual Take (Maximum Level A Harassment + Maximum Level B Harassment In Any One Year)	Total Percent Stock Taken In Any One Year Based on Maximum Annual Take[a]
LFC	North Atlantic Right Whale*	Western North Atlantic	338[b]	0	7	7	2.07
	Fin Whale*	Western North Atlantic	6,802	4	113	117	1.72
	Humpback Whale	Gulf of Maine	1,396	4	130	134	9.60
	Minke Whale	Canadian East Coast	21,968	8	56	64	0.29
	Sei Whale*	Nova Scotia	6,292	1	3	4	0.06
MFC	Sperm Whale*	North Atlantic	4,349	0	3	3	0.07
	Pygmy sperm whale[c]	Western North Atlantic	7,750	0	1	1	0.01
	Atlantic Spotted Dolphin	Western North Atlantic	39,921	0	7,360	7,360	18.44
	Atlantic White-sided Dolphin	Western North Atlantic	93,233	0	36	36	0.04
	Bottlenose Dolphin	Western North Atlantic - Offshore	62,851	0	4,290	4,290	6.83

		Southern Migratory Coastal	6,639	0	450	450	6.78
		Southern Migratory Coastal and Western North Atlantic - Offshore	69,490	0	5,520	5,520	7.94
	Clymene dolphin[c]	Western North Atlantic	4,237	0	5	5	0.12
	Common Dolphin	Western North Atlantic	172,974	0	7,360	7,360	4.25
	False killer whale[c]	Western North Atlantic	1,791	0	4	4	0.22
	Melon-headed whale[c]	Western North Atlantic	n/a	0	5	5	n/a
	Pilot Whale *spp.*	Western North Atlantic	39,215	0	82	82	0.21
	Pantropical Spotted Dolphin	Western North Atlantic	6,593	0	40	40	0.61
	Risso's Dolphin	Western North Atlantic	35,215	0	50	50	0.14
HFC	Harbor Porpoise	Gulf of Maine/Bay of Fundy	95,543	1	40	41	0.04
PP	Gray Seal	Western North Atlantic	27,300	1	83	84	0.31
	Harbor Seal	Western North Atlantic	61,336	1	83	84	0.14

*Note: LFC = low-frequency cetaceans; MFC = mid-frequency cetaceans; HFC = high-frequency cetaceans; PP = phocid pinnipeds; * denotes species listed under the Endangered Species Act.*

a – Calculations of percentage of stock taken are based on the maximum requested Level A harassment take in any one year + the total requested Level B harassment take in any one year and then compared against the best available abundance estimate, as shown in Tables 7 and 29. For this proposed action, the best available abundance estimates are derived from the NMFS SARs (88 FR 4162, January 24, 2023, https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports).

b – NMFS notes that, even using the maximum estimate presented in the 2021 North Atlantic Right whale Report Card (Pettis et al., 2022; n=350; nmin=336 with 95 percent confidence interval +/- 14), the total percentage of this species that would be taken by Level B harassment only over the five-year period of the proposed rule would be two percent of the overall population of North Atlantic right whales. While NMFS acknowledges the estimate found on the North Atlantic Right Whale Consortium's website (https://www.narwc.org/report-cards.html), we have used the value presented in the draft 2022 SARs (88 FR 4162, January 24, 2023, https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports; nbest=338) as the best available science for this proposed action.

c - While these species were not originally included in Dominion Energy's request, given recorded sightings/detections of these species during previous Dominion Energy IHAs in the same general area, NMFS has included these as species that may be harassed (by Level B harassment only) during the five-year effective period of this proposed rulemaking.

d - This value assumes that each instance of take is a different individual, which is not likely the case for all species, as described in the ***Negligible Impact Analysis and Determination*** *section.*

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Proposed Mitigation

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

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

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

(2) The practicability of the measures for applicant implementation, which may consider such things as cost, impact on operations, and, in the case of a military readiness activity, personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

The mitigation strategies described below are consistent with those required and successfully implemented under previous incidental take authorizations issued in association with in-water construction activities (*e.g.,* soft-start, establishing shutdown zones). Additional measures have also been incorporated to account for the fact that the proposed construction activities would occur offshore. Modeling was performed to estimate harassment zones, which were used to inform mitigation measures for pile driving activities to minimize Level A harassment and Level B harassment to the extent practicable while providing estimates of the areas within which Level B harassment might occur.

Generally speaking, the measures considered and proposed here fall into three categories: temporal (seasonal and daily) work restrictions, real-time measures (shutdown, clearance zones, and vessel strike avoidance), and noise reduction measures. Seasonal work restrictions are designed to avoid or minimize operations when marine mammals are concentrated or engaged in behaviors that make them more susceptible or make impacts more likely. Temporal restrictions are also designed to reduce both the number and severity of potential takes, and are effective in reducing both chronic (longer-term) and acute effects. Real-time measures, such as clearance and shutdown requirements and vessel strike avoidance measures, are intended to reduce the probability or scope of near-term acute impacts by taking steps in real time once a higher-risk scenario is identified (*i.e.,* once animals are detected within an impact zone). Noise reduction measures, such as the use of noise abatement devices like bubble curtains, are intended to reduce the noise at the source, which reduces both acute impacts as well as the contribution to aggregate and cumulative noise that results in longer term chronic impacts.

Below, we describe measures that apply to all activity types, and then in the following subsections, we describe the measures that apply specifically to WTG and OSS foundation installation, cable landfall construction pile driving, HRG surveys, and fishery monitoring surveys.

Although the language contained in this proposed rule directly refers to the applicant, Dominion Energy, all proposed measures discussed herein would also apply to any persons Dominion Energy authorizes or funds to conduct activities on its behalf specific to the CVOW–C project.

Training and Coordination

All relevant personnel and the marine mammal monitoring team(s) would be required to participate in joint, onboard briefings that would be led by CVOW–C project personnel and the Lead PSO prior to the beginning of project activities. This would serve to ensure that all relevant responsibilities, communication procedures, marine mammal monitoring and mitigation protocols, reporting protocols, safety, operational procedures, and ITA requirements are clearly understood by all involved parties. The briefing would be repeated whenever new relevant personnel (*e.g.,* new PSOs, acoustic source operators, relevant crew) join the operation before work commences. During this training, Dominion Energy would be required to instruct all project personnel regarding the authority of the marine mammal monitoring team(s). For example, the HRG acoustic equipment operator, pile driving personnel, *etc.,* would be required to immediately comply with any call for a delay or shutdown by the Lead PSO. Any disagreement between the Lead PSO and the project personnel would only be discussed after delay or shutdown has occurred. More information on vessel crew training requirements can be found in the *Vessel Strike Avoidance Measures* sections below.

Protected Species Observers and PAM Operator Training

Dominion Energy would employ NMFS-approved PSOs and PAM operators. The PSO field team and PAM team would have a lead member (designated as the ''Lead PSO'' or ''PAM Lead'') who would have prior experience observing mysticetes, odontocetes, and pinnipeds in the northwestern Atlantic Ocean on other offshore projects requiring PSOs. Any remaining PSOs and PAM operators must have previous experience observing marine mammals during projects and must have the ability to work with all required and relevant software and equipment. New and/or inexperienced PSOs would be paired with an experienced PSO to ensure that the quality of marine mammal observations and data recording is kept consistent. Additional information on the roles and requirements of the PAM operators (section 4.1.1.2) and PSOs (section 4.1.1.3) can be found in Dominion Energy's supplemental Protected Species Mitigation and Monitoring Plan (PSMMP) on NMFS' website (***https://www.fisheries.noaa.gov/action/****incidental-take-authorization-dominion-energy-virginia-construction-coastal-virginia*).

Prior to the start of activities, a briefing would be conducted between the supervisors, the crew, the PSO/PAM team, the environmental compliance monitors, and Dominion Energy personnel. This briefing would be to establish the responsibilities of each participating party, to define the chains of command, to discuss communication procedures, to provide an overview of the monitoring purposes, and to review the operational procedures. The designated PSO (*i.e.,* Lead PSO) would oversee the training, the environmental compliance monitors, the PSOs, and other tasks specifically related to monitoring. More information on the specific roles and requirements of the Lead PSO can be found in section 4.1.1.1 of Dominion Energy's PSMMP.

North Atlantic Right Whale Awareness Monitoring

Dominion Energy must use available sources of information on North Atlantic right whale presence, including daily monitoring of the Right Whale Sightings Advisory System, monitoring of Coast Guard VHF Channel 16 throughout each day to receive notifications of any sightings, and information associated with any regulatory management actions (*e.g.,* establishment of a zone identifying the need to reduce vessel speeds). Maintaining daily awareness and coordination affords increased protection of North Atlantic right whales by understanding North Atlantic right whale presence in the area through ongoing visual and passive acoustic monitoring efforts and opportunities (outside of Dominion Energy's efforts) and allows for planning of construction activities, when practicable, to minimize potential impacts on North Atlantic right whales.

Given the CVOW–C project is occurring within the general vicinity of the North Atlantic right whale SMA located outside of the mouth of the Chesapeake Bay, all vessels would be required to comply with the Mid-Atlantic Seasonal Management Area (SMA) mandatory speed restriction period (November 1st through April 30th) for all activities. Dominion Energy would also be required to monitor the NOAA Fisheries North Atlantic Right Whale reporting system for the establishment of a Dynamic Management Area (DMA).

Vessel Strike Avoidance Measures

This proposed rule contains numerous vessel strike avoidance measures. Dominion Energy will be required to comply with these measures except under circumstances when doing so would create an imminent and serious threat to a person or vessel or to the extent that a vessel is unable to maneuver and because of the inability to maneuver, the vessel cannot comply (*e.g.,* due to towing, *etc.*). Vessel operators and crews will receive protected species identification training prior to the start of in-water construction activities. This training will cover information about marine mammals and other protected species known to occur or which have the potential to occur in the project area. It will include training on making observations in both good weather conditions (*i.e.,* clear visibility, low wind, and low sea state) and bad weather conditions (*i.e.,* fog, high winds and high sea states, in glare). Training will not only include identification skills but will also include information and resources available regarding applicable Federal laws and regulations for protected species. In addition, all vessels must be equipped with an Automatic Identification System (AIS) and Dominion Energy must report all Maritime Mobile Service Identify (MMSI) numbers to NMFS Office of Protected Resources prior to initiating in-water activities.

Dominion Energy will abide by the following vessel strike avoidance measures:

- All vessel operators and crews must maintain a vigilant watch for all marine mammals and slow down, stop their vessel, or alter course (as appropriate) to avoid striking any marine mammal.
- During any vessel transits within or to/from the CVOW–C project area, such as for crew transfers, an observer would be stationed at the best vantage point of the vessel(s) to ensure that the vessel(s) are maintaining the appropriate separation distance from marine mammals.
- Year-round and when a vessel is in transit, all vessel operators will continuously monitor U.S. Coast Guard VHF Channel 16 over which North Atlantic right whale sightings are broadcasted.
- At the onset of transiting and at least once every four hours, vessel operators and/or trained crew members will monitor the project's Situational Awareness System, WhaleAlert, and the Right Whale Sighting Advisory System (RWSAS) for the presence of North Atlantic right whales.
- Any observations of any large whale by any Dominion Energy staff or contractors, including vessel crew, must be communicated immediately to PSOs, PAM operator, and all vessel captains to increase situational awareness. Conversely, any large whale observation or detection via a sighting network (*e.g.,* Mysticetus) by PSOs or PAM operators will be conveyed to vessel operators and crew.
- All vessels would comply with existing NMFS regulations and speed restrictions and state regulations, as applicable, for North Atlantic right whales.
- In the event that any Slow Zone (DMA or acoustically triggered slow zone) is established that overlaps with an area where a project-associated vessel would operate, that vessel, regardless of size, will transit that area at 10 kts or less.
- Between November 1st and April 30th, all vessels, regardless of size, would operate at 10 kts or less.
- All vessels, regardless of size, would immediately reduce speed to 10 kts or less when any large whale, whale mother/calf pairs, or large assemblages of non-delphinid cetaceans are observed near (within 100 m) an underway vessel.
- All vessels, regardless of size, would immediately reduce speed to 10 kts or less when a North Atlantic right whale is sighted, at any distance, by an observer or anyone else on the vessel.
- All transiting vessels (*e.g.,* transiting, surveying) must have a dedicated visual observer on duty at all times to monitor for marine mammals within a 180° direction of the forward path of the vessel (90° port to 90° starboard). Visual observers must be equipped with alternative monitoring technology for periods of low visibility (*e.g.,* darkness, rain, fog, *etc.*). The dedicated visual observer must receive prior training on protected species detection and identification, vessel strike minimization procedures, how and when to communicate with the vessel captain, and reporting requirements in this proposed action. Visual observers may be third-party observers (*i.e.,* NMFS-approved PSOs) or crew members and must not have any other duties other than observing for marine mammals. Observer training related to these vessel strike avoidance measures must be conducted for all vessel operators and crew prior to the start of in-water construction activities to distinguish marine mammals from other phenomena and broadly to identify a marine mammal as a North Atlantic right whale, other whale (defined in this context as sperm whales or baleen whales other than North Atlantic right whales), or other marine mammal. Confirmation of the observers' training and understanding of the ITA requirements must be documented on a training course log sheet and reported to NMFS.
- All vessels must maintain a minimum separation distance of 500 m from North Atlantic right whales. If a whale is observed but cannot be confirmed as a species other than a North Atlantic right whale, the vessel operator must assume that it is a North Atlantic right whale and take appropriate action.
- All transiting vessels must steer a course away from any sighted North

Atlantic right whale at 10 kts or less such that the 500-m minimum separation distance requirement is not violated. If a North Atlantic right whale or a large whale that cannot be confirmed as a species other than a North Atlantic right whale is sighted within 500 m of an underway vessel, that vessel must shift the engine to neutral. Engines will not be engaged until the whale has moved outside of the vessel's path and beyond 500 m. If a whale is observed but cannot be confirmed as a species other than a North Atlantic right whale, the vessel operator must assume that it is a North Atlantic right whale and take appropriate action.

- All vessels must maintain a minimum separation distance of 100 m from sperm whales and non-North Atlantic right whale baleen whales. If one of these species is sighted within 100 m of a transiting vessel, that vessel must shift the engine to neutral. Engines will not be engaged until the whale has moved outside of the vessel's path and beyond 100 m.
- All vessels must, to the maximum extent practicable, attempt to maintain a minimum separation distance of 50 m from all delphinid cetaceans and pinnipeds with an exception made for those that approach the vessel (*e.g.,* bow-riding dolphins). If a delphinid cetacean or pinniped is sighted within 50 m of an underway vessel, that vessel must shift the engine to neutral (again, with an exception made for those that approach the vessel). Engines will not be engaged until the animal(s) has moved outside of the vessel's path and beyond 50 m.
- When a marine mammal(s) is sighted while a vessel is transiting, the vessel must take action as necessary to maintain the relevant separation distances (*e.g.,* attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area). If a marine mammal(s) is sighted within the relevant separation distance, the vessel must reduce speed and shift the engine to neutral, not engaging the engine(s) until the animal(s) is clear of the area. This does not apply to any vessel towing gear or any situation where respecting the relevant separation distance would be unsafe (*i.e.,* any situation where the vessel is navigationally constrained).
- All transiting vessels must not divert or alter course in order to approach any marine mammal.
- For in-water construction heavy machinery activities, other than impact or vibratory pile driving, if a marine mammal is on a path towards or comes within 10 m of equipment, Dominion Energy must cease operations until the marine mammal has moved more than 10 m on a path away from the activity to avoid direct interaction with equipment.
- Dominion Energy must submit a North Atlantic right whale vessel strike avoidance plan 180 days prior to commencement of vessel use. The plan would, at minimum, describe how PAM, in combination with visual observations, would be conducted to ensure the transit corridor is clear of right whales. The plan would also provide details on the vessel-based observer protocols on transiting vessels.

WTG and OSS Foundation Installation

For WTG and OSS foundation installation, NMFS is proposing to include the following mitigation requirements, which are described in detail below: seasonal and daily restrictions; the use of noise abatement systems; the use of PSOs and PAM operators; the implementation of clearance and shutdown zones, and the use of soft-start.

Seasonal and Daily Restrictions

No foundation pile driving activities (inclusive of both vibratory and impact pile driving) would occur between November 1st through April 30th of any year. Based on the best scientific information available (*i.e.,* Roberts and Halpin, 2022), the highest densities of North Atlantic right whales in the project area are expected during the months of November through April. NMFS is proposing to require this seasonal work restriction to minimize the exposure of North Atlantic right whales to noise incidental to both vibratory and impact pile driving of monopiles (for the WTGs) and jacket pin piles (for the OSSs), which is expected to greatly reduce the number of takes of North Atlantic right whales.

No more than two foundation monopiles would be installed per day. Monopiles would be no larger than 9.5-m in diameter, representing the larger end of the tapered 9.5/7.5-m monopile design. For all monopiles, the minimum amount of hammer energy necessary to effectively and safely install and maintain the integrity of the piles must be used. These hammer energies must not exceed 4,000 kJ. Similarly, no more than two foundation pin piles would be installed per day. Pin piles for jacket foundations would be no larger than 2.8-m in diameter. A jacket foundation design no larger than a four-legged design must be used (four pin piles per jacket foundation). For all pin piles, the minimum amount of hammer energy necessary to effectively and safely install and maintain the integrity of the piles must be used. These hammer energies must not exceed 3,000 kJ.

Dominion Energy would initiate pile driving (inclusive of both vibratory and impact) no earlier than one hour after civil sunrise or no later than 1.5 hours before civil sunset. Dominion Energy has not proposed nighttime pile driving other than if pile driving continues after dark. This would only occur when installation of the same pile begins during daylight (*i.e.,* 1.5 hours before civil sunset). Dominion Energy would need to adequately monitor all relevant zones to ensure the most effective mitigative actions are being undertaken. Additional restrictions are discussed in the following Clearance and Shutdown Zones section.

Noise Abatement Systems

Dominion Energy would employ noise abatement systems (NAS), also known as noise attenuation systems, during all vibratory and impact pile driving of monopiles and pin piles to reduce the sound pressure levels that are transmitted through the water in an effort to reduce ranges to acoustic thresholds and minimize any acoustic impacts resulting from pile driving. Dominion Energy would be required to employ a big double bubble curtain (as was used during the CVOW Pilot Project), other technology capable of achieving a 10-dB sound level reduction, or a combination of two or more NAS capable of achieving a 10-dB sound level reduction during these activities as well as the adjustment of operational protocols to minimize noise levels.

Two categories of NAS exist: primary and secondary. A primary NAS would be used to reduce the level of noise produced by the pile driving activities at the source, typically through adjustments on to the equipment (*e.g.,* hammer strike parameters). Primary NAS are still evolving and will be considered for use during mitigation efforts when the NAS has been demonstrated as effective in commercial projects. However, as primary NAS are not fully effective at eliminating noise, a secondary NAS would be employed. The secondary NAS is a device or group of devices that would reduce noise as it was transmitted through the water away from the pile, typically through a physical barrier that would reflect or absorb sound waves and therefore, reduce the distance the higher energy sound propagates through the water column. Together, these systems must reduce noise levels to the lowest level practicable with the goal of not exceeding measured ranges to Level A harassment and Level B harassment isopleths corresponding to those modeled assuming 10-dB sound attenuation, pending results of Sound Field Verification (SFV; see the *Acoustic Monitoring for Sound Field and Harassment Isopleth Verification* section).

Noise abatement systems, such as bubble curtains, are used to decrease the sound levels radiated from a source. Bubbles create a local impedance change that acts as a barrier to sound transmission. The size of the bubbles determines their effective frequency band, with larger bubbles needed for lower frequencies. There are a variety of bubble curtain systems, confined or unconfined bubbles, and some with encapsulated bubbles or panels. Attenuation levels also vary by type of system, frequency band, and location. Small bubble curtains have been measured to reduce sound levels but effective attenuation is highly dependent on depth of water, current, and configuration and operation of the curtain (Austin *et al.,* 2016; Koschinski and Lüdemann, 2013). Bubble curtains vary in terms of the sizes of the bubbles and those with larger bubbles tend to perform a bit better and more reliably, particularly when deployed with two separate rings (Bellmann, 2014; Koschinski and Lüdemann, 2013; Nehls *et al.,* 2016). Encapsulated bubble systems (*e.g.,* Hydro Sound Dampers (HSDs)), can be effective within their targeted frequency ranges (*e.g.,* 100–800 Hz), and when used in conjunction with a bubble curtain appear to create the greatest attenuation. The literature presents a wide array of observed attenuation results for bubble curtains. The variability in attenuation levels is the result of variation in design as well as differences in site conditions and difficulty in properly installing and operating in-water attenuation devices. Secondary NAS that may be used by Dominion Energy include a big bubble curtain (BBC), a hydro-sound damper, or an AdBm Helmholz resonator (Elzinga *et al.,* 2019). If a single system is used, it must be a double big bubble curtain (dBBC). Other dual systems (*e.g.,* noise mitigation screens, hydro-sound damper, AdBm Helmholz resonator) are being considered for the CVOW–C project, although many of these are in their early stages of development and field tests to evaluate performance and effectiveness have not been completed. Should the research and development phase of these newer systems demonstrate effectiveness, as part of adaptive management, Dominion Energy may submit data on the effectiveness of these systems and request approval from NMFS to use them during vibratory and impact pile driving.

The literature presents a wide array of observed attenuation results for bubble curtains. The variability in attenuation levels is the result of variation in design as well as differences in site conditions and difficulty in properly installing and operating in-water attenuation devices. Dähne *et al.* (2017) found that single bubble curtains that reduce sound levels by 7 to 10 dB reduced the overall sound level by approximately 12 dB when combined as a double bubble curtain for 6-m steel monopiles in the North Sea. During installation of monopiles (consisting of approximately 8-m in diameter) for more than 150 WTGs in comparable water depths (>25 m) and conditions in Europe indicate that attenuation of 10 dB is readily achieved (Bellmann, 2019; Bellmann *et al.,* 2020) using single BBCs for noise attenuation. Designed to gather additional data regarding the efficacy of BBCs, the CVOW Pilot Project systematically measured noise resulting from the impact driven installation of two 7.8-m diameter monopiles, one installation using a dBBC and the other installation using no noise abatement system (CVOW, unpublished data). Although many factors contributed to variability in received levels throughout the installation of the piles (*e.g.,* hammer energy, technical challenges during operation of the dBBC), reduction in broadband SEL using the dBBC (comparing measurements derived from the mitigated and the unmitigated monopiles) ranged from approximately 9–15 dB.

If a bubble curtain is used (single or double), Dominion Energy would be required to maintain the following operational parameters: the bubble curtain(s) must distribute air bubbles using a target air flow rate of at least 0.5 $m^3/(min*m)$ and must distribute bubbles around 100 percent of the piling perimeter for the full depth of the water column. The lowest bubble ring must be in contact with the seafloor for the full circumference of the ring, and the weights attached to the bottom ring must ensure 100-percent seafloor contact; no parts of the ring or other objects should prevent full seafloor contact. Dominion Energy must require that construction contractors train personnel in the proper balancing of airflow to the bubble ring and must require that construction contractors submit an inspection/performance report for approval by Dominion Energy within 72 hours following the performance test. Corrections to the attenuation device to meet the performance standards must occur prior to impact driving of monopiles. If Dominion Energy uses a noise mitigation device in addition to a BBC, similar quality control measures would be required.

Again, NMFS would require Dominion Energy to apply a dBBC or a single BBC coupled with an additional noise mitigation device to ensure sound generated from the project does not exceed that modeled (assuming 10-dB reduction) at given ranges to harassment isopleths and to minimize noise levels to the lowest level practicable. Double BBCs are successfully and widely applied across European wind development efforts and are known to reduce noise levels more than single BBC alone (*e.g.,* Bellman *et al.,* 2020). Dominion Energy anticipates and NMFS agrees that the use of a noise abatement system would likely produce field measurements of the isopleth distances to the Level A harassment and Level B harassment thresholds that accord with those modeled assuming 10-dB of attenuation for vibratory and impact pile driving of monopiles and pin piles (refer back to the Estimated Take, Proposed Mitigation, and Proposed Monitoring and Reporting sections).

Use of PSOs and PAM Operators

As described above, Dominion Energy would be required to use PSOs and acoustic PSOs (*i.e.,* PAM operators) during all WTG and OSS foundation installation activities. Dominion Energy would be required to utilize a team of sufficient size to allow for appropriate implementation of mitigation measures and monitoring. At a minimum, four PSOs would be actively observing marine mammals before, during, and after pile driving. At least two PSOs would be stationed on the primary pile driving installation vessel and at least two PSOs would be stationed on a secondary, dedicated PSO vessel. The dedicated PSO vessel would be positioned approximately 3 km from the pile being driven and circle the pile at a speed of less than 10 kts. Concurrently, at least one PAM operator would be actively monitoring for marine mammals before, during, and after pile driving. PSOs fulfilling the role of both the PAM operator and PSO may be utilized interchangeably, if all relevant experience and educational requirements are met; however, PAM operators/PSOs must only serve in one capacity per watch period. During all monopile installation and in the two days prior to and daily throughout the construction, the Lead PSO would continue to consult the NOAA Fisheries

North Atlantic right whale reporting systems for the presence of North Atlantic right whales. More details on PSO and PAM operator requirements can be found in the Proposed Monitoring and Reporting section.

As a requirement that is not only exclusive to PAM operators and PSOs, all crew and personnel working on the CVOW–C project would be required to maintain situational awareness of marine mammal presence (discussed further above) and would be required to report any sightings to the PSOs for implementation of mitigation measures, if necessary.

Clearance and Shutdown Zones

NMFS is proposing to require the establishment of both clearance and shutdown zones during all impact and vibratory pile driving of monopiles and pin piles, which would be monitored by visual PSOs and PAM operators before, during and after pile driving. PSOs must visually monitor clearance zones for marine mammals for a minimum of 60 minutes immediately prior to commencing pile driving. At least one PAM operator must review data from at least 24 hours prior to pile driving and actively monitor hydrophones for 60 minutes immediately prior to pile driving. Prior to initiating soft-start procedures, all clearance zones must be visually confirmed to be free of marine mammals for 30 minutes immediately prior to starting a soft-start of pile driving. If a marine mammal is observed entering or within the relevant clearance zone prior to the initiation of impact pile driving activities, pile driving must be delayed and will not begin until either the marine mammal(s) has voluntarily left the specific clearance zones and have been visually or acoustically confirmed beyond that clearance zone or when specific time periods have elapsed with no further sightings or acoustic detections have occurred (*i.e.,* 15 minutes for small odontocetes and 30 minutes for all other marine mammal species).

The purpose of ''clearance'' of a particular zone is to prevent or minimize potential instances of auditory injury and more severe behavioral disturbances by delaying the commencement of impact pile driving if marine mammals are near the activity. Prior to the start of impact pile driving activities, Dominion Energy would ensure the area is clear of marine mammals, per the clearance zones presented in Tables 30 and 31, to minimize the potential for and degree of harassment. Once pile driving activity begins, any marine mammal entering the shutdown zone would trigger pile driving to cease (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). The purpose of a shutdown is to prevent a specific acute impact, such as auditory injury or severe behavioral disturbance of sensitive species, by halting the activity.

In addition to the clearance and shutdown zones that would be monitored both visually and acoustically, NMFS is proposing to establish a minimum visibility zone to ensure both visual and acoustic methods are used in tandem to detect marine mammals resulting in maximum detection capability. The minimum visibility zone that has been proposed by Dominion Energy would extend 1,750 m from the pile being driven during all months in which foundation installation is planned to occur. This value was proposed by Dominion Energy as it corresponds to the Exclusion Zone implemented during the CVOW Pilot Project (see 85 FR 30930, May 21, 2020). While NMFS acknowledges that this distance was adequate and appropriate for the CVOW Pilot Project, the turbine models for the proposed CVOW–C project are much larger (7.8-m versus 9.5-m, respectively) and would require a much larger maximum hammer energy (1,000 kJ maximum versus 4,000 kJ maximum). These factors create a larger distance to the Level A harassment threshold than the CVOW Pilot Project. Because of these reasons, NMFS has instead proposed a minimum visibility distance for WTG monopile and OSS pin pile installation as 2,000 m.

During all foundation installation, Dominion Energy must ensure that the entire minimum visibility zone (as based on the installation activity occurring) is visible (*i.e.,* not obscured by dark, rain, fog, *etc.*) for a full 30 minutes immediately prior to commencing vibratory or impact pile driving. In addition, the entire clearance zone must be visually clear of marine mammals prior to commencing vibratory or impact pile driving. For North Atlantic right whales, there is an additional requirement that the clearance zone may only be declared clear if no confirmed North Atlantic right whale acoustic detections (in addition to visual) have occurred during the 60-minute monitoring period. Any large whale sighted by a PSO or acoustically detected by a PAM operator that cannot be identified as a non-North Atlantic right whale must be treated as if it were a North Atlantic right whale.

Proposed clearance and shutdown zones have been developed in consideration of modeled distances to relevant PTS thresholds with respect to minimizing the potential for take by Level A harassment. All proposed clearance and shutdown zones for large whales are larger than the largest modeled acoustic range ($R_{95\%}$) distances to thresholds corresponding to Level A harassment (SEL and peak).

If a marine mammal is observed entering or within the respective shutdown zone (Tables 30 and 31) after pile driving has begun, the PSO will request a temporary cessation of pile driving. Dominion Energy will stop pile driving immediately unless Dominion Energy determines 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 pile refusal or pile instability. Pile refusal occurs when the pile driving sensors indicate the pile is approaching refusal, and a shut-down would lead to a stuck pile which then poses an imminent risk of injury or loss of life. 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, pile refusal, or pile instability. In any of these situations, Dominion Energy must reduce hammer energy to the lowest level practicable and the reason(s) for not shutting down must be documented and reported to NMFS.

The lead engineer must evaluate the following to determine if a shutdown is safe and practicable:

a. Use of site-specific soil data and real-time hammer log information to judge whether a stoppage would risk causing piling refusal at re-start of piling;

b. 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

c. 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 it is determined that shutdown is not feasible, the reason must be documented and reported (see Proposed Monitoring and Reporting section).

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

The clearance and shutdown zone sizes vary by species and are shown in Tables 30 and 31. All distances to the perimeter of these mitigation zones are the radii from the center of the pile. Pursuant to the proposed adaptive management provisions, Dominion Energy may request modification to these zone sizes pending results of sound field verification (see Proposed Monitoring and Reporting section). Any changes to zone size would require NMFS' prior approval.

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Table 30 – Mitigation Zone Distances To The Level A Harassment And Level B Harassment Thresholds During Vibratory And Impact Pile Driving Of WTG Monopile Foundations, Assuming The Maximum Daily Build-Out (Two Piles Installed Per Day) And Deep Water Conditions (Inclusive Of 10 dB Of Sound Attenuation)

Marine Mammals	WTG Monopile Foundations[a, b]							
	Impact Pile Driving Installation				Vibratory Pile Driving Installation			
	Clearance Zone (m)		Shutdown Zone (m)		Clearance Zone (m)		Shutdown Zone (m)	
	One Pile Per Day	Two Piles Per Day	One Pile Per Day	Two Piles Per Day	One Pile Per Day	Two Piles Per Day	One Pile Per Day	Two Piles Per Day
North Atlantic right whale - PAM detection	Any distance				Any distance			
North Atlantic right whale - visual detection	Any distance				Any distance			
All other Mysticetes and sperm whales	5,100	6,500	1,750	1,750	1,000	1,000	1,000	1,000
Dolphins and Pilot whales	500	500	500	500	250	250	250	250
Harbor porpoises	750	750	750	750	500	500	500	500
Seals	500	500	500	500	250	250	250	250

a - The minimum visibility zone, an area in which marine mammals must be able to be visually detected, extends 2.0 km.
b - Dominion Energy may request modification of these zones based on the results of sound field verification.

Table 31 – Mitigation Zone Distances To The Level A Harassment And Level B Harassment Thresholds During Vibratory And Impact Pile Driving Of OSS Jacket Foundations, Assuming The Maximum Daily Build-Out (Two Pin Piles Installed Per Day; Inclusive Of 10 dB Of Sound Attenuation)

Marine Mammals	OSS Jacket Foundations[a, b]							
	Impact Pile Driving Installation				Vibratory Pile Driving Installation			
	Clearance Zone (m)		Shutdown Zone (m)		Clearance Zone (m)		Shutdown Zone (m)	
	One Pile Per Day	Two Piles Per Day	One Pile Per Day	Two Piles Per Day	One Pile Per Day	Two Piles Per Day	One Pile Per Day	Two Piles Per Day
North Atlantic right whale - PAM detection	Any distance				Any distance			
North Atlantic right whale - visual detection	Any distance				Any distance			
All other Mysticetes and sperm whales	5,100	6,500	1,750	1,750	1,000	1,000	1,000	1,000
Dolphins and Pilot whales	500	500	500	500	250	250	250	250
Harbor porpoises	750	750	750	750	500	500	500	500
Seals	500	500	500	500	250	250	250	250

a - The minimum visibility zone, an area in which marine mammals must be able to be visually detected, extends 2.0 km.
b - Dominion Energy may request modification of these zones based on the results of sound field verification.

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Soft-Start

The use of a soft-start procedure is believed to provide additional protection to marine mammals by warning them or providing them with a chance to leave the area prior to the hammer operating at full capacity. Soft-start typically involves initiating hammer operation at a reduced energy level (relative to full operating capacity) followed by a waiting period. Dominion Energy must utilize a soft-start protocol for impact pile driving of monopiles by performing 4–6 strikes per minute at 10 to 20 percent of the maximum hammer energy for a minimum of 30 minutes.

Soft-start will be required at the beginning of each day's monopile and pin pile installation and at any time following a cessation of vibratory or impact pile driving of 30 minutes or longer. If a marine mammal is detected within or about to enter the applicable clearance zones prior to the beginning of soft-start procedures, impact pile driving would be delayed until the animal has been visually observed exiting the clearance zone or until a specific time period has elapsed with no further sightings (*i.e.,* 15 minutes for small odontocetes and 30 minutes for all other species).

Cable Landfall Activities—Temporary Cofferdams

For the installation and removal of temporary cofferdams, NMFS is proposing to include the following mitigation requirements, which are described in detail below: daily restrictions; the use of PSOs; and the implementation of clearance and shutdown zones. Given the short duration of work and lower noise levels during vibratory driving, NMFS is not proposing to require PAM or noise abatement system use during these activities.

Seasonal and Daily Restrictions

Dominion Energy has proposed to install and remove all sheet piles associated with temporary cofferdams within the first year of the effective period of the regulations and LOA and has proposed to only perform these activities within the same seasonal work window as previously specified for foundation installation (*i.e.,* May 1st through October 31st). Dominion Energy also proposes to conduct pile driving associated with cable landfall construction during daylight hours. NMFS has carried forward these measures in this proposed rule.

Use of PSOs

Prior to the start of vibratory pile driving activities, at least two PSOs located at the best vantage points would monitor the clearance zone for 30 minutes, continue monitoring during vibratory pile driving, and for 30 minutes following cessation of the activity. The clearance zones must be fully visible for at least 30 minutes and all marine mammal(s) must be confirmed to be outside of the clearance zone for at least 30 minutes immediately prior to initiation of the activity.

Clearance and Shutdown Zones

Dominion Energy would establish clearance and shutdown zones for vibratory pile driving activities associated with sheet pile installation (Table 32). If a marine mammal is observed entering or is observed within the respective zones, activities will not commence until the animal has exited the zone or a specific amount of time has elapsed since the last sighting (*i.e.,* 30 minutes for large whales and 15 minutes for odontocetes and pinnipeds). If a marine mammal is observed entering or within the respective shutdown zone after vibratory pile driving has begun, the PSO will call for a temporary cessation of the activity. Pile driving must not be restarted until either the marine mammal(s) has voluntarily left the specific clearance zones and has been visually confirmed beyond that clearance zone or when specific time periods have elapsed with no further sightings or acoustic detections have occurred (*i.e.,* 15 minutes for small odontocetes and 30 minutes for all other marine mammal species). Because a vibratory hammer can grip a pile without operating, pile instability should not be a concern and no caveat for not ceasing pile driving due to pile instability would be allowed. However, the lead engineer may determine that pile driving cannot cease due to risk to human safety or equipment damage.

The clearance and shutdown zone sizes vary by species and are shown in Table 32. All distances to the perimeter of these mitigation zones are the radii from the center of the pile. Dominion Energy is not proposing, and NMFS is not requiring, sound field verification, hence these distances would not change.

TABLE 32—DISTANCES TO MITIGATION ZONES DURING NEARSHORE CABLE LANDFALL ACTIVITIES

[Temporary Cofferdams]

Marine mammals	Installation and removal of temporary cofferdams	
	Clearance zone (m)	Shutdown zone (m)
North Atlantic right whale—visual detection	Any distance	
All other Mysticetes and sperm whales	1,000	1,000
Delphinids	250	100
Pilot whales	1,000	1,000
Harbor porpoises	250	100
Seals	250	100

Cable Landfall Activities—Temporary Goal Posts

For the installation of temporary goal posts, NMFS is proposing to include the following mitigation requirements, which are described in detail below: daily restrictions; the use of PSOs; the implementation of clearance and shutdown zones; and the use of soft-start. Given the short duration of work and relatively small harassment zones, NMFS is not proposing to require PAM or noise abatement system use during these activities.

Seasonal and Daily Restrictions

Dominion Energy has proposed to install all pile pipes associated with temporary goal posts within the first year of the effective period of the regulations and LOA and has proposed to only perform these activities within the same seasonal work window as previously specified for foundation installation (*i.e.,* May 1st through October 31st). Similar to cofferdam work, Dominion Energy is not proposing to conduct goal post installation during daylight hours. Because removal of goal posts would be conducted via means that do not produce noise (see the Description of the Specified Activities section), removal could occur during darkness.

Use of PSOs

Prior to the start of impact hammering activities, at least two PSOs located at the best vantage points would monitor the clearance zone for 30 minutes, continue monitoring during impact pile driving, and for 30 minutes following cessation of the activity. The clearance zones must be fully visible for at least 30 minutes and all marine mammal(s) must be confirmed to be outside of the clearance zone for at least 30 minutes immediately prior to initiation of the activity.

Clearance and Shutdown Zones

Dominion Energy would establish clearance and shutdown zones for impact pile driving for casing pipe installation (Table 33). If a marine mammal is observed entering or is observed within the respective zones, activities will not commence until the animal has exited the zone or a specific amount of time has elapsed since the last sighting (*i.e.,* 30 minutes for large whales and 15 minutes for dolphins, porpoises, and pinnipeds). If a marine mammal is observed entering or within the respective shutdown zone after impact pile driving has begun, the PSO will call for a temporary cessation of the activity. Pile driving must not be restarted until either the marine mammal(s) has voluntarily left the specific clearance zones and has been visually confirmed beyond that clearance zone or when specific time periods have elapsed with no further sightings or acoustic detections have occurred (*i.e.,* 15 minutes for small odontocetes and 30 minutes for all other marine mammal species).

The clearance and shutdown zone sizes vary by species and are shown in Table 33. All distances to the perimeter of these mitigation zones are the radii from the center of the pile. Dominion Energy is not proposing, and NMFS is not requiring, sound field verification, hence these distances would not change.

TABLE 33—DISTANCES TO MITIGATION ZONES DURING NEARSHORE CABLE LANDFALL ACTIVITIES

[Temporary Goal Posts]

Marine mammals	Installation of temporary goal posts	
	Clearance zone (m)	Shutdown zone (m)
North Atlantic right whale—visual detection	Any distance	
All other Mysticetes and sperm whales	1,000	1,000
Delphinids	250	100
Pilot whales	1,000	1,000
Harbor porpoises	750	100
Seals	500	100

Soft-Start

Dominion Energy did not provide specific details in either their ITA application or their PSMMP as to the soft-start plan that would be implemented for piles associated with temporary goal posts, however, NMFS proposes the following approach below, which is similar to the soft-start requirements proposed for WTG and OSS foundation installation via impact pile driving.

Dominion Energy must utilize a soft-start protocol for impact pile driving of goal post pipe piles. Soft start requires contractors to provide an initial set of three strikes at reduced energy, followed by a 30-second waiting period, then two subsequent reduced-energy strike sets. Soft-start will be required at the beginning of the installation procedure for each goal post pipe pile and at any time following a cessation of impact pile driving of 30 minutes or longer. If a marine mammal is detected within or about to enter the applicable clearance zones prior to the beginning of soft-start procedures, impact pile driving would be delayed until the animal has been visually observed exiting the clearance zone or until a specific time period has elapsed with no further sightings (*i.e.,* 15 minutes for small odontocetes and 30 minutes for all other species).

HRG Surveys

For HRG surveys, NMFS is proposing to include the following mitigation requirements, which are described in detail below, for all HRG survey activities using boomers, sparkers, and CHIRPs: the use of PSOs; the implementation of clearance, shutdown, and vessel separation zones; and ramp-up of survey equipment.

There are no mitigation measures prescribed for sound sources operating at frequencies greater than 180 kHz as these would be expected to fall outside of marine mammal hearing ranges and not result in harassment; however, all HRG survey vessels would be subject to the aforementioned vessel strike avoidance measures described earlier in this section. Furthermore, due to the frequency range and characteristics of some of the sound sources, take is not anticipated for non-impulsive sources (*e.g.,* Ultra-Short BaseLine (USBL) and other parametric sub-bottom profilers) with exception to usage of CHIRPS and other non-parametric sub-bottom profilers. Hence, mitigation measures are only prescribed for CHIRPS, boomers and sparkers.

PAM would not be required during HRG surveys. While NMFS agrees that PAM can be an important tool for augmenting detection capabilities in certain circumstances, its utility in further reducing impacts during HRG survey activities is limited. We have provided a thorough description of our reasoning for not requiring PAM during previous HRG surveys in several **Federal Register** notices (*e.g.,* 87 FR 40796, July 8, 2022; 87 FR 52913, August 3, 2022; 87 FR 51356, August 22, 2022).

Seasonal and Daily Restrictions

Given the potential impacts to marine mammals from exposure to HRG survey noise sources are relatively minor (*e.g.,* limited to Level B harassment) and that the distances to the Level B harassment isopleth are very small (maximum distance is 100 m via the GeoMarine Dual 400 Sparker at 800 J), NMFS is not proposing to implement any seasonal or time-of-day restrictions for HRG surveys.

Although no temporal restrictions are proposed, NMFS would require Dominion Energy to deactivate acoustic sources during periods where no data is being collected except as determined necessary for testing. Any unnecessary use of the acoustic source would be avoided.

Use of PSOs

During all HRG survey activities using boomers, sparkers, and CHIRPS, one PSO would be required to monitor during daylight hours and two would be required to monitor during nighttime hours per vessel. PSOs would begin visually monitoring 30 minutes prior to the initiation of the specified acoustic source (*i.e.,* ramp-up, if applicable) through 30 minutes after the use of the specified acoustic source has ceased. PSOs would be required to monitor the appropriate clearance and shutdown zones. These zones would be based around the radial distance from the acoustic source and not from the vessel.

Clearance, Shutdown, and Vessel Separation Zones

Dominion Energy would be required to implement a 30-minute clearance period of the clearance zones (Table 34) immediately prior to the commencing of the survey or when there is more than a 30-minute break in survey activities and PSOs have not been actively monitoring. The clearance zones would be monitored by PSOs using the appropriate visual technology. If a marine mammal is observed within a clearance zone during the clearance period, ramp-up (described below) may not begin until the animal(s) has been observed voluntarily exiting its respective clearance zone or until an additional time period has elapsed with no further sighting (*i.e.,* 15 minutes for small odontocetes and seals, and 30 minutes for all other species). In any case when the clearance process has begun in conditions with good visibility, including via the use of night vision equipment (IR/thermal camera), and the Lead PSO has determined that the clearance zones are clear of marine mammals, survey operations would be allowed to commence (*i.e.,* no delay is required) despite periods of inclement weather and/or loss of daylight.

Once the survey has commenced, Dominion Energy would be required to shut down boomers, sparkers, and CHIRPs if a marine mammal enters a respective shutdown zone (Table 34). In cases when the shutdown zones become obscured for brief periods due to inclement weather, survey operations would be allowed to continue (*i.e.,* no shutdown is required) so long as no marine mammals have been detected. The use of boomers, sparkers, and CHIRPs would not be allowed to commence or resume until the animal(s) has been confirmed to have left the shutdown zone or until a full 15 minutes (for small odontocetes and seals) or 30 minutes (for all other marine mammals) have elapsed with no further sighting. Any large whale sighted by a PSO within 1,000 m of the boomers, sparkers, and CHIRPs that cannot be identified as a non-North Atlantic right whale must be treated as if it were a North Atlantic right whale.

The shutdown requirement would be waived for small delphinids of the following genera: *Delphinus, Stenella, Lagenorhynchus,* and *Tursiops.* Specifically, if a delphinid from the specified genera is visually detected approaching the vessel (*i.e.,* to bow-ride) or towed equipment, shutdown would not be required. Furthermore, if there is uncertainty regarding identification of a marine mammal species (*i.e.,* whether the observed marine mammal(s) belongs to one of the delphinid genera for which shutdown is waived), the PSOs would use their best professional judgment in making the decision to call for a shutdown. Shutdown would be required if a delphinid that belongs to a genus other than those specified is detected in the shutdown zone.

If a boomer, sparker, or CHIRP is shut down for reasons other than mitigation (*e.g.,* mechanical difficulty) for less than 30 minutes, it would be allowed to be activated again without ramp-up only if (1) PSOs have maintained constant observation, and (2) no additional detections of any marine mammal occurred within the respective shutdown zones. If a boomer, sparker, or CHIRP was shut down for a period longer than 30 minutes, then all clearance and ramp-up procedures would be required, as previously described.

TABLE 34—DISTANCES TO THE MITIGATION ZONES DURING HRG SURVEYS

Marine mammals	HRG surveys	
	Clearance zone (m)	Shutdown zone (m)
North Atlantic right whale—visual detection	500	500
Endangered species (excluding North Atlantic right whales)	500	500
All other marine mammals [a]	100	100

[a] Exceptions are noted for delphinids from genera Delphinus, Lagenorhynchus, Stenella, or Tursiops and seals.

Ramp-Up

At the start or restart of the use of boomers, sparkers, and/or CHIRPs, a ramp-up procedure would be required unless the equipment operates on a binary on/off switch. A ramp-up procedure, involving a gradual increase in source level output, is required at all times as part of the activation of the acoustic source when technically feasible. Operators would ramp up sources to half power for 5 minutes and then proceed to full power. Prior to a ramp-up procedure starting, the operator would have to notify the Lead PSO of the planned start of the ramp-up. This notification time would not be less than 60 minutes prior to the planned ramp-up activities as all relevant PSOs would need the appropriate 30 minute period to monitor prior to the initiation of ramp-up. Prior to ramp-up beginning, the operator must receive confirmation from the PSO that the clearance zone is clear of any marine mammals. All ramp-ups would be scheduled to minimize the overall time spent with the source being activated. The ramp-up procedure must be used at the beginning of HRG survey activities or after more than a 30-minute break in survey activities using the specified HRG equipment to provide additional protection to marine mammals in or near the survey area by allowing them to vacate the area prior to operation of survey equipment at full power.

Dominion Energy would not initiate ramp-up until the clearance process has been completed (see Clearance and Shutdown Zones section above). Ramp-up activities would be delayed if a marine mammal(s) enters its respective clearance zone. Ramp-up would only be reinitiated if the animal(s) has been observed exiting its respective shutdown zone or until additional time has elapsed with no further sighting (*i.e.,* 15 minutes for small odontocetes and seals, and 30 minutes for all other species).

Fishery Monitoring Surveys

For all pot/trap surveys, Dominion Energy would implement marine mammal monitoring and gear interaction avoidance measures to ensure no marine mammals are taken (*e.g.,* entangled) during the surveys. Monitoring measures would be implemented based on the Atlantic Large Whale Take Reduction Plan (50 CFR 229.32).

All captains and crew conducting the surveys will be trained in marine mammal detection and identification. Dominion Energy and/or its cooperating institutions, contracted vessels, or commercially-hired captains must implement the following ''move-on'' rule. If marine mammals are sighted within 1 nm of the planned location in the 15 minutes before gear deployment, Dominion Energy and/or its cooperating institutions, contracted vessels, or commercially-hired captains, as appropriate, may decide to move the vessel away from the marine mammal to a different section of the sampling area if the animal appears to be at risk of interaction with the gear, based on best professional judgment. If, after moving on, marine mammals are still visible from the vessel, Dominion Energy and/or its cooperating institutions, contracted vessels, or commercially-hired captains may decide to move again or to skip the station. Gear would not be deployed if marine mammals are observed within the area and if a marine mammal is deemed to be at risk of interaction, all gear will be immediately removed. Dominion Energy and/or its cooperating institutions must deploy pot gear as soon as is practicable upon arrival at the sampling station. Dominion Energy and/or its cooperating institutions must initiate marine mammal watches (visual observation) no less than 15 minutes prior to both deployment and retrieval of the pot gear. Marine mammal watches must be conducted by scanning these surrounding waters with the naked eye and binoculars and monitoring effort must be maintained during the entire period of the time that gear is in the water (*i.e.,* throughout gear deployment, fishing, and retrieval).

If marine mammals are sighted near the vessel during the soak and are determined to be at risk of interacting with the gear, then Dominion Energy and/or its cooperating institutions, contracted vessels, or commercially-hired captains must immediately and carefully retrieve the gear as quickly as possible. Dominion Energy and/or its cooperating institutions, contracted vessels, or commercially-hired captains may use best professional judgment in making this decision. Dominion Energy and/or its cooperating institutions, contracted vessels, or commercially-hired captains must ensure that surveys deploy gear fulfilling all pot universal commercial gear configurations such as weak link requirements and marking requirements as specified by applicable take reduction plans as required for commercial pot fisheries. Dominion Energy will be using on-demand fishing systems aimed at reducing the entanglement risk to protected species. These systems include, but are not limited to, spooled systems, buoy and stowed systems, lift bag systems, and grappling. All gear must be clearly labeled as attributed to Dominion Energy's fishery surveys. All fisheries monitoring gear must be fully cleaned and repaired (if damaged) before each use. Any lost gear associated with the fishery surveys will be reported to the NOAA Greater Atlantic Regional Fisheries Office Protected Resources Division (*nmfs.gar.incidental-take@noaa.gov*) as soon as possible or within 24 hours of the documented time of missing or lost gear. This report must include information on any markings on the gear and any efforts undertaken or planned to recover the gear. Finally, all survey vessels will adhere to all vessel mitigation measures (see the Proposed Mitigation section).

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

Proposed Monitoring and Reporting

In order to promulgate a rulemaking for an activity, section 101(a)(5)(A) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104(a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the proposed action area. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

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

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.,* presence, abundance, distribution, density);
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.,* source characterization, propagation, ambient noise); (2) affected species (*e.g.,* life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.,* age, calving or feeding areas);
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;
- Effects on marine mammal habitat (*e.g.,* marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and/or
- Mitigation and monitoring effectiveness.

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

During Dominion Energy's construction activities, visual monitoring by NMFS-approved PSOs would be conducted before, during, and after impact pile driving, vibratory pile driving, and HRG surveys. PAM would also be conducted during all impact pile driving. Observations and acoustic detections by PSOs would be used to support the activity-specific mitigation measures described above. Also, to increase understanding of the impacts of the activity on marine mammals, observers would record all incidents of marine mammal occurrence at any distance from the vibratory/impact piling and during active HRG acoustic sources, and monitors would document all behaviors and behavioral changes, in concert with distance from an acoustic source. The required monitoring is described below, beginning with PSO measures that are applicable to all activities or monitoring and followed by activity-specific monitoring requirements.

Again, we specify here that although the language contained in this proposed rule directly refers to the applicant, Dominion Energy, all proposed measures discussed herein would also apply to any contractors or other agents working for Dominion Energy specific to the CVOW–C project.

PSO and PAM Operator Requirements

Dominion Energy would be required to collect sighting, behavioral response, and acoustic data related to construction activities for marine mammal species observed in the region of the activity during the period in which the activities occur using NMFS-approved visual PSOs and acoustic PAM operators (see Proposed Mitigation section). All observers must be trained in marine mammal identification and behaviors and are required to have no other construction-related tasks while conducting monitoring. PSOs would monitor all clearance and shutdown zones prior to, during, and following impact pile driving, vibratory pile driving, and during HRG surveys using boomers, sparkers, and CHIRPs (with monitoring durations specified further below). PSOs will also monitor the Level B harassment zones to the extent practicable (noting that some zones are too large to fully observe) and beyond and will document any marine mammals observed. Observers would be located at the best practicable vantage points on the pile driving vessel and, where required, on an aerial platform. Full details regarding all marine mammal monitoring must be included in relevant Plans (*e.g.,* Pile Driving and Marine Mammal Monitoring Plan) that, under this proposed action, Dominion Energy would be required to submit to NMFS for approval at least 180 days in advance of the commencement of any construction activities.

The following measures apply to all visual monitoring efforts:

1. Monitoring must be conducted by NMFS-approved, trained PSOs and PAM operators. PSOs must be placed at the primary location relevant to the activity (*i.e.,* pile driving vessel, HRG survey vessel) and on any necessary dedicated PSO vessels (*e.g.,* additional pile driving vessel(s), if required). PSOs must be in the best vantage point(s) position in order to ensure 360° visual coverage of the entire clearance and shutdown zones, around the observing platform and as much of the Level B harassment zone as possible while still maintaining a safe work environment;

2. PSO and PAM operators must be independent third-party observers and must have no tasks other than to conduct observational effort, collect data, and communicate with and instruct the relevant vessel crew with regard to the presence of protected species and mitigation requirements;

3. PSOs may not exceed 4 consecutive watch hours, must have a minimum 2-hour break between watches, and may not exceed a combined watch schedule of more than 12 hours in a single 24-hour period;

4. PSOs would be required to use appropriate equipment (specified below) to monitor for marine mammals. During periods of low visibility (*e.g.,* darkness, rain, fog, poor weather conditions, *etc.*), PSOs would be required to use alternative technologies (*i.e.,* infrared or thermal cameras) to monitor the shutdown and clearance zones; and

5. PSOs must be in the best vantage point to monitor for marine mammals and implement the relevant clearance and shutdown procedures, when determined to be applicable.

6. PSOs should have the following minimum qualifications:

a. Visual acuity in both eyes (corrected is permissible) sufficient for discernment of moving targets at the water's surface with the ability to estimate the target size and distance. The use of binoculars is permitted and may be necessary to correctly identify the target(s);

b. Ability to conduct field observations and collect data according to the assigned protocols;

c. Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations;

d. Writing skills sufficient to document observations, including but not limited to: the number and species of marine mammals observed, the dates and times of when in-water construction activities were conducted, the dates and time when in-water construction activities were suspended to avoid potential incidental injury of marine mammals from construction noise within a defined shutdown zone, and marine mammal behavior; and

e. Ability to communicate orally, by radio, or in-person, with project personnel to provide real-time information on marine mammals observed in the area, as necessary.

Observer teams employed by Dominion Energy, in satisfaction of the mitigation and monitoring requirements described herein, must meet the following additional requirements:

7. PSOs must successfully complete relevant training, including completion of all required coursework and a written and/or oral examination developed for the training;

8. PSOs must have successfully attained a bachelor's degree from an accredited college or university with a major in one of the natural sciences, a minimum of 30 semester hours or equivalent in the biological sciences, and at least one undergraduate course in math or statistics. The educational requirements may be waived if the PSO has acquired the relevant skills through alternate experience. Requests for such a waiver shall be submitted to NMFS and must include written justification. Alternate experience that may be considered includes, but is not limited to: Secondary education and/or experience comparable to PSO duties; previous work experience conducting academic, commercial, or government sponsored marine mammal surveys; or previous work experience as a PSO; the PSO should demonstrate good standing and consistently good performance of PSO duties;

9. One observer will be designated as lead observer or monitoring coordinator (''Lead PSO''). This Lead PSO would be required to have a minimum of 90 days of at-sea experience working in this role in an offshore environment and would be required to have no more than eighteen months elapsed since the conclusion of their last at-sea experience;

10. At least one PSO located on platforms (either vessel-based or aerial) would be required to have a minimum of 90 days of at-sea experience working in this role in an offshore environment and would be required to have no more than eighteen months elapsed since the conclusion of their last at-sea experience; and

11. All PSOs and PAM operators must be approved by NMFS. Dominion Energy would be required to submit resumes of the initial set of PSOs necessary to commence the project to NMFS Office of Protected Resources (OPR) for approval at least 60 days prior to the first day of in-water construction activities requiring PSOs. Resumes

would need to include the dates of training and any prior NMFS approval as well as the dates and description of their last PSO experience and must be accompanied by information documenting their successful completion of an acceptable training course. NMFS would allow three weeks to approve PSOs from the time that the necessary information is received by NMFS after which any PSOs that meet the minimum requirements would automatically be considered approved.

Some Dominion Energy activities may require the use of PAM, which would necessitate the employment of at least one PAM operator on duty at any given time. PAM operators would be required to meet several of the specified requirements described above for PSOs, including: 2, 4, 6b–e, 8, 9, 10, and 11. Furthermore, PAM operators would be required to complete a specialized training for operating PAM systems and must demonstrate familiarity with the PAM system on which they would be working.

PSOs would be able to act as both acoustic and visual observers for the project if the individual(s) demonstrates that they have had the required level and appropriate training and experience to perform each task. However, a single individual would not be allowed to concurrently act in both roles or exceed work hours, as specified in #4 above.

Dominion Energy's personnel and PSOs would also be required to use available sources of information on North Atlantic right whale presence to aid in monitoring efforts. This includes:

1. Daily monitoring of the Right Whale Sightings Advisory System;

2. Consulting of the WhaleAlert app; and,

3. Monitoring of the Coast Guard's VHF Channel 16 throughout the day to receive notifications of any sightings and information associated with any Dynamic Management Areas to plan construction activities and vessel routes, if practicable, to minimize the potential for co-occurrence with North Atlantic right whales.

Additionally, whenever multiple project-associated vessels (of any size; *e.g.,* construction survey, crew transfer) are operating concurrently, any visual observations of ESA-listed marine mammals must be communicated to PSOs and vessel captains associated with other vessels to increase situational awareness.

The following are proposed monitoring and reporting measures that NMFS would require specific to each construction activity:

WTG and OSS Foundation Installation

Dominion Energy would be required to implement the following monitoring procedures during all impact pile driving of WTG and OSS foundations.

During all observations associated with pile driving (vibratory and/or impact), PSOs would use magnification (7x) binoculars and the naked eye to search continuously for marine mammals. At least one PSO would be located on the foundation pile driving vessel and a secondary dedicated-PSO vessel. These PSOs must be equipped with Big Eye binoculars (*e.g.,* 25 x 50; 2,7 view angle; individual ocular focus; height control) of appropriate quality. These would be pedestal-mounted on the deck at the most appropriate vantage point that provides optimal sea surface observation and PSO safety.

Dominion Energy would be required to have a minimum of four PSOs actively observing marine mammals before, during, and after (specific times described below) the installation of foundation piles (monopiles and pin piles for jacket foundations). At least two PSOs must be actively observing on the pile driving vessel while at least two PSOs are actively observing on a secondary, PSO-dedicated vessel. Concurrently, at least one acoustic PSO (*i.e.,* PAM operator) must be actively monitoring for marine mammals before, during and after impact pile driving.

As described in the Proposed Mitigation section, if the minimum visibility zone cannot be visually monitored at all times, pile driving operations may not commence or, if active, must shutdown, unless Dominion Energy determines shutdown is not practicable due to imminent risk of injury or loss of life to an individual, pile refusal, or pile instability.

To supplement visual observation efforts, Dominion Energy would utilize at least one PAM operator before, during, and after pile installation. This PAM operator would assist the PSOs in ensuring full coverage of the clearance and shutdown zones. All on-duty visual PSOs would remain in contact with the on-duty PAM operator, who would monitor the PAM systems for acoustic detections of marine mammals in the area. In some cases, the PAM operator and workstation may be located onshore or they may be located on a vessel. In either situation, PAM operators would maintain constant and clear communication with visual PSOs on duty regarding detections of marine mammals that are approaching or within the applicable zones related to impact pile driving. Dominion Energy would utilize PAM to acoustically monitor the clearance and shutdown zones (and beyond for situational awareness), and would record all detections of marine mammals and estimated distance, when possible, to the activity (noting whether they are in the Level A harassment or Level B harassment zones). To effectively utilize PAM, Dominion Energy would implement the following protocols:

- PAM operators would be stationed on at least one of the dedicated monitoring vessels in addition to the PSOs, or located remotely/onshore.
- All PAM operators must be NMFS-approved, third party contractors. PAM operators would have completed specialized training for operating PAM systems prior to the start of monitoring activities, including identification of species-specific mysticete vocalizations (*e.g.,* North Atlantic right whales). The PAM operator must demonstrate that they have prior experience with similar acoustic projects and/or completed specialized training for operating PAM systems and detecting and identifying Atlantic Ocean marine mammals sounds.
- Where localization of sounds or deriving bearings and distance are proposed, the PAM operators need to have demonstrated experience in using this technique.
- PAM operators must demonstrate experience with relevant acoustic software and equipment.
- PAM operators must have the qualifications and relevant experience/training to safely deploy and retrieve equipment and program the software, as necessary.
- PAM operators must be able to test software and hardware functionality prior to operation.
- PAM operators must have evaluated their acoustic detection software using the PAM Atlantic baleen whale annotated data set available through the National Centers for Environmental Information (NCEI; *https://www.ncei.noaa.gov/*) and provide evaluation/performance metric.

The PAM operator(s) on-duty would monitor the PAM systems for acoustic detections of marine mammals that are vocalizing in the area. Any detections would be conveyed to the PSO team and any PSO sightings would be conveyed to the PAM operator for awareness purposes, and to identify if mitigation is to be triggered. For real-time PAM systems, at least one PAM operator would be designated to monitor each system by viewing data or data products that are streamed in real-time or near real-time to a computer workstation and monitor located on a project vessel or onshore. The PAM operator would inform the Lead PSO on duty of marine mammal detections approaching or within applicable ranges of interest to the pile driving activity via the data collection software system (*i.e.,* Mysticetus or similar system), who would be responsible for requesting that the designated crew member implement the necessary mitigation procedures (*i.e.,* delay or shutdown). Acoustic monitoring would complement visual monitoring at all times and would cover an area of at least the Level B harassment zone around each foundation.

All PSOs and PAM operators would be required to begin monitoring 60 minutes prior to and during all impact pile driving and for 30 minutes after impact driving. However, PAM operators must review acoustic data from the previous 24 hours as well. As described in the Proposed Mitigation section, pile driving of monopiles and pin piles would only commence when the minimum visibility zone (extending 2.0 km from the pile, based on NMFS' proposed distance) is fully visible (*e.g.,* not obscured by darkness, rain, fog, *etc.*) and the clearance zones are clear of marine mammals for at least 30 minutes, as determined by the Lead PSO, immediately prior to the initiation of impact pile driving.

For North Atlantic right whales, any visual (regardless of distance) or acoustic detection would trigger a delay to the commencement of pile driving. In the event that a large whale is sighted or acoustically detected that cannot be confirmed as a non-North Atlantic right whale species, it must be treated as if it were a North Atlantic right whale. Following a shutdown, monopile/pin pile installation may not recommence until the minimum visibility zone is fully visible and the clearance zone is clear of marine mammals for 30 minutes and no marine mammals have been detected acoustically within the PAM clearance zone for 30 minutes.

During the time period in which Dominion Energy would be allowed to pile driving (May 1–October 31), North Atlantic right whales are most likely to occur in May. Dominion Energy has proposed additional enhanced monitoring measures to supplement PSO and PAM operators during the month of May (per the May Pile Driving Memo Dominion Energy submitted to NMFS on March 23, 2023 and which can be found on NMFS' website), including the use of drones equipped with infrared technology (referred to as autonomous vehicles, remote operated vehicles in Dominion Energy's PSMMP), additional PSO vessels on-site, aerial surveys, and/or 24-hour PAM use. These measures, as proposed by Dominion Energy, would not prevent or replace other proposed monitoring measures (*i.e.,* PSOs and/or PAM operators). Instead, these additional measures would serve to complement and strengthen other monitoring approaches. Dominion Energy would seek to use autonomous or remotely operated vehicles (*i.e.,* drones) that may use infrared technology; then the use of additional PSOs for enhanced coverage; and then aerial surveys. While Dominion Energy proposed these measures, they have not committed to implementing these measures in order to proceed with foundation installation in May. Hence, NMFS is not proposing to require them here. However, we describe requirements for drone use below in the case that Dominion Energy does employ drones in addition to the previously described PSO and acoustic monitoring requirements.

If drones are deployed during May foundation installation activities Dominion Energy would undertake monitoring approaches in a way that would ensure no additional behavioral harassment or impacts on marine mammals would occur. While specifics on Dominion Energy's drone strategy was not provided in either the ITA application, nor the PSMMP, given ongoing and planned testing to occur in 2023, NMFS would require that:

- All drone operators and associated drone crews would be fully trained, qualified, and would operate in compliance with current Federal Aviation Administration (FAA), Federal, State, and local standards and would be operated in accordance with 14 CFR part 107 (Small Unmanned Aircraft Systems, Docket FAA–2015–0150, Amdt. 107–1, 81 FR 42209, June 28, 2016, unless otherwise noted);
- An appropriate number of drone operators and crews would be utilized, with some personnel operating the drone and others monitoring the instrumentation for marine mammal identification in real-time (*i.e.,* would be trained and certified PSOs);
- All monitoring crews (*i.e.,* PSOs operating drones) would meet the requirements and qualifications previously described in this proposed rulemaking;
- All drones would maintain appropriate altitudes and minimize maneuvers or circling activities that may incur behavioral harassment to marine mammals and appropriate distances (to be decided based on the 2023 testing by Dominion Energy) would be required if mothers and calves are sighted; and
- All drone visual observations would be incorporated into the standard reporting requirements, described later on in this proposed rulemaking.

The advancement of additional monitoring measures have the potential to enhance capabilities in situations where there is limited visibility. However, implementation of such strategies would require additional testing by Dominion Energy (via 2023 trials) and additional discussions between NMFS.

For all foundation installation activities, Dominion Energy must prepare and submit a Pile Driving and Marine Mammal Monitoring Plan (including information related to the proposed enhanced monitoring measures described above) to NMFS for review and approval at least 180 days before the start of any pile driving. The plans must include final pile driving project design (*e.g.,* number and type of piles, hammer type, noise abatement systems, anticipated start date, *etc.*) and all information related to PAM PSO monitoring protocols for pile-driving and visual PSO protocols for all activities.

Cable Landfall Activities—Temporary Cofferdams

Dominion Energy would be required to implement the following procedures during all vibratory pile driving activities associated with the installation and removal of temporary cofferdams.

During all observation periods related to vibratory pile driving, PSOs must use standard handheld (7x) binoculars and the naked eye to search continuously for marine mammals. Dominion Energy would be required to have a minimum of two PSOs on active duty during any installation and removal activities related to temporary cofferdams. These PSOs would always be located at the best vantage point(s) on the vibratory pile driving platform or secondary platform in the immediate vicinity of the primary platforms in order to ensure that appropriate visual coverage is available of the entire visual clearance zone and as much of the Level B harassment zone as possible. NMFS would not require the use of PAM for these activities.

PSOs would monitor the clearance zone for the presence of marine mammals for 30 minutes before, throughout the installation of the piles, and for 30 minutes after the activities have ceased. Installation may only commence when visual clearance zones are fully visible (*e.g.,* not obscured by darkness, rain, fog, *etc.*) and clear of marine mammals, as determined by the

Lead PSO, for at least 30 minutes immediately prior to initiation of vibratory pile driving.

Cable Landfall Activities—Temporary Goal Posts

Dominion Energy would be required to implement the following procedures during all impact pile driving activities associated with the installation of temporary goal posts. These requirements generally mirror the requirements described above for temporary cofferdams.

During all observation periods related to impact pile driving, PSOs must use standard handheld (7x) binoculars and the naked eye to search continuously for marine mammals. Dominion Energy would be required to have a minimum of two PSOs on active duty during any installation activities related to temporary goal posts. These PSOs would always be located at the best vantage point(s) on the impact pile driving platform or secondary platform in the immediate vicinity of the primary platforms in order to ensure that appropriate visual coverage is available of the entire visual clearance zone and as much of the Level B harassment zone as possible. NMFS would not require the use of PAM for these activities.

PSOs would monitor the clearance zone for the presence of marine mammals for 30 minutes before, throughout the installation of the pipe piles, and for 30 minutes after the activities have ceased. Installation may only commence when visual clearance zones are fully visible (*e.g.,* not obscured by darkness, rain, fog, *etc.*) and clear of marine mammals, as determined by the Lead PSO, for at least 30 minutes immediately prior to initiation of impact pile driving.

HRG Surveys

Dominion Energy would be required to implement the following procedures during all HRG surveys.

During all observation periods, PSOs must use standard handheld (7x) binoculars and the naked eye to search continuously for marine mammals.

Between four and six PSOs would be present on every 24-hour survey vessel, and two to three PSOs would be present on every 12-hour survey vessel. Dominion Energy would be required to have at least one PSO on active duty during HRG surveys that are conducted during daylight hours (*i.e.,* from 30 minutes prior to sunrise through 30 minutes following sunset) and at least two PSOs during HRG surveys that are conducted during nighttime hours.

All PSOs would begin monitoring 30 minutes prior to the activation of boomers, sparkers, or CHIRPs; throughout use of these acoustic sources, and for 30 minutes after the use of the acoustic sources has ceased.

Given that multiple HRG vessels may be operating concurrently, any observations of marine mammals would be required to be communicated to PSOs on all nearby survey vessels.

Ramp-up of boomers, sparkers, and CHIRPs would only commence when visual clearance zones are fully visible (*e.g.,* not obscured by darkness, rain, fog, *etc.*) and clear of marine mammals, as determined by the Lead PSO, for at least 30 minutes immediately prior to initiation of survey activities utilizing the specified acoustic sources.

During daylight hours when survey equipment is not operating, Dominion Energy would 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 monitoring reports.

Marine Mammal Passive Acoustic Monitoring

As described previously, Dominion Energy would be required to utilize a PAM system to supplement visual monitoring for all foundation installation activities, inclusive of vibratory and impact hammer installation. Training and qualified PAM operators would monitor the PAM systems. PAM operators may be on watch for a maximum of four consecutive hours followed by a break of at least two hours between watches. Again, PSOs can act as PAM operators or visual PSOs (but not simultaneously) as long as they demonstrate that their training and experience are sufficient to perform each task. The PAM system must be monitored by a minimum of one PAM operator beginning at least 60 minutes prior to the initiation of soft-start of foundation piles, at all times during installation, and for 30 minutes after pile driving has ceased. To further aid in detections of North Atlantic right whales during the highest occurrence month (May) during the construction period (and as described above for monitoring during *WTG and OSS foundation Installation*), PAM would be implemented 24-hours prior to foundation activities.

PAM operators would monitor the signals from the hydrophones in both real-time using headphones and visually via the outputs on a computer monitor. PAM operators must immediately communicate all detections of marine mammals at any distance (*i.e.,* not limited to the Level B harassment zones) to visual PSOs, including any determination regarding species identification, distance, and bearing and the degree of confidence in the determination. Based on the information provided by the PAM operator, the Lead PSO on duty would ensure that the appropriate mitigation measures are implemented, if determined to be necessary. A PAM detection alone, even without a visual confirmation that a marine mammal is within a relevant clearance and/or shutdown zone, would trigger mitigation measures, such as a delay or the shutdown of pile driving activities (if safe to do so). Additionally, PAM detections of North Atlantic right whales, even without a visual detection, would trigger the appropriate mitigation measures.

PAM systems may be used for real-time mitigation monitoring. The PAM system would be, at a minimum, capable of detecting animals at least 5 km away from the pile driving location. The PAM system would offer real-time detections of low-frequency cetaceans with a targeted frequency range of 20 Hz to 1,500 Hz, with a specific focus on a system capable of monitoring the bandwidth for North Atlantic right whales (65–400 Hz; corresponding to information provided in Van Parijs *et al.* (2021)). The requirement for real-time detection and localization limits the types of PAM technologies that can be used to those systems that are either cabled, satellite, or radio-linked. It is most likely that Dominion Energy would deploy fixed surface buoys and/or gliding autonomous vehicle PAM devices. The system chosen will dictate the design and protocols of the PAM operations. Dominion Energy is not considering bottom-mounted, fixed cabled PAM systems, in part due to the ability of most of these systems to record data archivally rather than in real-time or near-real-time. Towed systems, while being considered, are not preferred as they could be easily masked by vessel noise. For a review of the PAM systems Dominion Energy is considering, see section 7.3 and 7.4 of the PSMMP included as a supplement to Dominion Energy's ITA application.

At this stage, Dominion Energy has not chosen the appropriate and final PAM systems for the CVOW–C project. However, when an appropriate system or configuration of systems is chosen, a Passive Acoustic Monitoring (PAM) Plan must be submitted to NMFS for review and approval at least 180 days prior to the planned start of foundation installations. PAM should follow standardized measurement, processing methods, reporting metrics, and metadata standards for offshore wind

(Van Parijs *et al.,* 2021). The plan must describe all proposed PAM equipment, procedures, and protocols. However, NMFS considers PAM usage for every project on a case-by-case basis and would continue discussions with Dominion Energy regarding selection of the PAM system that is most appropriate for the proposed project. The authorization to take marine mammals would be contingent upon NMFS' approval of the PAM Plan.

Acoustic Monitoring for Sound Field and Harassment Isopleth Verification (SFV)

During the installation (inclusive of both vibratory and impact pile driving approaches) of the first three WTG monopile foundations and all three OSSs using jacket foundations, Dominion Energy must empirically determine source levels, the ranges to the isopleths corresponding to the Level A harassment and Level B harassment thresholds, and the transmission loss coefficient(s). Dominion Energy may also estimate ranges to the Level A harassment and Level B harassment isopleths by extrapolating from *in situ* measurements conducted at several distances from the monopile and pin piles in each OSS being driven. Dominion Energy must measure received levels at a standard distance of 750 m from the monopile and pin piles in each OSS and at both the presumed modeled Level A harassment and Level B harassment isopleth ranges or an alternative distance(s) as agreed to in the SFV Plan. In addition to the 750 m distance, Dominion Energy has also proposed to monitor at 2,500 m and 5,000 m from the pile, as well as the extent of the modeled Level B harassment zone to verify the accuracy of the modeled zones.

If acoustic field measurements collected during installation of the WTG monopiles and OSS foundations indicates ranges to the isopleths corresponding to Level A harassment and Level B harassment thresholds are greater than the ranges predicted by modeling (assuming 10-dB attenuation), Dominion Energy must implement additional noise attenuation measures prior to installing the next WTG monopile or OSS jacket foundation. Dominion Energy has also proposed to monitor and collect acoustic information on a subsequent monopile in the event that obtained technical information indicates a monopile would produce a larger sound field than previously monitored. Initial additional measures may include improving the efficacy of the implemented noise mitigation technology (*e.g.,* BBC, dBBC) and/or modifying the piling schedule to reduce the sound source. Each sequential modification would be evaluated empirically by acoustic field measurements. In the event that field measurements indicate ranges to isopleths corresponding to Level A harassment and Level B harassment thresholds are greater than the ranges predicted by modeling (assuming 10-dB attenuation), NMFS may expand the relevant harassment, clearance, and shutdown zones and associated monitoring protocols. If harassment zones are expanded beyond an additional 1,500 m, additional PSOs would be deployed on additional platforms with each observer responsible for maintaining watch in no more than 180° and of an area with a radius no greater than 1,500 m.

If acoustic measurements indicate that ranges to isopleths corresponding to the Level A harassment and Level B harassment thresholds are less than the ranges predicted by modeling (assuming 10-dB attenuation), Dominion Energy may request a modification of the clearance and shutdown zones for pile driving of WTG monopiles and OSS foundation pin piles. For NMFS to consider a modification request, Dominion Energy will have had to conduct SFV on three or more WTG monopiles and two full OSS jacket foundations (8 total pin piles), thus far, to verify that zone sizes are consistently smaller than those predicted by modeling (assuming 10-dB attenuation). In addition, if a subsequent monopile installation location is selected that was not represented by previous three locations (*i.e.,* substrate composition, water depth), SFV would be required. Furthermore, if pile driving of WTG foundations occurs across different seasons from the season the first monopile was installed in (*i.e.,* the first monopile was driven in the spring and as pile driving would also occur in the fall, acoustic measurements for the pile driven in the fall would also be required to occur), Dominion Energy has proposed, for comparison, to collect acoustic measurements on these piles as well.

Upon receipt of an interim SFV report, NMFS may adjust zones (*i.e.,* Level A harassment, Level B harassment, clearance, shutdown, and/or minimum visibility zone) to reflect SFV measurements. The shutdown and clearance zones for pile driving would be equivalent to the measured range to the Level A harassment isopleths plus 10 percent (shutdown zone) and 20 percent (clearance zone), rounded up to the nearest 100 m for PSO clarity. The minimum visibility zone would be based on the largest measured distance to the Level A harassment isopleth for large whales. Regardless of SFV, a North Atlantic right whale detected at any distance by PSOs would continue to result in a delay to the start of pile driving. Similarly, if pile driving has commenced, shutdown would be called for in the event a North Atlantic right whale is observed at any distance. That is, the visual clearance and shutdown criteria for North Atlantic right whales would not change, regardless of field acoustic measurements. The Level B harassment zone would be equal to the largest measured range to the Level B harassment isopleth.

The SFV plan must also include how operational noise from the wind farm would be monitored. Dominion Energy would be required to estimate source levels based on measurements in the near and far-field at a minimum of three locations from each foundation monitored. These data must be used to also identify estimated transmission loss rates. Operational parameters (*e.g.,* direct drive/gearbox information, turbine rotation rate) as well as sea state conditions and information on nearby anthropogenic activities (*e.g.,* vessels transiting or operating in the area) must be reported.

Dominion Energy must submit a SFV Plan at least 180 days prior to the planned start of impact pile driving activities. The plan must describe how Dominion Energy would ensure that the first three WTG monopile and OSS jacket (using pin piles) foundation installation sites selected for SFV are representative of the rest of the monopile and pin pile installation sites. Dominion Energy must include information on how additional sites/scenarios would be selected for SFV should it be determined that these sites/scenarios are not representative of all other monopile installation sites. The plan must also include the methodology for collecting, analyzing, and preparing SFV data for submission to NMFS. The plan must describe how the effectiveness of the sound attenuation methodology would be evaluated based on the results. Dominion Energy must also provide, as soon as they are available but no later than 48 hours after each installation, the initial results of the SFV measurements to NMFS in an interim report after each monopile for the first three piles.

Reporting

Prior to any construction activities occurring, Dominion Energy would provide a report to NMFS (at *itp.potlock@noaa.gov* and *pr.itp.monitoringreports@noaa.gov*) documenting that all required training for Dominion Energy personnel (*i.e.,* vessel crews, vessel captains, PSOs, and PAM operators) has been completed. Dominion Energy has also proposed to contact both BOEM and NMFS within 24-hour of the commencement of pile driving activities for the year and again within 24 hours of the completion of the pile driving activities for that year (based on May 1st through October 31st).

NMFS would require standardized and frequent reporting from Dominion Energy during the life of the proposed regulations and LOA. All data collected relating to the Dominion Energy project would be recorded using industry-standard software (*e.g.,* Mysticetus or a similar software) installed on field laptops and/or tablets. Dominion Energy would be required to submit weekly, monthly and annual reports as described below. During activities requiring PSOs, the following information would be collected and reported related to the activity being conducted:

- Date and time that monitored activity begins or ends;
- Construction activities occurring during each observation period;
- Watch status (*i.e.,* sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform);
- PSO who sighted the animal;
- Time of sighting;
- Weather parameters (*e.g.,* wind speed, percent cloud cover, visibility);
- Water conditions (*e.g.,* sea state, tide state, water depth);
- All marine mammal sightings, regardless of distance from the construction activity;
- Species (or lowest possible taxonomic level possible);
- Pace of the animal(s);
- Estimated number of animals (minimum/maximum/high/low/best);
- Estimated number of animals by cohort (*e.g.,* adults, yearlings, juveniles, calves, group composition, *etc.*);
- Description (*i.e.,* as many distinguishing features as possible of each individual seen, including length, shape, color, pattern, scars or markings, shape and size of dorsal fin, shape of head, and blow characteristics);
- Description of any marine mammal behavioral observations (*e.g.,* observed behaviors such as feeding or traveling) and observed changes in behavior, including an assessment of behavioral responses thought to have resulted from the specific activity;
- Animal's closest distance and bearing from the pile being driven or specified HRG equipment and estimated time spent within the Level A harassment and/or Level B harassment zones;
- Construction activity at time of sighting (*e.g.,* vibratory installation/removal, impact pile driving, HRG survey), use of any noise abatement device(s), and specific phase of activity (*e.g.,* ramp-up of HRG equipment, HRG acoustic source on/off, soft start for pile driving, active pile driving, *etc.*);
- Description of any mitigation-related action implemented, or mitigation-related actions called for but not implemented, in response to the sighting (*e.g.,* delay, shutdown, *etc.*) and time and location of the action; and
- Other human activity in the area.

For all real-time acoustic detections of marine mammals, the following must be recorded and included in weekly, monthly, annual, and final reports:

1. Location of hydrophone (latitude & longitude; in Decimal Degrees) and site name;
2. Bottom depth and depth of recording unit (in meters);
3. Recorder (model & manufacturer) and platform type (*i.e.,* bottom-mounted, electric glider, *etc.*), and instrument ID of the hydrophone and recording platform (if applicable);
4. Time zone for sound files and recorded date/times in data and metadata (in relation to Universal Coordinated Time (UTC); *i.e.,* Eastern Standard Time (EST) time zone is UTC–5);
5. Duration of recordings (start/end dates and times; in ISO 8601 format, yyyy-mm-ddTHH:MM:SS.sssZ);
6. Deployment/retrieval dates and times (in ISO 8601 format);
7. Recording schedule (must be continuous);
8. Hydrophone and recorder sensitivity (in dB *re. 1 µPa*);
9. Calibration curve for each recorder;
10. Bandwidth/sampling rate (in Hz);
11. Sample bit-rate of recordings; and
12. Detection range of equipment for relevant frequency bands (in meters).

For each detection the following information must be noted:

13. Species identification (if possible);
14. Call type and number of calls (if known);
15. Temporal aspects of vocalization (date, time, duration, *etc.,* date times in ISO 8601 format);
16. Confidence of detection (detected, or possibly detected);
17. Comparison with any concurrent visual sightings;
18. Location and/or directionality of call (if determined) relative to acoustic recorder or construction activities;
19. Location of recorder and construction activities at time of call;
20. Name and version of detection or sound analysis software used, with protocol reference;
21. Minimum and maximum frequencies viewed/monitored/used in detection (in Hz); and
22. Name of PAM operator(s) on duty.

If a North Atlantic right whale is detected, data shall be submitted to *nmfs.pacmdata@noaa.gov* using the NMFS Passive Acoustic Reporting System Metadata and Detection data spreadsheets (*https://www.fisheries.noaa.gov/resource/document/passive-acoustic-reporting-system-templates*) as soon as feasible but no longer than 24 hours after the detection. Submit the completed data templates to *nmfs.pacmdata@noaa.gov*. The full acoustic species Detection data, Metadata and GPS data records, from real-time data, must be submitted within 90 days via the ISO standard metadata forms available on the NMFS Passive Acoustic Reporting System website (*https://www.fisheries.noaa.gov/resource/document/passive-acoustic-reporting-system-template*). Submit the completed data templates to *nmfs.pacmdata@noaa.gov*. Full detection data and metadata must be submitted monthly on the 15th of every month for the previous month via the webform on the NMFS North Atlantic right whale Passive Acoustic Reporting System website (*https://www.fisheries.noaa.gov/resource/document/passive-acoustic-reporting-system-templates*).

If a North Atlantic right whale is observed at any time by PSOs or personnel on or in the vicinity of any impact or vibratory pile-driving vessel, dedicated PSO vessel, construction survey vessel, or during vessel transit, Dominion Energy must immediately report sighting information to the NMFS North Atlantic Right Whale Sighting Advisory System (866) 755–6622, to the U.S. Coast Guard via channel 16, and through the WhaleAlert app (*https://www.whalealert.org/*) as soon as feasible but no longer than 24 hours after the sighting. Information reported must include, at a minimum: time of sighting, location, and number of North Atlantic right whales observed.

SFV Interim Report—Dominion Energy would be required to provide, as soon as they are available but no later than 48 hours after each installation, the initial results of SFV measurements to NMFS in an interim report after each monopile for the first three piles and any subsequent piles monitored.

Weekly Report—Dominion Energy would be required to compile and submit weekly PSO, PAM, and SFV reports to NMFS

(*PR.ITP.monitoringreports@noaa.gov*) that document the daily start and stop of all pile driving or HRG survey activities, the start and stop of associated observation periods by PSOs, details on the deployment of PSOs, a record of all detections of marine mammals (acoustic and visual), any mitigation actions (or if mitigation actions could not be taken, provide reasons why), and details on the noise abatement system(s) used and its performance. Weekly reports would be due on Wednesday for the previous week (Sunday–Saturday). The weekly report would also identify which turbines become operational and when (a map must be provided). Once all foundation pile installation is complete, weekly reports would no longer be required.

Monthly Report—Dominion Energy would be required to compile and submit monthly reports to NMFS (at *itp.potlock@noaa.gov* and *PR.ITP.monitoringreports@noaa.gov*) that include a summary of all information in the weekly reports, including project activities carried out in the previous month, vessel transits (number, type of vessel, and route), number of piles installed, all detections of marine mammals, and any mitigative actions taken. Monthly reports would be due on the 15th of the month for the previous month. The monthly report would also identify which turbines become operational and when (a map must be provided). Once foundation pile installation is complete, monthly reports would no longer be required.

Annual Report—Dominion Energy would be required to submit an annual PSO, PAM, and SFV summary report to NMFS (at *itp.potlock@noaa.gov* and *PR.ITP.monitoringreports@noaa.gov*) no later than 90 days following the end of a given calendar year describing, in detail, all of the information required in the monitoring section above. A final annual report would be prepared and submitted within 30 calendar days following receipt of any NMFS comments on the draft report. If no comments were received from NMFS within 60 calendar days of NMFS' receipt of the draft report, the report would be considered final.

Final Report—Dominion Energy must submit its draft final report(s) to NMFS (at *itp.potlock@noaa.gov* and *PR.ITP.monitoringreports@noaa.gov*) on all visual and acoustic monitoring conducted under the LOA within 90 calendar days of the completion of activities occurring under the LOA. A final report must be prepared and submitted within 30 calendar days following receipt of any NMFS comments on the draft report. If no comments are received from NMFS within 30 calendar days of NMFS' receipt of the draft report, the report shall be considered final.

Situational Reporting

Specific situations encountered during the development of the Dominion Energy project would require reporting. These situations and the relevant procedures include:

• If a large whale is detected during vessel transit, the following information must be recorded and reported:

a. Time, date, and location;

b. The vessel's activity, heading, and speed;

c. Sea state, water depth, and visibility;

d. Marine mammal identification to the best of the observer's ability (*e.g.,* North Atlantic right whale, whale, dolphin, seal);

e. Initial distance and bearing to marine mammal from vessel and closest point of approach; and,

f. Any avoidance measures taken in response to the marine mammal sighting.

• If a sighting of a stranded, entangled, injured, or dead marine mammal occurs, the sighting would be reported to NMFS OPR, the NMFS Greater Atlantic Regional Fisheries Office (GARFO) Marine Mammal and Sea Turtle Stranding & Entanglement Hotline (866–755–6622), and the U.S. Coast Guard within 24 hours. If the injury or death was caused by a project activity, Dominion Energy must immediately cease all activities until NMFS 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 LOA. NMFS may impose additional measures to minimize the likelihood of further prohibited take and ensure MMPA compliance. Dominion Energy may not resume their activities until notified by NMFS. The report must include the following information:

a. Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);

b. Species identification (if known) or description of the animal(s) involved;

c. Condition of the animal(s) (including carcass condition if the animal is dead);

d. Observed behaviors of the animal(s), if alive;

e. If available, photographs or video footage of the animal(s); and

f. General circumstances under which the animal was discovered.

• In the event of a vessel strike of a marine mammal by any vessel associated with the CVOW–C project, Dominion Energy shall immediately report the strike incident to the NMFS OPR and the GARFO within and no later than 24 hours. Dominion Energy must immediately cease all activities until NMFS 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 LOA. NMFS may impose additional measures to minimize the likelihood of further prohibited take and ensure MMPA compliance. Dominion Energy may not resume their activities until notified by NMFS. The report must include the following information:

a. Time, date, and location (latitude/longitude) of the incident;

b. Species identification (if known) or description of the animal(s) involved;

c. Vessel's speed during and leading up to the incident;

d. Vessel's course/heading and what operations were being conducted (if applicable);

e. Status of all sound sources in use;

f. 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;

g. Environmental conditions (*e.g.,* wind speed and direction, Beaufort sea state, cloud cover, visibility) immediately preceding the strike;

h. Estimated size and length of animal that was struck;

i. Description of the behavior of the marine mammal immediately preceding and following the strike;

j. If available, description of the presence and behavior of any other marine mammals immediately preceding the strike;

k. Estimated fate of the animal (*e.g.,* dead, injured but alive, injured and moving, blood or tissue observed in the water, status unknown, disappeared); and

l. To the extent practicable, photographs or video footage of the animal(s).

Sound Monitoring Reporting

As described previously, Dominion Energy would be required to provide the initial results of SFV (including measurements) to NMFS in interim reports after each monopile installation for the first three piles (and any subsequent piles) as soon as they are available, but no later than 48 hours after each installation. In addition to in situ measured ranges to the Level A harassment and Level B harassment isopleths, the acoustic monitoring report must include: hammer energies (pile driving), SPL_{peak}, SPL_{rms} that contains 90 percent of the acoustic energy, single strike sound exposure level, integration time for SPL_{rms}, and 24-hour cumulative SEL extrapolated from measurements. The sound levels reported must be in median and linear average (*i.e.,* average in linear space), and in dB. All these levels must be reported in the form of median, mean, max, and minimum. The SEL and SPL power spectral density and one-third octave band levels (usually calculated as decidecade band levels) at the receiver locations should be reported. The acoustic monitoring report must also include: a description of the SFV PAM hardware and software, including software version used, calibration data, bandwidth capability and sensitivity of hydrophone(s), any filters used in hardware or software, any limitations with the equipment, a description of the hydrophones used, hydrophone and water depth, distance to the pile driven, sediment type at the recording location, and local environmental conditions (*e.g.,* wind speed). In addition, pre- and post-activity ambient sound levels (broadband and/or within frequencies of concern) should be reported. Finally, the report must include a description of the noise abatement system and operational parameters (*e.g.,* bubble flow rate, distance deployed from the pile, *etc.*), and any action taken to adjust the noise abatement system. Final results of SFV must be submitted as soon as possible, but no later than within 90 days following completion of impact pile driving of monopiles.

Adaptive Management

The regulations governing the take of marine mammals incidental to Dominion Energy's construction activities would contain an adaptive management component. The reporting requirements associated with this rule are designed to provide NMFS with monitoring data throughout the life of the regulations that can inform potential consideration of whether any changes to mitigation or monitoring are appropriate. The use of adaptive management allows NMFS to consider new information from different sources to determine (with input from Dominion Energy regarding practicability) if mitigation or monitoring measures should be modified (including additions or deletions). Mitigation measures could be modified if new data suggests that such modifications would have a reasonable likelihood of reducing adverse effects to marine mammals and if the measures are practicable.

The following are some of the possible sources of applicable data to be considered through the adaptive management process: (1) Results from monitoring reports, as required by MMPA authorizations; (2) results from general marine mammal and sound research; and (3) any information which reveals that marine mammals may have been taken in a manner, extent, or number not authorized by these regulations or subsequent LOA. During the course of the rule, Dominion Energy (and other LOA-holders conducting offshore wind development activities) would be required to participate in one or more adaptive management meetings convened by NMFS and/or BOEM, in which the above information would be summarized and discussed in the context of potential changes to the mitigation or monitoring measures.

Negligible Impact Analysis and Determination

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.,* population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be ''taken'' by mortality, serious injury, and Level A harassment or Level B harassment, we consider other factors, such as the likely nature of any behavioral responses (*e.g.,* intensity, duration), the context of any such responses (*e.g.,* critical reproductive time or location, migration) as well as effects on habitat and the likely effectiveness of mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS' implementing regulations (54 FR 40338; September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (*e.g.,* as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

In the Estimated Take section, we identified the subset of potential effects that would be expected to qualify as takes under the MMPA and then identified the total number of takes by Level A harassment and Level B harassment that we estimate are reasonably expected to occur based on the methods described. The impact that any given take would have is dependent on many case-specific factors that need to be considered in the negligible impact analysis (*e.g.,* the context of behavioral exposures such as duration or intensity of a disturbance, the health of impacted animals, the status of a species that incurs fitness-level impacts to individuals, *etc.*). In this rule, we evaluate the likely impacts of the enumerated harassment takes that are proposed for authorization in the context of the specific circumstances surrounding these estimated takes. We also collectively evaluate this information as well as other more taxa-specific information and mitigation measure effectiveness in group-specific discussions that support our negligible impact conclusions for each stock. As also described above, no serious injury or mortality is expected or proposed for authorization for any species or stock.

The Description of the Specified Activities section describes the specified activities proposed by Dominion Energy that may result in take of marine mammals and an estimated schedule for conducting those activities. Dominion Energy has provided a realistic construction schedule (*e.g.,* Dominion Energy's schedule reflects the maximum number of piles they anticipate to be able to drive each month in which pile driving is authorized to occur), although, we recognize schedules may shift for a variety of reasons (*e.g.,* weather or supply delays). However, the total number of take would not exceed the 5-year totals and maximum annual total in any given year indicated in Tables 27, 28, and 29, respectively.

We base our analysis and negligible impact determination (NID) on the total number of takes that would be reasonably expected to occur and are proposed to be authorized in the 5-year LOA, if issued, and extensive qualitative consideration of other contextual factors that influence the degree of impact of the takes on the affected individuals and the number and context of the individuals affected. As stated before, the number of takes, both annual and 5-year total, alone are only a part of the analysis. To avoid repetition, we provide some general analysis in this Negligible Impact Analysis and Determination section that applies to all the species listed in Table 7, given that some of the anticipated effects of Dominion Energy's construction activities on marine mammals are expected to be relatively similar in nature. Then, we subdivide into more detailed discussions for mysticetes, odontocetes, and pinnipeds, which have broad life history traits that support an overarching discussion of some factors considered within the analysis for those groups (*e.g.,* habitat-use patterns, high-level differences in feeding strategies).

Last, we provide a negligible impact determination for each species or stock, providing species or stock-specific information or analysis, where appropriate, for example, for North Atlantic right whales given their population status. Organizing our analysis by grouping species or stocks that share common traits or that would respond similarly to effects of Dominion Energy's proposed activities and then providing species- or stock-specific information allows us to avoid duplication while ensuring that we have analyzed the effects of the specified activities on each affected species or stock. It is important to note that in the group or species sections, we base our negligible impact analysis on the maximum annual take that is predicted under the 5-year rule; however, the majority of the impacts are associated with installation of the WTG and OSS foundations, which would occur largely within a two year period. The estimated take in the other years is expected to be notably less, which is reflected in the total take that would be allowable under the rule (see Tables 27, 28, and 29).

As described previously, no serious injury or mortality is anticipated or proposed for authorization in this rule. The amount of harassment Dominion Energy has requested and NMFS is proposing to authorize is based on exposure models that consider the outputs of acoustic source and propagation models as well as consideration of other information such as group size and PSO data during previous HRG surveys. For all species, the amount of take proposed to be authorized represents the amount of Level A harassment and Level B harassment that could occur.

Behavioral Disturbance

In general, NMFS anticipates that impacts on an individual that has been harassed are likely to be more intense when exposed to higher received levels and for a longer duration (though this is in no way a strictly linear relationship for behavioral effects across species, individuals, or circumstances) and less severe impacts result when exposed to lower received levels and for a shorter duration. However, there is also growing evidence of the importance of contextual factors, such as distance from a source in predicting marine mammal behavioral response to sound—*i.e.,* sounds of a similar level emanating from a more distant source have been shown to be less likely to evoke a response of equal magnitude (*e.g.,* DeRuiter and Doukara, 2012; Falcone *et al.,* 2017). As described in the Potential Effects to Marine Mammals and their Habitat section, the intensity and duration of any impact resulting from exposure to Dominion Energy's activities is dependent upon a number of contextual factors including, but not limited to, sound source frequencies, whether the sound source is moving towards the animal, hearing ranges of marine mammals, behavioral state at time of exposure, status of individual exposed (*e.g.,* reproductive status, age class, health) and an individual's experience with similar sound sources. Ellison *et al.* (2012) and Moore and Barlow (2013), among others, emphasize the importance of context (*e.g.,* behavioral state of the animals, distance from the sound source) in evaluating behavioral responses of marine mammals to acoustic sources. Harassment of marine mammals may result in behavioral modifications (*e.g.,* avoidance, temporary cessation of foraging or communicating, changes in respiration or group dynamics, masking) or may result in auditory impacts such as hearing loss. In addition, some of the lower level physiological stress responses (*e.g.,* orientation or startle response, change in respiration, change in heart rate) discussed previously would likely co-occur with the behavioral modifications, although these physiological responses are more difficult to detect and fewer data exist relating these responses to specific received levels of sound. Takes by Level B harassment, then, may have a stress-related physiological component as well; however, we would not expect Dominion Energy's activities to produce conditions of long-term and continuous exposure to noise leading to long-term physiological stress responses in marine mammals that could affect reproduction or survival.

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

Many species perform vital functions, such as feeding, resting, traveling, and socializing on a diel cycle (24-hour cycle). Behavioral reactions to noise exposure, when taking place in a biologically important context, such as disruption of critical life functions, displacement, or avoidance of important habitat, are more likely to be significant if they last more than one day or recur on subsequent days (Southall *et al.,* 2007) due to diel and lunar patterns in diving and foraging behaviors observed in many cetaceans (Baird *et al.,* 2008, Barlow *et al.,* 2020, Henderson *et al.,* 2016, Schorr *et al.,* 2014). It is important to note the water depth in the CVOW–C project area is generally shallow (less than 40 m) and deep diving species, such as sperm whales, are not expected to be engaging in deep foraging dives when exposed to noise above NMFS harassment thresholds during the specified activities. Therefore, we do not anticipate impacts to deep foraging behavior to be impacted by the specified activities.

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

For the CVOW–C project, impact pile driving is likely to result in a higher magnitude and severity of behavioral disturbance than vibratory pile driving, HRG surveys, or other activities. Impact pile driving has higher source levels than vibratory pile driving and HRG sources. HRG survey equipment also produces much higher frequencies than pile driving, resulting in minimal sound propagation. While impact pile driving is anticipated to be most impactful for these reasons, impacts are minimized through implementation of mitigation measures, including soft-start, use of a sound attenuation system, and the implementation of clearance zones that would facilitate a delay of pile driving if marine mammals were observed approaching or within areas that could be ensonified above sound levels that could result in Level B harassment. Given sufficient notice through the use of soft-start, marine mammals are expected to move away from a sound source prior to becoming exposed to very loud noise levels. The requirement that pile driving can only commence when the full extent of all clearance zones are fully visible to visual PSOs would ensure a higher marine mammal detection, enabling a high rate of success in implementation of clearance zones. Furthermore, Dominion Energy would be required to utilize PAM to augment visual observations prior to and during all clearance periods, during impact pile driving, and after pile driving has ended during the post-piling period. PAM has been shown to be particularly effective when used in conjunction with visual observations, increasing the overall capability to detect marine mammals (Van Parijs *et al.,* 2021).

Occasional, milder behavioral reactions are unlikely to cause long-term consequences for individual animals or populations, and even if some smaller subset of the takes are in the form of a longer (several hours or a day) and more severe response, if they are not expected to be repeated over sequential days, impacts to individual fitness are not anticipated. Nearly all studies and experts agree that infrequent exposures of a single day or less are unlikely to impact an individual's overall energy budget (Farmer *et al.,* 2018; Harris *et al.,* 2017; King *et al.,* 2015; NAS 2017; New *et al.,* 2014; Southall *et al.,* 2007; Villegas-Amtmann *et al.,* 2015).

Temporary Threshold Shift

TTS is one form of Level B harassment that marine mammals may incur through exposure to Dominion Energy's activities and, as described earlier, the proposed takes by Level B harassment may represent takes in the form of behavioral disturbance, TTS, or both. As discussed in the Potential Effects to Marine Mammals and their Habitat section, in general, TTS can last from a few minutes to days, be of varying degree, and occur across different frequency bandwidths, all of which determine the severity of the impacts on the affected individual, which can range from minor to more severe. Impact and vibratory pile driving generate sounds in the lower frequency ranges (with most of the energy below 1–2 kHz, but with a small amount energy ranging up to 20 kHz); therefore, in general and all else being equal, we would anticipate the potential for TTS is higher in low-frequency cetaceans (*i.e.,* mysticetes) than other marine mammal hearing groups and would be more likely to occur in frequency bands in which they communicate. However, though the frequency range of TTS that marine mammals might sustain would overlap with some of the frequency ranges of their vocalizations, the frequency range of TTS from Dominion Energy's pile driving activities would not typically span the entire frequency range of one vocalization type, much less span all types of vocalizations or other critical auditory cues for any given species. Furthermore, the mitigation measures proposed by Dominion Energy and proposed by NMFS further reduce the potential for TTS in mysticetes.

Generally, both the degree of TTS and the duration of TTS would be greater if the marine mammal is exposed to a higher level of energy (which would occur when the peak dB level is higher or the duration is longer). The threshold for the onset of TTS was discussed previously (refer back to the Level B Harassment section in *Marine Mammal Acoustic Thresholds*). However, source level alone is not a predictor of TTS. An animal would have to approach closer to the source or remain in the vicinity of the sound source appreciably longer to increase the received SEL, which would be difficult considering the proposed mitigation and the nominal speed of the receiving animal relative to the stationary sources such as impact pile driving. The recovery time of TTS is also of importance when considering the potential impacts from TTS. In TTS laboratory studies (as discussed in the Potential Effects to Marine Mammals and their Habitat section), some using exposures of almost an hour in duration or up to 217 SEL, almost all individuals recovered within 1 day (or less, often in minutes) and we note that while the pile driving activities last for hours a day, it is unlikely that most marine mammals would stay in the close vicinity of the source long enough to incur more severe TTS. Overall, given the small number of times that any individual might incur TTS, the low degree of TTS and the short anticipated duration, and the unlikely scenario that any TTS overlapped the entirety of a critical hearing range, it is unlikely that TTS of the nature expected to result from Dominion Energy's activities would result in behavioral changes or other impacts that would impact any individual's (of any hearing sensitivity) reproduction or survival.

Permanent Threshold Shift

Dominion Energy has requested and NMFS proposed to authorize a very small amount of take by PTS to some marine mammal individuals. The maximum amount of Level A harassment proposed to be authorized is relatively low for all marine mammal stocks and species: humpback whales (4 takes), fin whales (4 takes), sei whales (1 take), minke whale (8 takes), harbor porpoises (1 take), gray seals (1 take), and harbor seals (1 take). The only activities we anticipate PTS may result from are exposure to impact pile driving foundation piles, an activity that produces sound that is both impulsive and primarily concentrated in the lower frequency ranges (below 1 kHz) (David, 2006; Krumpel *et al.,* 2021). Take by Level A harassment incidental to any other activity is not anticipated due to either the nature of the source (*e.g.,* HRG survey equipment) or the very small distances to Level A harassment isopleths (*e.g.,* the distance to PTS thresholds for vibratory driving large foundation piles is less than 158 m for all species).

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

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

Auditory Masking or Communication Impairment

The ultimate potential impacts of masking on an individual are similar to those discussed for TTS (*e.g.,* decreased ability to communicate, forage effectively, or detect predators), but an important difference is that masking only occurs during the time the animal is exposed to the signal, versus TTS, which continues beyond the duration of the signal. Also, though, masking can result from the sum of exposure to multiple signals, none of which might individually cause TTS. Fundamentally, masking is referred to as a chronic effect because one of the key potential harmful components of masking is its duration—the fact that an animal would have reduced ability to hear or interpret critical cues becomes much more likely to cause a problem the longer it is occurring. Also inherent in the concept of masking is the fact that the potential for the effect is only present during the times that the animal and the source are in close enough proximity for the effect to occur (and further, this time period would need to coincide with a time that the animal was utilizing sounds at the masked frequency). As our analysis has indicated, for this project we expect that pile driving foundations have the greatest potential to mask marine mammal signals, and this pile driving may occur for several, albeit intermittent, hours per day, given the need to switch between vibratory and impact hammers. Masking is fundamentally more of a concern at lower frequencies (which are pile driving dominant frequencies) because low frequency signals propagate significantly further than higher frequencies and because they are more likely to overlap both the narrower low frequency calls of mysticetes, as well as many non-communication cues related to fish and invertebrate prey, and geologic sounds that inform navigation. However, the area in which masking would occur for all marine mammal species and stocks (*e.g.,* predominantly in the vicinity of the foundation pile being driven) is small relative to the extent of habitat used by each species and stock. In summary, the nature of Dominion Energy's activities, paired with habitat use patterns by marine mammals, does not support the likelihood that the level of masking that could occur would have the potential to affect reproductive success or survival.

Impacts on Habitat and Prey

As previously discussed in the Potential Effects of Specified Activities to Marine Mammals and their Habitat section, construction activities may result in fish and invertebrate mortality or injury very close to the source, and all activities (including HRG surveys) may cause some fish to leave the area of disturbance. It is anticipated that any mortality or injury would be limited to a very small subset of available prey and the implementation of mitigation measures, such as the use of a noise attenuation system during impact pile driving of foundations, would further limit the degree of impact. Behavioral changes in prey in response to construction activities could temporarily impact marine mammals' foraging opportunities in a limited portion of the foraging range but because of the relatively small area of the habitat that may be affected at any given time (*e.g.,* around a pile being driven), the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences.

Cable presence and operation are not anticipated to impact marine mammal habitat as these would be buried, and any electromagnetic fields emanating from the cables are not anticipated to result in consequences that would impact marine mammals prey to the extent they would be unavailable for consumption.

The presence and operation of wind turbines within the Lease Area could have longer-term impacts on marine mammal habitat, as the project would result in the persistence of the structures within marine mammal habitat for more than 30 years. The presence and operation of an extensive number of structures, such as wind turbines, are, in general, likely to result in local and broader oceanographic effects in the marine environment and may disrupt dense aggregations and distribution of marine mammal zooplankton prey through altering the strength of tidal currents and associated fronts, changes in stratification, primary production, the degree of mixing, and stratification in the water column (Chen *et al.,* 2021, Johnson *et al.,* 2021, Christiansen *et al.,* 2022, Dorrell *et al.,* 2022). However, the scale of impacts is difficult to predict and may vary from hundreds of meters for local individual turbine impacts (Schultze *et al.,* 2020) to large-scale dipoles of surface elevation changes stretching hundreds of kilometers (Christiansen *et al.,* 2022).

As discussed in the Potential Effects to Marine Mammals and Their Habitat section, the CVOW–C proposed project would consist of no more than 176 WTGs (all of which are scheduled to be operational by the end of 2027) in Federal and state waters off of Virginia, an area dominated by physical oceanographic patterns of strong seasonal stratification (summer) and turbulence-driven mixing (winter), with a maximum of 183 piling events for all WTGs. While there are likely to be local oceanographic impacts from the presence and operation of the CVOW–C project area, meaningful oceanographic impacts relative to stratification and mixing that would significantly affect marine mammal habitat and prey over large areas in key habitats are not anticipated from the CVOW–C project. Although this area supports aggregations of zooplankton (baleen whale prey) that could be impacted if long-term oceanographic changes occurred, prey densities are typically significantly less in the CVOW–C project area than in known baleen whale foraging habitats to the northern areas off the New England coast (*e.g.,* south of Nantucket and Martha's Vineyard, Great South Channel). For these reasons, if oceanographic features are affected by wind farm operation during the course of the proposed rule (approximately end of Year 2 through Year 5), the impact on marine mammal habitat and their prey is likely to be comparatively minor.

Mitigation To Reduce Impacts on All Species

This proposed rulemaking includes a variety of mitigation measures designed to minimize impacts on all marine mammals, with a focus on North Atlantic right whales (the latter is described in more detail below). For the dual approach of vibratory and impact pile driving of foundation piles, nine overarching mitigation measures are proposed, which are intended to reduce both the number and intensity of marine mammal takes: (1) seasonal/time of day work restrictions; (2) use of multiple PSOs to visually observe for marine mammals (with any detection within designated zones triggering delay or shutdown); (3) use of PAM to acoustically detect marine mammals, with a focus on detecting baleen whales (with any detection within designated zones triggering delay or shutdown); (4) implementation of clearance zones; (5) implementation of shutdown zones; (6) use of soft-start; (7) use of noise abatement technology; (8) maintaining situational awareness of marine mammal presence through various communication and network monitoring requirements; and (9) use of sound field verification. Several of these proposed mitigation measures are also applicable to other proposed activities (*e.g.,* use of PSOs and clearance and shutdown zones) while others are not considered viable for some activities (*e.g.,* PAM during non-foundation installation activities, use and seasonal/time of day work restrictions during HRG surveys; and use of soft-start during vibratory installation of cofferdams). These are discussed in more detail above in the relevant sections found in Proposed Mitigation Measures.

When foundation installation does occur, Dominion Energy is committed to reducing the noise levels generated by impact pile driving to the lowest levels practicable and ensuring that they do not exceed a noise footprint above that which was modeled assuming a 10-dB attenuation. Use of a soft-start would allow animals to move away from (*i.e.,* avoid) the sound source prior to applying higher hammer energy levels needed to install the pile (Dominion Energy would not use a hammer energy greater than necessary to install piles). Clearance zone and shutdown zone implementation, required when marine mammals are within given distances associated with certain impact thresholds, would reduce the magnitude and severity of marine mammal take.

Dominion Energy proposed, and NMFS proposed to require, use a noise attenuation device (likely a double big bubble curtain, another technology, or combination of technologies, such as a hydro-sound damper) during all foundation pile driving to ensure sound generated from the project does not exceed that modeled (assuming a 10-dB reduction) distances to harassment isopleths and to minimize noise levels to the lowest level practicable. Double big bubble curtains are successfully and widely applied across European wind development efforts, and are known to reduce noise levels more than a single big bubble curtain alone (*e.g.,* see Bellman *et al.,* 2020).

Mysticetes

Five mysticete species (comprising five stocks) of cetaceans (North Atlantic right whale, humpback whale, fin whale, sei whale, and minke whale) are proposed to be taken by harassment. These species, to varying extents, utilize coastal Virginia waters, including the project area, primarily for the purposes of migration. Key foraging grounds for most of these species are located hundreds of kilometers north of the project area off of southern New England, and will not be impacted by Dominion Energy's activities.

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

Mysticetes encountered in the CVOW–C project area are primarily expected to be migrating through the project area; the extent to which an animal engages in these behaviors in the area is species-specific and varies seasonally. Given that extensive feeding BIAs for the North Atlantic right whale, humpback whale, fin whale, sei whale, and minke whale are identified in area hundreds of kilometers north of the project area (LaBrecque *et al.,* 2015; Van Parijs *et al.,* 2015), many mysticetes are expected to predominantly be migrating through the project area towards or from these feeding habitats.

While we have acknowledged above that mortality, hearing impairment, or displacement of mysticete prey species may result locally from impact pile driving, the project area during which time impact pile driving of foundations may occur is not a known key foraging area. Impact pile driving foundations would not occur in winter when whales (*e.g.,* humpback whales) are more likely to be foraging within the project area. Primary mysticete foraging grounds (*i.e.,* much more suitable foraging habitat) are found much further north of the CVOW–C project area. Whales temporarily displaced from the proposed project area would be expected to have sufficient remaining habitat available to them and would not be prevented from migrating through other areas outside the CVOW–C project area. In addition, any displacement of whales or interruption of any potential foraging bouts that may occur sporadically during transit would be expected to be temporary in nature. Hence, any impacts on mysticetes foraging would be expected to be negligible.

The potential for repeated exposures is dependent upon the residency time of whales, with migratory animals unlikely to be exposed on repeated occasions and animals remaining in the area to be more likely exposed repeatedly. As is the case here, where relatively low amounts of species-specific proposed Level B harassment are predicted (Tables 27, 28, and 29) and movement patterns suggest that individuals would not necessarily linger in a particular area for multiple days, each estimated take likely represents an exposure of a different individual. The behavioral impacts to any given individual would, therefore, be expected to occur within a single day within a year—an amount that would not be expected to impact reproduction or survival. Alternatively, species with longer residence time in the project area may be subject to repeated exposures. In general, for this project, the duration of exposures would not be continuous throughout any given day and pile driving would not occur on all consecutive days within a given year due to weather delays, other planned activities in the construction schedule, and any number of logistical constraints that Dominion Energy has already identified. Given mysticete habitat use of waters off Virginia is predominately migratory in nature (reducing the likelihood of repeated exposures), we do not anticipate whales to experience repeated exposures, if it does occur, to the degree any meaningful consequence to reproduction or survival would occur. Species-specific analysis regarding potential for repeated exposures and impacts is provided below. Overall, we do not expect impacts to whales within the CVOW–C project area to affect the fitness of any large whales.

NMFS is proposing to authorize Level A harassment (in the form of PTS) of fin, minke, humpback, and sei whales incidental to installation of the WTG and OSS foundations. As described previously, PTS for mysticetes from impact pile driving may overlap frequencies used for communication, navigation, or detecting prey. However, given the nature and duration of the activity, the mitigation measures, and likely avoidance behavior, any PTS is expected to be of a small degree, would be limited to frequencies where pile driving noise is concentrated (*i.e.,* only a small subset of their expected hearing range) and would not be expected to impact reproductive success or survival.

North Atlantic Right Whales

North Atlantic right whales are listed as endangered under the ESA and as described in the Effects to Marine Mammals and Their Habitat section, are threatened by a low population abundance, higher than average mortality rates, and lower than average reproductive rates. Recent studies have reported individuals showing high stress levels (*e.g.,* Corkeron *et al.,* 2017) and poor health, which has further implications on reproductive success and calf survival (Christiansen *et al.,* 2020; Stewart *et al.,* 2021; Stewart *et al.,* 2022). Given this, the status of the North Atlantic right whale population is of heightened concern and therefore, merits additional analysis and consideration.

North Atlantic right whales are presently experiencing an ongoing UME (beginning in June 2017). Preliminary findings support human interactions, specifically vessel strikes and entanglements, as the cause of death for the majority of North Atlantic right whales. Given the current status of the North Atlantic right whale, the loss of even one individual could significantly impact the population. No mortality, serious injury, or injury of North Atlantic right whales as a result of the project is expected or proposed to be authorized. Any disturbance to North Atlantic right whales due to Dominion Energy's activities is expected to result in temporary avoidance of the immediate area of construction. As no injury, serious injury, or mortality is expected or authorized, and Level B harassment of North Atlantic right whales will be reduced to the level of least practicable adverse impact through use of mitigation measures, the authorized number of takes of North Atlantic right whales would not exacerbate or compound the effects of the ongoing UME in any way.

NMFS proposes to authorize a maximum of 7 takes of North Atlantic right whales by Level B harassment only in any given year (primarily due to activities occurring in Years 1 and 2) with no more than 17 takes incidental to all construction activities over the 5-year period of effectiveness of this proposed rule.

As described above, the CVOW–C project area represents part of a migratory corridor that North Atlantic right whales use for transit between northern feeding grounds in New England and southern calving grounds off Georgia and Florida. Northward migration occurs mainly during the months of March and April while southern transit typically takes place during the months of November and December (LaBrecque *et al.,* 2015; Van Parijs *et al.,* 2015). Overall, the CVOW–C project area contains habitat less frequently utilized by North Atlantic right whales than the foraging and calving grounds. Salisbury *et al.* (2015) detected North Atlantic right whales year-round off the coast of Virginia, yet they were only detected on 10 percent of the days from May through October. The greatest detections occurred from October through December and February through March, outside of the months of Dominion Energy's planned foundation installation. Therefore, we anticipate that any individual whales would typically be migrating through the project area and would not be lingering for extended periods of time and, further, fewer would be present in the months when foundation installation would be occurring. Other proposed activities by Dominion Energy that involve either much smaller harassment zones (*i.e.,* HRG surveys) or are limited in amount and nearshore in location (*i.e.,* cable landfall construction) may occur during periods when North Atlantic right whales are more likely to be migrating through. However, North Atlantic right whales would be less likely to occur within the project area during the time when the most impactful project activities would take place.

As any North Atlantic right whales within the project area would likely be engaged in migratory behavior (LaBrecque *et al.,* 2015), it is likely that the estimated instances of take would occur to separate individual whales; however, some may be repeat takes of the same animal across multiple days for some short period of time. The only activity occurring from December through May that may impact North Atlantic right whale would be HRG surveys no take from cable landfall construction is anticipated or proposed to be authorized). Across all years, while it is possible an animal could have been exposed during a previous year, the low amount of take proposed to be authorized during the 5-year period of the proposed rule makes this scenario possible but unlikely. However, if an individual were to be exposed during a subsequent year, the impact of that exposure is likely independent of the previous exposure given the duration between exposures.

As described in the general *Mysticete* section above, installation of foundation piles by both impact and vibratory pile driving has the potential to result in the highest amount of annual take of North Atlantic right whales (7 Level B harassment takes) and is of greatest concern given the louder source levels present during impact pile driving. However, foundation installation would likely be limited to two years, during times when North Atlantic right whales are not present in high numbers and are likely to be primarily migrating to more northern foraging grounds. Furthermore, the potential types, severity, and magnitude of impacts are also anticipated to mirror that described in the general *Mysticete* section above, including avoidance (the most likely outcome), changes in foraging or vocalization behavior, masking, a small amount of TTS, and temporary physiological impacts (*e.g.,* change in respiration, change in heart rate). Importantly, the effects of the activities proposed by Dominion Energy are expected to be sufficiently low-level and localized to specific areas as to not meaningfully impact important behaviors such as migratory behavior of North Atlantic right whales.

As described above, no more than 7 takes of North Atlantic right whales would occur in any given year (likely in Year 1 or Year 2 if all foundations are installed according to the construction schedule provided by Dominion Energy) with no more than 17 takes occurring across the 5 years the proposed rule would be effective. If exposure results in temporary behavioral reactions, such as slight displacement (but not abandonment), it is unlikely to result in energetic consequences that could affect reproduction or survival of any individuals. Overall, NMFS expects that any harassment of North Atlantic right whales incidental to the specified activities would not result in meaningful changes to their migration patterns or disruption of foraging behavior as only temporary avoidance of an area during construction is expected to occur. As described previously, right whales migrating through these areas are not expected to remain in this habitat for extensive durations. Because of this, NMFS expects that any temporarily displaced animals would be able to return to or continue to travel through these areas once Dominion

Energy's proposed construction activities have ceased.

Although acoustic masking may occur, based on the acoustic characteristics of noise associated with pile driving (*e.g.,* frequency spectra, short duration of exposure) and construction surveys (*e.g.,* intermittent signals), NMFS expects masking effects to be minimal (*e.g.,* impact or vibratory pile driving) to none (*e.g.,* HRG surveys). In addition, masking would likely only occur during the period of time that a North Atlantic right whale is in the relatively close vicinity of pile driving, which is expected to be infrequent and brief given time of year restrictions, anticipated mitigation effectiveness, and likely avoidance behaviors. TTS is another potential form of Level B harassment that could result in brief periods of slightly reduced hearing sensitivity affecting behavioral patterns by making it more difficult to hear or interpret acoustic cues within the frequency range (and slightly above) of sound produced during impact pile driving. However, any TTS would likely be of low amount and limited to frequencies where most construction noise is centered (below 2 kHz). NMFS expects that right whale hearing sensitivity would return to pre-exposure levels shortly after migrating through the area or moving away from the sound source.

As described in the Potential Effects to Marine Mammals and Their Habitat section, the distance of the receiver to the source influences the severity of response with greater distances typically eliciting less severe responses. Additionally, NMFS recognizes North Atlantic right whales migrating could be pregnant females (in the fall) and cows with older calves (in spring) and that these animals may slightly alter their migration course in response to any foundation pile driving. However, as described in the Potential Effects to Marine Mammals and Their Habitat section, we anticipate that course diversion would be of small magnitude. Hence, while some avoidance of the pile driving activities may occur, we anticipate any avoidance behavior of migratory right whales would be similar to that of gray whales (Tyack *et al.,* 1983), on the order of hundreds of meters up to 1 to 2 km. This slight diversion from an otherwise uninterrupted path is neither anticipated to push North Atlantic right whales out of their migratory habitat nor expected to result in meaningful energetic costs that would impact annual rates of recruitment of survival. NMFS expects that North Atlantic right whales would be able to avoid areas during periods of active noise production while not being forced out of this portion of their habitat.

Dominion Energy has proposed, and NMFS is proposing to require, a suite of enhanced mitigation measures designed to reduce impacts to North Atlantic right whales to the maximum extent practicable. These mitigation measures are fully described in the Proposed Mitigation section above and are designed to minimize the amount and severity of Level B harassment (TTS and behavioral disruptions) by minimizing the potential for exposure and, if exposures do occur, the noise levels and duration associated with those exposures. Implementation of these measures further ensure that takes by Level B harassment proposed to be authorized would not be expected to affect reproductive success or survivorship of species during migratory transit.

As described in the Description of Marine Mammals in the Area of Specified Activities section, the proposed CVOW–C project would be constructed within the North Atlantic right whale migratory corridor BIA, which represent areas and months within which a substantial portion of a species or population is known to migrate. Off the coast of Virginia, this BIA extends from the coast to beyond the shelf break. The CVOW–C Lease Area is relatively small compared with the migratory BIA area (approximately 456.5 km^2 versus the size of the full North Atlantic right whale migratory BIA, 269,448 km^2). Because of this and for reasons described above, overall North Atlantic right whale migration is not expected to be impacted by the proposed activities. There are no known North Atlantic right whale mating or calving areas within the project area. Impact pile driving, which is responsible for the majority of North Atlantic right whale impacts from the CVOW–C project, would be limited to a maximum of approximately 9 intermittent hours per day (inclusive of a maximum daily built-out of two intermittent 4-hour pile driving events and the 1.2 hour transition time between vibratory equipment to impact); therefore, if migratory activities are disrupted due to foundation pile driving, any disruption would be brief as North Atlantic right whales would likely resume migrating after pile driving ceases or when animals move away from the sound source to another nearby location. The Chesapeake Bay SMA, a management tool designed to reduce vessel strikes, also temporally and spatially overlaps a small portion of the project area for a portion of the year. Given the vessel speed regulations and other enhanced measures within this proposed rule, vessel strike of a North Atlantic right whale is not anticipated and no take, by mortality, serious injury, or non-auditory injury (potential outcomes of a vessel strike) is proposed for authorization.

The primary prey species for the North Atlantic right whale are mobile (*e.g.,* calanoid copepods can initiate rapid and directed escape responses) and are broadly distributed much further north from the CVOW–C project area (noting again that North Atlantic right whale prey is not particularly concentrated in the CVOW–C project area relative to nearby habitats). Therefore, any impacts to prey that may occur are also unlikely to impact marine mammals.

The most significant measure to minimize impacts to individual North Atlantic right whales during monopile installations is the seasonal moratorium on impact pile driving of monopiles from November 1st through April 30th when North Atlantic right whale abundance in the project area is expected to be highest for the proposed construction period. NMFS also expects this measure to greatly reduce the potential for mother-calf pairs to be exposed to foundation pile driving noise above the Level B harassment threshold during their annual spring migration through the CVOW–C project area from southern calving grounds to the foraging grounds in southern New England and north. Further, NMFS expects that exposures to North Atlantic right whales would be reduced due to the additional proposed mitigation measures that would ensure that any exposures above the Level B harassment threshold would result in only short-term effects to individuals exposed. Impact pile driving may only begin in the absence of North Atlantic right whales (based on visual and passive acoustic monitoring). If impact pile driving has commenced, NMFS anticipates North Atlantic right whales would avoid the area, utilizing nearby waters to carry on pre-exposure behaviors. However, NMFS proposes to require that impact pile driving must be shut down if a North Atlantic right whale is sighted at any distance unless a shutdown is not feasible due to risk of injury or loss of life, pile refusal, or pile instability. Shutdown may occur anywhere if right whales are seen within or beyond the Level B harassment zone, further minimizing the duration and intensity of exposure. NMFS anticipates that if North Atlantic right whales go undetected and they are exposed to impact pile driving noise, it is unlikely a North Atlantic right whale would approach the impact pile driving locations to the degree that they would purposely expose themselves to very high noise levels. These measures are designed to avoid PTS and also reduce the severity of Level B harassment, including the potential for TTS. While some TTS could occur, given the proposed mitigation measures (*e.g.,* delay pile driving upon a sighting or acoustic detection and shutting down upon a sighting or acoustic detection), the potential for TTS to occur is low.

The proposed clearance and shutdown measures are most effective when detection efficiency is maximized, as the measures are triggered by a sighting or acoustic detection. To maximize detection efficiency, Dominion Energy proposed, and NMFS is proposing to require the combination of PAM and visual observers (as well as communication protocols with other Dominion Energy vessels, and other heightened awareness efforts such as daily monitoring of North Atlantic right whale sighting databases) such that as a North Atlantic right whale approaches the source (and thereby could be exposed to higher noise energy levels), PSO detection efficacy would increase, the whale would be detected, and a delay to commencing pile driving or shutdown (if feasible) would occur. In addition, the implementation of a soft start would provide an opportunity for whales to move away from the source if they are undetected, reducing received levels. Further, Dominion Energy has committed to not installing two WTG or OSS foundations simultaneously. North Atlantic right whales would, therefore, not be exposed to concurrent impact pile driving on any given day and the area ensonified at any given time would be limited. We further note that Dominion Energy has not requested to install foundation piles at night, which is likely to further improve the ability of observers to spot and identify any approach or transiting North Atlantic right whales.

Dominion Energy anticipates a need to undertake a dual vibratory and impact pile driving approach for foundation piles to avoid risks associated with pile run due to softer sedimentation in the CVOW–C project area. While Dominion Energy expects that up to 70 percent of their piles may necessitate this joint approach (approximately 123 foundation piles), realistically not all piles would be at risk of pile run and would be installed by impact pile driving. However, as a conservative approach given uncertainty with the seabed conditions for the location of each pile, Dominion Energy assumed all foundation piles would undertake this approach. Furthermore, Dominion Energy has already stated that no concurrent installation of foundation piles is planned to occur, no concurrent vibratory and impact driving is expected to occur either as a 1.2 hour gap between the end vibratory driving to the start of impact pile driving (to allow for the moving and set-up of equipment) would treat each installation approach as a separate event and would not overlap.

Finally, for HRG surveys, the maximum distance to the Level B harassment isopleth is 100 m. The estimated take, by Level B harassment only, associated with HRG surveys is to account for any North Atlantic right whale sightings PSOs may miss when HRG acoustic sources are active. However, because of the short maximum distance to the Level B harassment isopleth (100 m via the GeoMarine Dual 400 Sparker 800 J), the requirement that vessels maintain a distance of 500 m from any North Atlantic right whales, the fact whales are unlikely to remain in close proximity to an HRG survey vessel for any length of time, and that the acoustic source would be shutdown if a North Atlantic right whale is observed within 500 m of the source, any exposure to noise levels above the harassment threshold (if any) would be very brief and at comparatively low received levels. To further minimize exposures, ramp-up of boomers, sparkers, and CHIRPs must be delayed during the clearance period if PSOs detect a North Atlantic right whale (or any other ESA-listed species) within 500 m of the acoustic source. Potential impacts associated with Level B harassment would include low-level, temporary behavioral modifications, most likely in the form of brief avoidance behavior that would return to baseline conditions once the vessel leaves the area. Given the high level of precautions taken to minimize both the amount and intensity of Level B harassment on North Atlantic right whales, it is unlikely that the anticipated low-level exposures would lead to reduced reproductive success or survival of any individuals.

North Atlantic right whales are listed as endangered under the ESA with a declining population primarily due to vessel strike and entanglement. Again, NMFS is proposing to authorize no more than 17 instances of take, by Level B harassment only, within the a given year with no more than 7 instances of take could occur over the 5-year effective period of the proposed rule, with the likely scenario that each instance of exposure occurs to a different individual (a small portion of the stock), and any individual North Atlantic right whale is likely to be disturbed at a low level. The low magnitude and severity of harassment are not expected to result in impacts on the reproduction or survival of any individuals, let alone have impacts on annual rates of recruitment or survival of this stock. No mortality, serious injury, or Level A harassment is anticipated or proposed to be authorized. For these reasons, we have preliminarily determined, in consideration of all of the effects of Dominion Energy's activities combined, that the proposed authorized take would have a negligible impact on the Western North Atlantic stock of North Atlantic right whales.

Humpback Whales

Humpback whales potentially impacted by Dominion Energy's activities do not belong to a DPS that is listed as threatened or endangered under the ESA. However, humpback whales along the Atlantic Coast have been experiencing an active UME as elevated humpback whale mortalities have occurred along the Atlantic coast from Maine through Florida since January 2016. Of the cases examined, approximately half had evidence of human interaction (ship strike or entanglement). The UME does not yet provide cause for concern regarding population-level impacts, and take from ship strike and entanglement is not proposed to be authorized. Despite the UME, the relevant population of humpback whales (the West Indies breeding population, or DPS of which the Gulf of Maine stock is a part) remains stable at approximately 12,000 individuals.

Dominion Energy has requested, and NMFS has proposed to authorize incidental take by Level A harassment (n=8) and Level B harassment (n=242) over the five-year effective period of the rule, with no more than 4 takes by Level A harassment and 130 takes by Level B harassment in any year (likely year one or two, with fewer anticipated in other years). No mortality or serious injury is anticipated or proposed for authorization. Among the activities analyzed, impact pile driving has the potential to result in the highest amount of annual take of humpback whales and is of greatest concern, given the associated louder source levels. As mentioned earlier, humpback whales are generally migratory in Virginia waters, although the mid-Atlantic region may also serve as a supplemental winter feeding ground for juvenile and mature male humpback whales (Mallette *et al.,* 2017; Barco *et al.,* 2002; LaBrecque *et* *al.,* 2015). Although there is limited information about the specific migratory path, humpback whale migration may take place in the open ocean or on the continental shelf of the mid-Atlantic region (Barco *et al.,* 2002; LaBrecque *et al.,* 2015), thus, potentially overlapping with the project area during the spring or fall. Juvenile and adult male humpback whales may utilize Virginia waters as a feeding ground during the winter months (December–March) (Barco *et al., 2*002), however this habitat is anticipated to be used less frequently than the northern summer feeding grounds. The most impactful project activities are planned to occur from May through October, outside of the time when humpback whales are expected to be migrating through the area or using Virginia waters as a feeding ground. Humpback whales would therefore be less likely to occur during the time when the most impactful project activities would take place.

The 130 maximum annual instances of estimated take by Level B harassment would likely consist of individuals exposed to noise levels above the harassment thresholds once during migration through the CVOW–C project area and/or individuals exposed on multiple days if they are utilizing the area as foraging habitat. Based on the observed winter peaks in humpback whale seasonal distribution in the Virginia region, it is likely that these individuals would primarily be exposed to HRG survey activities given there is no time of year restriction for this activity. The proposed pile driving restrictions for foundation installation and cable landfall activities are designed around North Atlantic right whales; however, this seasonal restriction also affords protection to humpback whales utilizing the waters off of Virginia during the winter months.

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

Altogether, the low magnitude and severity of harassment effects is not expected to result in impacts on the reproduction or survival of any individuals, let alone have impacts on annual rates of recruitment or survival of this stock. No mortality or serious injury is anticipated or proposed to be authorized. For these reasons, we have preliminarily determined, in consideration of all of the effects of Dominion Energy's activities combined, that the proposed authorized take would have a negligible impact on the Gulf of Maine stock of humpback whales.

Fin Whales

The western North Atlantic stock of fin whales is listed as endangered under the ESA. The amount of incidental take of fin whales proposed for authorization in any year is 4 by Level A harassment and 113 by Level B harassment. The 5-year total amount of fin whale take proposed for authorization is 7 by Level A harassment and 208 by Level B harassment with the majority of take occurring in the first two years of the proposed authorization. The amount of take proposed for authorization is low relative to the population abundance. No serious injury or mortality is anticipated or proposed for authorization. Any Level B harassment is expected to be in the form of behavioral disturbance, primarily resulting in avoidance of the Project Area where pile driving and HRG surveys are occurring, and some low-level TTS and masking that may limit the detection of acoustic cues for relatively brief periods of time. Any potential PTS or TTS would be small (limited to a few dB) and concentrated at half or one octave above the frequency band of pile driving noise (most sound is below 2 kHz) which does not include the full predicted hearing range of fin whales. As described previously, there are no known areas of biological importance in or adjacent to the project area, the closest fin whale BIA (located east of Montauk Point, New York) is hundreds of kilometers away.

Because of the relatively low magnitude and severity of take proposed for authorization, the fact that no serious injury or mortality is anticipated, the temporary nature of the disturbance, and the availability of similar habitat and resources in the surrounding area, NMFS has preliminarily determined that the impacts of Dominion Energy's activities on fin whales are not expected to cause significant impacts on the reproduction or survival of any individuals, let alone have impacts on annual rates of recruitment or survival of this stock.

Sei Whales

The Nova Scotia stock of sei whales are listed under the ESA. There are no known areas of specific biological importance in or around the project area, nor are there any UMEs for this species. The actual abundance of each stock is likely significantly greater than what is reflected in each draft and final SAR because, as noted in the SARs, the most recent population estimates are primarily based on surveys conducted in U.S. waters and the stock's range extends well beyond the U.S. EEZ.

The maximum annual amount of incidental take of sei whales proposed for authorization in any year is 1 by Level A harassment and 3 by Level B harassment. The number of takes proposed to be authorized in the last three years of the rule is notably less and the 5-year total amount of sei whale take proposed for authorization is 2 by Level A harassment and 8 by Level B harassment. The amount of take proposed for authorization is low in the context of the population abundance. No serious injury or mortality is anticipated or proposed for authorization. Similar to other mysticetes, we would anticipate the number of takes to represent individuals taken only once or, in rare cases, an individual taken a very small number of times as most whales in the project area would be migrating. To a small degree, sei whales may forage in the project area, although the currently identified foraging habitats (BIAs) are found much further north of the area in which Dominion Energy's activities would occur (LaBrecque *et al.,* 2015). With respect to the severity of those individual takes by behavioral Level B harassment, we would anticipate impacts to be limited to low-level, temporary behavioral responses with avoidance and potential masking impacts in the vicinity of the turbine installation to be the most likely type of response. Any potential PTS or TTS would be small (limited to a few dB) and concentrated at half or one octave above the frequency band of pile driving noise (most sound is below 2 kHz) which does not include the full predicted hearing range of sei whales. Any avoidance of the project area due to Dominion Energy's activities would be expected to be temporary.

Overall, the take by harassment proposed for authorization is of a low magnitude and severity and is not expected to result in impacts on the reproduction or survival of any individuals, let alone have impacts on annual rates of recruitment or survival of this stock. No mortality or serious injury is anticipated or proposed to be authorized. For these reasons, we have preliminarily determined, in consideration of all of the effects of Dominion Energy's activities combined, that the proposed authorized take would have a negligible impact on the Nova Scotia sei whale stock.

Minke Whales

The Canadian East Coast stock of minke whales is not listed under the ESA. There are no known areas of specific biological importance in or around the project area off of Virginia. Beginning in January 2017, elevated minke whale strandings have occurred along the Atlantic coast from Maine through South Carolina, with highest numbers in Massachusetts, Maine, and New York. This event does not provide cause for concern regarding population level impacts, as the likely population abundance is greater than 21,000 whales. No mortality or serious injury of this stock is anticipated or proposed for authorization.

The maximum annual amount of incidental take of minke whales proposed for authorization in any year is 8 by Level A harassment and 56 by Level B harassment. The number of takes proposed to be authorized in the last three years of the rule is notably less (refer back to Table 27) and the 5-year total amount of minke whale take proposed for authorization is 15 by Level A harassment and 116 by Level B harassment. The amount of take proposed for authorization is low in the context of the population abundance. No serious injury or mortality is anticipated or proposed for authorization.

We anticipate the impacts of this harassment to follow those described in the general *Mysticete* section above. In summary, Level B harassment would be temporary, with primary impacts being temporary displacement of the project area but not abandonment of any migratory or foraging behavior. Overall, the amount of take proposed to be authorized is small and the low magnitude and severity of harassment effects is not expected to result in impacts on the reproduction or survival of any individuals, let alone have impacts on annual rates of recruitment or survival of this stock. No mortality or serious injury is anticipated or proposed to be authorized. Any potential PTS or TTS would be small (limited to a few dB) and concentrated at half or one octave above the frequency band of pile driving noise (most sound is below 2 kHz) which does not include the full predicted hearing range of minke whales. For these reasons, we have preliminarily determined, in consideration of all of the effects of Dominion Energy's activities combined, that the proposed authorized take would have a negligible impact on the Canadian East Coast stock of minke whales.

Odontocetes

In this section, we include information here that applies to all of the odontocete species and stocks addressed below, which are further divided into the following subsections: sperm whales, delphinids and pilot whales, and harbor porpoises. These sub-sections include more specific information, as well as conclusions for each stock represented.

The majority of takes by harassment of odontocetes incidental to Dominion Energy's specified activities are by Level B harassment incidental to pile driving and HRG surveys. We anticipate that, given ranges of individuals (*i.e.,* that some individuals remain within a smaller area for some period of time), and non-migratory nature of some odontocetes in general (especially as compared to mysticetes), these takes are more likely to represent multiple exposures of a smaller number of individuals than is the case for mysticetes, though some takes may also represent one-time exposures to an individual.

Pile driving, particularly vibratory and impact pile driving of WTG and OSS foundation piles, has the potential to disturb odontocetes to the greatest extent, compared to HRG surveys and nearshore cable landfall activities (*i.e.,* temporary cofferdams and goal posts). While we do expect animals to avoid the area during pile driving, their habitat range is relatively extensive compared to the area ensonified during pile driving.

As described earlier, Level B harassment may manifest as changes to behavior (*e.g.,* avoidance, changes in vocalizations (from masking) or foraging), physiological responses, or TTS. Odontocetes are highly mobile species and, similar to mysticetes, NMFS expects any avoidance behavior to be limited to the area near the pile being driven. While masking could occur during pile driving, it would only occur in the vicinity of and during the duration of the pile driving, and would not generally occur in a frequency range that overlaps most odontocete communication or echolocation signals. The mitigation measures (*e.g.,* use of sound abatement systems, implementation of clearance and shutdown zones) would also minimize received levels such that the severity of any behavioral response would be expected to be less than exposure to unmitigated noise exposure.

Any masking or TTS effects are anticipated to be of low-severity. First, the frequency range of pile driving, the most impactful activity conducted by Dominion Energy in terms of response severity, falls within a portion of the frequency range of most odontocete vocalizations. However, odontocete vocalizations span a much wider range than the low frequency construction activities proposed by Dominion Energy. Further, as described above, recent studies suggest odontocetes have a mechanism to self-mitigate (*i.e.,* reduce hearing sensitivity) the impacts of noise exposure, which could potentially reduce TTS impacts (Nachtigall and Supin, 2013; Finneran, 2018). Any masking or TTS is anticipated to be limited and would typically only interfere with communication within a portion of an odontocete's range and as discussed earlier, the effects would only be expected to be of a short duration and, for TTS, a relatively small degree. Furthermore, odontocete echolocation occurs predominantly at frequencies significantly higher than low frequency construction activities; therefore, there is little likelihood that threshold shift specifically, either temporary or permanent, would interfere with feeding behaviors (noting that take by Level A harassment (PTS) is proposed for only harbor porpoises (n=2)). For HRG surveys, the sources operate at higher frequencies than pile driving; however, sounds from these sources attenuate very quickly in the water column, as described above, and many of the sources are downward directed; therefore, the potential for TTS and masking is very limited. Further, odontocetes (*e.g.,* common dolphins, spotted dolphins, bottlenose dolphins) have demonstrated an affinity to bow-ride actively surveying HRG surveys; therefore, the severity of any harassment, if it does occur, is anticipated to be minimal based on the lack of avoidance previously demonstrated by these species.

The waters off the coast of Virginia are used by several odontocete species; however, none (except the sperm whale) are listed under the ESA and there are no known habitats of particular importance in the vicinity of the project. In general, odontocete habitat ranges are far-reaching along the Atlantic coast of the U.S. and the waters off of Virginia and within the continental slope, including the project area, do not contain any particularly unique odontocete habitat features.

Sperm Whales

The Western North Atlantic stock of sperm whales spans the East Coast out into oceanic waters well beyond the U.S. EEZ. Although listed as endangered, the primary threat faced by the sperm whale (*i.e.,* commercial whaling) has been eliminated and, further, sperm whales in the western North Atlantic were little affected by modern whaling (Taylor *et al.,* 2008). Current potential threats to the species globally include vessel strikes, entanglement in fishing gear, anthropogenic noise, exposure to contaminants, climate change, and marine debris. There is no currently reported trend for the stock and, although the species is listed as endangered under the ESA, there are no specific issues with the status of the stock that cause particular concern (*e.g.,* no UMEs). There are no known areas of biological importance (*e.g.,* critical habitat or BIAs) in or near the project area.

No mortality, serious injury or Level A harassment is anticipated or proposed to be authorized for this species. Impacts would be limited to Level B harassment and would occur to only a very small number of individuals (maximum of 3 in any given year and six total across all 5-years of the proposed project) incidental to pile driving associated with foundation installation and HRG surveys. Sperm whales are not common within the project area due to the shallow waters, and it is not expected that any noise levels would reach habitat in which sperm whales are common, including deep-water foraging habitat. If sperm whales do happen to be present in the project area during any activities related to the CVOW–C project, they would likely be only transient visitors and not engaging in any significant behaviors. This very low magnitude and severity of effects is not expected to result in impacts on the reproduction or survival of individuals, much less impact annual rates of recruitment or survival. For these reasons, we have determined, in consideration of all of the effects of Dominion Energy's activities combined, that the take proposed to be authorized would have a negligible impact on sperm whales.

Dolphins and Small Whales (Inclusive of Delphinid Species, False Killer Whale, Melon-Headed Whale, Pygmy Sperm Whale, and Pilot Whales)

None of the delphinids or small whale species for which take has been proposed for authorization are listed as endangered in the ESA. Across these species, the maximum amount of incidental take, by Level B harassment only, proposed for authorization in any one year ranges between 1 (pygmy sperm whale) and 7,360 (for both Atlantic spotted dolphins and common dolphins). The number of takes proposed to be authorized in the last three years of the rule is notably less and the 5-year total amount of take (by Level B harassment only) proposed for authorization ranges between 2 (pygmy sperm whale) and 26,764 (Atlantic spotted dolphin) No mortality, serious injury, or Level A harassment is anticipated or proposed to be authorized for any delphinid or small whale. There are no recent UMEs, specific areas of known biological importance, or other specific issues related to the status of odontocete stocks that cause particular concern. Further, though the estimated numbers of take are comparatively higher than the numbers for mysticetes, we note that for all species they are relatively low relative to the population abundance.

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

Overall, the populations of all delphinid and small whale species and stocks for which we propose to authorize take are stable (no declining population trends), not facing existing UMEs, and the relatively low magnitude and severity of effects is not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. No mortality, serious injury or Level A harassment is anticipated or proposed to be authorized for any of these species. For these reasons, we have preliminarily determined, in consideration of all of the effects of Dominion Energy's activities combined, that the take proposed to be authorized would have a negligible impact on all delphinid and small whale species and stocks considered in this analysis.

Harbor Porpoises

The Gulf of Maine/Bay of Fundy stock of harbor porpoises is found predominantly in northern U.S. coastal waters (less than 150 m depth) and up into Canada's Bay of Fundy. This stock of harbor porpoise is not listed as endangered under the ESA. The maximum amount of incidental take of harbor porpoises proposed for authorization in any year is 1 by Level A harassment and 40 by Level B harassment. The number of takes proposed to be authorized in the last three years of the rule is notably less and the 5-year total amount of harbor porpoise take proposed for authorization is 2 by Level A harassment and 141 by Level B harassment. The amount of take proposed for authorization is low in the context of the population abundance. No serious injury or mortality is anticipated or proposed for authorization. Although the population trend is not known, there are no UMEs, known areas of biological importance, or other factors that specifically cause concern for this stock. No mortality or non-auditory injury by WTG and OSS foundation installation, or due to any other activities planned by Dominion Energy, are anticipated or authorized for this stock.

Regarding the severity of takes by behavioral Level B harassment, because harbor porpoises are particularly sensitive to noise, it is likely that a fair number of the responses could be of a more moderate nature, particularly to pile driving. In response to pile driving, harbor porpoises are likely to avoid the area during construction, as previously demonstrated in Tougaard *et al.* (2009) in Denmark, in Dahne *et al.* (2013) in Germany, and in Vallejo *et al.* (2017) in the United Kingdom, although a study by Graham *et al.* (2019) may indicate that the avoidance distance could decrease over time. However, pile driving is primarily scheduled to occur when harbor porpoise abundance is low off the coast of Virginia (based on the density values (0.00000) presented for both summer (June to August) and fall (September to October)) and, given alternative foraging areas, any avoidance of the area by individuals is not likely to impact the reproduction or survival of any individuals. Given a maximum of two monopile foundations for WTGs would be installed on any given day, any behavioral responses would be expected to be of relatively short duration.

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

No mortality or serious injury of harbor porpoise is anticipated or proposed to be authorized. While harbor porpoises are likely to avoid the area during any construction activity discussed herein, as demonstrated during the construction of European wind farms, the time of year in which work would occur is when harbor porpoises are not in high abundance, and any work that does occur would not be expected to result in the species' abandonment of the waters off of Virginia. The low magnitude and low to moderate severity of harassment effects is not expected to result in impacts on the reproduction or survival of any individuals, let alone have impacts on annual rates of recruitment or survival of this stock. No mortality or serious injury is anticipated or proposed to be authorized. For these reasons, we have preliminarily determined, in consideration of all of the effects of Dominion Energy's activities combined, that the proposed authorized take would have a negligible impact on the Gulf of Maine/Bay of Fundy stock of harbor porpoises.

Pinnipeds (Harbor and Gray Seals)

Neither the harbor seal nor gray seal are listed as endangered under the ESA. The maximum amount of incidental take proposed for authorization in any year is 1 by Level A harassment and 83 by Level B harassment for each seal species. The number of takes proposed to be authorized in the last three years of the rule is notably less than this. Further, the 5-year total number of take of each seal species proposed for authorization is 2 by Level A harassment and 218 by Level B harassment. The amount of take proposed for authorization is low relative to the population abundance. No serious injury or mortality is anticipated or proposed for authorization. We expect that the majority of takes of these two species is from the vibratory and impact installation of WTG monopile and OSS jacket foundations. Any takes by Level B harassment are expected to be in the form of behavioral disturbance, primarily due to temporary avoidance of the Project Area during pile driving and HRG survey activities. Some low-level TTS and masking may occur and may limit the detection of acoustic cues for relatively brief periods of time. As described previously for other species, any potential TTS or PTS would be small and limited to a few dB. There are no known haul-out locations or other areas of importance in or adjacent to the Project Area for either harbor or gray seals.

These pinniped species occur in Virginia waters in relatively low numbers in the summer (0.00001; June to August) and fall (0.00047; September to October), as compared to the spring density (0.01828; May). Given foundation installation would occur during months primarily when pinniped densities are lower, we expect impacts to animals to be minimal. Seals are also more likely to be close to shore such that exposure to impact pile driving would be expected to be at lower levels generally (but still above NMFS behavioral harassment threshold). Research and observations show that pinnipeds in the water may be tolerant of anthropogenic noise and activity (a review of behavioral reactions by pinnipeds to impulsive and non-impulsive noise can be found in Richardson *et al.* (1995) and Southall *et al.* (2007)). Available data, though limited, suggest that exposures between approximately 90 and 140 dB SPL do not appear to induce strong behavioral responses in pinnipeds exposed to non-pulse sounds in water (Costa *et al.,* 2003; Jacobs and Terhune, 2002; Kastelein *et al.,* 2006c). Although there was no significant displacement during construction as a whole, Russell *et al.* (2016) found that displacement did occur during active pile driving at predicted received levels between 168 and 178 dB re 1µPa$_{(p-p)}$; however seal distribution returned to the pre-piling condition within two hours of cessation of pile driving. Pinnipeds may not react at all until the sound source is approaching (or they approach the sound source) within a few hundred meters and then may alert, ignore the stimulus, change their behaviors, or avoid the immediate area by swimming away or diving.

Effects on pinnipeds that are taken by Level B harassment in the CVOW–C project area would likely be limited to reactions such as increased swimming speeds, increased surfacing time, or decreased foraging (if such activity were occurring). Most likely, individuals would simply move away from the sound source and be temporarily displaced from those areas (see Lucke *et al.,* 2006; Edren *et al.,* 2010; Skeate *et al.,* 2012; Russell *et al.,* 2016). Given their comparatively greater documented tolerance of anthropogenic sound (Richardson *et al.,* 1995; Southall *et al.,* 2007), repeated exposures of individuals of either of these species to levels of sound that may cause Level B harassment are unlikely to significantly disrupt foraging behavior. Given the low anticipated magnitude of impacts from any given exposure, even repeated Level B harassment across a few days of some small subset of individuals, which could occur, is unlikely to result in impacts on the reproduction or survival of any individuals. Moreover, pinnipeds would benefit from the mitigation measures described in the Proposed Mitigation section.

As described above, noise from impact pile driving is low frequency and, while any PTS that does occur would fall within the lower end of pinniped hearing ranges (50 Hz to 86 kHz), it would be of small degree and not occur across the entire, or even most sensitive, hearing part of the pinniped hearing range. Hence, any impacts from PTS are likely to be of low severity and not interfere with behaviors critical to reproduction or survival.

Elevated numbers of harbor seal and gray seal mortalities were first observed in July 2018 and occurred across Maine, New Hampshire, and Massachusetts until 2020. Based on tests conducted so far, the main pathogen found in the seals belonging to that UME was phocine distemper virus, although additional testing to identify other factors that may be involved in this UME are underway. Currently, the only active UME is occurring in Maine with some harbor and gray seals testing positive for highly pathogenic avian influenza (HPAI) H5N1. Although elevated strandings continue, neither UME (alone or in combination) provide cause for concern regarding population-level impacts to any of these stocks. For harbor seals, the population abundance is over 75,000 and annual M/SI (350) is well below PBR (2,006) (per the draft 2022 SARs (88 FR 4162; January 24, 2023)). The population abundance for gray seals in the United States is over 27,000, with an estimated overall abundance, including seals in Canada, of approximately 450,000. In addition, the abundance of gray seals is likely increasing in the U.S. Atlantic, as well as in Canada (per the draft 2022 SARs (88 FR 4162; January 24, 2023)).

Overall, impacts from the Level B harassment take proposed for authorization incidental to Dominion Energy's specified activities would be of relatively low magnitude and a low severity. Similarly, while some individuals may incur PTS overlapping some frequencies that are used for foraging and communication, given the low degree, the impacts would not be expected to impact reproduction or survival of any individuals. In consideration of all of the effects of Dominion Energy's activities combined, we have preliminarily determined that the authorized take will have a negligible impact on harbor seals and gray seals.

Preliminary Negligible Impact Determination

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS preliminarily finds that the marine mammal take from all of Dominion Energy's specified activities combined would have a negligible impact on all affected marine mammal species or stocks.

Small Numbers

As noted above, only small numbers of incidental take may be authorized under sections 101(a)(5)(A) and (D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals. When the predicted number of individuals to be taken is less than one-third of the species or stock abundance, the take is considered to be of small numbers. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

NMFS proposes to authorize incidental take (by Level A harassment and Level B harassment) of 21 species of marine mammal (with 22 total managed stocks). The maximum number of takes estimated within any one year and proposed for authorization relative to the best available population abundance is less than one-third for all species and stocks potentially impacted (*i.e.,* less than 3 percent for fifteen stocks, less than 10 percent for five stocks, and less than 20 percent for one stock (see Table 29)). For one species, the melon-headed whale, there is no available abundance estimate (Hayes *et al.,* 20220); however, given that only 5 takes, by Level B harassment only, are proposed to be authorized, the amount of take relative to the population can reasonably be considered small. Based on the analysis contained herein of the proposed activities (including the proposed mitigation and monitoring measures) and the estimated take of marine mammals, NMFS preliminarily finds that small numbers of marine mammals may be taken relative to the population abundance of the affected species or stocks.

Unmitigable Adverse Impact Analysis and Determination

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

Endangered Species Act (ESA)

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. 1531 *et seq.*) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the promulgation of rulemakings, NMFS consults internally whenever we propose to authorize take for endangered or threatened species, in this case with the NMFS Greater Atlantic Regional Field Office (GARFO).

NMFS is proposing to authorize the take of four marine mammal species which are listed under the ESA: the North Atlantic right, sei, fin, and sperm whale. The Permit and Conservation Division requested initiation of Section 7 consultation on April 4, 2023, with GARFO for the issuance of this proposed rulemaking. NMFS will conclude the Endangered Species Act consultation prior to reaching a determination regarding the proposed issuance of the authorization. The proposed regulations and any subsequent LOA(s) would be conditioned such that, in addition to measures included in those documents, the applicant would also be required to abide by the reasonable and prudent measures and terms and conditions of a Biological Opinion and Incidental Take Statement, issued by NMFS, pursuant to section 7 of the Endangered Species Act.

Proposed Promulgation

As a result of these preliminary determinations, NMFS proposes to promulgate an ITA for Dominion Energy that would authorize take, by Level A harassment and Level B harassment, of marine mammals incidental to construction activities associated with the CVOW–C project offshore of Virginia for a 5-year period from February 5, 2024, through February 4, 2029, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated.

Request for Additional Information and Public Comments

NMFS requests interested persons to submit comments, information, and suggestions concerning Dominion Energy's request and the proposed regulations (see **ADDRESSES**). All comments will be reviewed and evaluated as we prepare the final rule and make final determinations on whether to issue the requested authorization. This proposed rule and referenced documents provide all environmental information relating to our proposed action for public review.

Recognizing, as a general matter, that this action is one of many current and future wind energy actions, we invite comment on the relative merits of the IHA, single-action rule/LOA, and programmatic multi-action rule/LOA approaches, including potential marine mammal take impacts resulting from this and other related wind energy actions and possible benefits resulting from regulatory certainty and efficiency.

Classification

Pursuant to the procedures established to implement Executive Order 12866, the Office of Management and Budget has determined that this proposed rule is not significant.

Pursuant to section 605(b) of the Regulatory Flexibility Act (RFA), the Chief Counsel for Regulation of the Department of Commerce has certified to the Chief Counsel for Advocacy of the Small Business Administration that this proposed rule, if adopted, would not have a significant economic impact on a substantial number of small entities. Dominion Energy is the sole entity that would be subject to the requirements in these proposed regulations, and Dominion Energy is not a small governmental jurisdiction, small organization, or small business, as defined by the RFA. Under the RFA, governmental jurisdictions are considered to be small if they are governments of cities, counties, towns, townships, villages, school districts, or special districts, with a population of less than 50,000. Because of this certification, a regulatory flexibility analysis is not required and none has been prepared.

Notwithstanding any other provision of law, no person is required to respond to nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act (PRA) unless that collection of information displays a currently valid Office of Management and Budget (OMB) control number. These requirements have been approved by OMB under control number 0648–0151 and include applications for regulations, subsequent LOA, and reports. Send comments regarding any aspect of this data collection, including suggestions for reducing the burden, to NMFS.

The Coastal Zone Management Act (CZMA) requires Federal actions within and outside the coastal zone that have reasonably foreseeable effects on any coastal use or natural resource of the coastal zone be consistent with the enforceable policies of a state's federally approved coastal management program. 16 U.S.C. 1456(c). Additionally, regulations implementing the CZMA require non-Federal applicants for Federal licenses or permits to submit a consistency certification to the state that declares that the proposed activity complies with the enforceable policies of the state's approved management program and will be conducted in a manner consistent with such program.

In 2021, the Virginia Electric and Power Company, doing business as Dominion Energy Virginia, submitted a Federal consistency certification to the Virginia Department of Environmental Quality (VDEQ) seeking concurrence that the construction, operations, and decommissioning activities of the proposed CVOW–C project is consistent with the enforceable policies of the State's federally approved coastal management program. Although no project components are proposed in the State of North Carolina or in North Carolina State waters, Dominion Energy also submitted a Federal consistency certification to the North Carolina Division of Coastal Management. A revised draft of the consistency certifications dated May 2022 was prepared and submitted to each state and is included as Appendix P of the company's Construction and Operation Plan.

NMFS has determined that Dominion Energy's application for authorization to take small numbers of marine mammals incidental to the development of the CVOW–C project on the outer continental shelf of the Atlantic Ocean is an unlisted activity and, thus, is not, at this time, subject to Federal consistency requirements in the absence of the receipt and prior approval of an unlisted activity review request from the state by the Director of NOAA's Office for Coastal Management. This determination does not excuse Dominion Energy from responsibility to seek concurrence from VDEQ on other Federal permits, approvals, or actions that might be subject to consistency review pursuant to the CZMA.

List of Subjects in 50 CFR Part 217

Administrative practice and procedure, Endangered and threatened species, Fish, Fisheries, Marine mammals, Penalties, Reporting and recordkeeping requirements, Wildlife.

Dated: April 24, 2023.

Samuel D. Rauch, III,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

For reasons set forth in the preamble, NMFS proposes to amend 50 CFR part 217 as follows:

PART 217—REGULATIONS GOVERNING THE TAKING AND IMPORTING OF MARINE MAMMALS

■ 1. The authority citation for part 217 continues to read as follows:

Authority: 16 U.S.C. 1361 *et seq.,* unless otherwise noted.

■ 2. Add subpart DD, consisting of §§ 217.290 through 217.299, to read as follows:

Subpart DD—Taking Marine Mammals Incidental to the Coastal Virginia Offshore Wind Commercial Project Offshore Virginia

Subpart DD—Taking Marine Mammals Incidental to the Coastal Virginia Offshore Wind Commercial Project Offshore Virginia

§ 217.290 Specified activity and specified geographical region.

(a) Regulations in this subpart apply only to the taking of marine mammals that occurs incidental to activities associated with construction of the Coastal Virginia Offshore Wind Commercial (CVOW–C) project by Virginia Electric and Power Company, doing business as Dominion Energy Virginia (Dominion Energy), and those persons it authorizes or funds to conduct activities on its behalf in the area outlined in paragraph (b) of this section.

(b) The taking of marine mammals by Dominion Energy may be authorized in a Letter of Authorization (LOA) only if it occurs in the Bureau of Ocean Energy Management (BOEM) Lease Area Outer Continental Shelf (OCS)–A–0483 Commercial Lease of Submerged Lands for Renewable Energy Development, along export cable routes, and at the sea-to-shore transition points west of the firing range at the State Military Reservation in Virginia Beach, Virginia.

(c) The taking of marine mammals by Dominion Energy is only authorized if it occurs incidental to the following activities associated with the CVOW–C project: installation of up to 176 wind turbine generator (WTG) and 3 offshore substation (OSS) foundations by impact and vibratory pile driving, impact and vibratory pile driving associated with cable landfall construction; and high-resolution geophysical (HRG) site characterization surveys.

§ 217.291 Effective dates.

Regulations in this subpart are effective from February 5, 2024, through February 4, 2029.

§ 217.292 Permissible methods of taking.

Under an LOA, issued pursuant to §§ 216.106 of this chapter and 217.296, Dominion Energy, and those persons it authorizes or funds to conduct activities on its behalf, may incidentally, but not intentionally, take marine mammals within the area described in § 217.290(b) in the following ways, provided Dominion Energy is in complete compliance with all terms, conditions, and requirements of the regulations in this subpart and the appropriate LOA:

(a) By Level B harassment associated with the acoustic disturbance of marine mammals by impact and vibratory pile driving (WTG and OSS foundation installation), impact and vibratory pile driving during cable landfall construction (temporary goal posts and temporary cofferdams), and HRG site characterization surveys; and

(b) By Level A harassment associated with the acoustic disturbance of marine mammals by impact pile driving WTG and OSS foundations.

(c) Take by mortality or serious injury of any marine mammal species is not authorized; and

(d) The incidental take of marine mammals by the activities listed in paragraphs (a) and (b) of this section is limited to the following species:

TABLE 1 TO PARAGRAPH (d)

Marine mammal species	Scientific name	Stock
Fin whale	*Balaenoptera physalus*	Western North Atlantic.
Sei whale	*Balaenoptera borealis*	Nova Scotia.
Minke whale	*Balaenoptera acutorostrata*	Canadian East Coastal.
North Atlantic right whale	*Eubalaena glacialis*	Western North Atlantic.
Humpback whale	*Megaptera novaeangliae*	Gulf of Maine.
Sperm whale	*Physeter macrocephalus*	North Atlantic.
Atlantic spotted dolphin	*Stenella frontalis*	Western North Atlantic.
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Western North Atlantic.
Bottlenose dolphin	*Tursiops truncatus*	Western North Atlantic—Offshore.
		Southern Migratory Coastal.
Clymene dolphin	*Stenella clymene*	Western North Atlantic.
Common dolphin	*Delphinus delphis*	Western North Atlantic.
False killer whale	*Pseudorca crassidens*	Western North Atlantic.
Harbor porpoise	*Phocoena phocoena*	Gulf of Maine/Bay of Fundy.
Melon-headed whale	*Peponocephala electra*	Western North Atlantic.
Long-finned pilot whale	*Globicephala melas*	Western North Atlantic.
Pantropical spotted dolphin	*Stenella attenuata*	Western North Atlantic.
Pygmy sperm whale	*Kogia breviceps*	Western North Atlantic.
Short-finned pilot whale	*Globicephala macrorhynchus*	Western North Atlantic.
Risso's dolphin	*Grampus griseus*	Western North Atlantic.
Gray seal	*Halichoerus grypus*	Western North Atlantic.
Harbor seal	*Phoca vitulina*	Western North Atlantic.

§ 217.293 Prohibitions.

Except for the takings described in § 217.292 and authorized by an LOA issued under § 217.296 or § 217.297, it is unlawful for any person to do any of the following in connection with the activities described in this subpart:

(a) Violate, or fail to comply with, the terms, conditions, and requirements of this subpart or an LOA issued under §§ 217.296 and 217.297;

(b) Take any marine mammal not specified in § 217.292(d);

(c) Take any marine mammal specified in the LOA in any manner other than as specified in the LOA; or

(d) Take any marine mammal specified in § 217.292(d), after NMFS determines such taking results in more than a negligible impact on the species or stocks of such marine mammals.

§ 217.294 Mitigation requirements.

When conducting the activities identified in §§ 217.290 and 217.292, Dominion Energy must implement the mitigation measures contained in this section and any LOA issued under §§ 217.296 and 217.297. These mitigation measures include, but are not limited to:

(a) *General conditions.* The following measures apply to the CVOW–C Project:

(1) A copy of any issued LOA must be in the possession of Dominion Energy and its designees, all vessel operators, visual protected species observers (PSOs), passive acoustic monitoring (PAM) operators, pile driver operators, and any other relevant designees operating under the authority of the issued LOA.

(2) Dominion Energy must conduct briefings between construction supervisors, construction crews, and the PSO and PAM team prior to the start of all construction activities, and when new personnel join the work, in order to explain responsibilities, communication procedures, marine mammal monitoring and reporting protocols, and operational procedures. A simple guide must be included with the Marine Mammal Monitoring Plan to aid personnel in identifying species if they are observed in the vicinity of the project area.

(3) Prior to and when conducting any in-water construction activities and vessel operations, Dominion Energy personnel (*e.g.,* vessel operators, PSOs) must use available sources of information on North Atlantic right whale presence in or near the project area including daily monitoring of the Right Whale Sightings Advisory System, and monitoring of Coast Guard VHF Channel 16 throughout the day to receive notification of any sightings and/or information associated with any Slow Zones (*i.e.,* Dynamic Management Areas (DMAs) and/or acoustically-triggered slow zones) to provide situational awareness for both vessel operators and PSO.

(4) Dominion Energy must ensure that any visual observations of an Endangered Species Act (ESA)-listed marine mammal are communicated to PSOs and vessel captains during the concurrent use of multiple project-associated vessels (of any size; *e.g.,* construction surveys, crew/supply transfers, *etc.*).

(5) Dominion Energy must establish and implement clearance and shutdown zones as described in the LOA.

(6) Dominion Energy must instruct all vessel personnel regarding the authority of the PSO(s). Any disagreement between the Lead PSO and the vessel operator would only be discussed after shutdown has occurred.

(7) If an individual from a species for which authorization has not been granted, or a species for which authorization has been granted but the authorized take number has been met, is observed entering or within the relevant Level B harassment zone for a specified activity, pile driving and HRG acoustic sources must be shut down immediately, unless shutdown would result in imminent risk of injury or loss of life to an individual, pile refusal, or pile instability, or be delayed if the activity has not commenced. Impact and vibratory pile driving and initiation of

HRG acoustic sources must not commence or resume until the animal(s) has been confirmed to have left the relevant clearance zone or the observation time has elapsed with no further sightings.

(8) Construction and survey activities shall only commence when visual clearance zones are fully visible (*e.g.,* not obscured by darkness, rain, fog, *etc.*) and clear of marine mammals, as determined by the Lead PSO, for at least 30 minutes immediately prior to initiation of equipment (*i.e.,* vibratory and impact pile driving, HRG surveys that use boomers, sparkers, and Compressed High-Intensity Radiated Pulses (CHIRPs)).

(9) Any visual or acoustic detection within the clearance or shutdown zones must trigger a delay to the commencement of construction and survey activities. Any marine mammals observed within a clearance or shutdown zone must be allowed to remain in the area (*i.e.,* must leave of their own volition) prior to commencing pile driving activities or HRG surveys.

(10) Dominion Energy must treat any large whale sighted by a PSO or acoustically detected by a PAM operator as if it were a North Atlantic right whale and apply the mitigation measures applicable to North Atlantic right whales, unless a PSO or a PAM operator confirms the large whale is another type of whale.

(11) Following a shutdown, construction and survey activities shall not recommence until the minimum visibility zone is fully visible and clear of marine mammals for 30 minutes and no marine mammals have been detected acoustically within the PAM clearance zone for 30 minutes.

(12) For in-water construction heavy machinery activities, other than impact and vibratory pile driving, if a marine mammal is on a path towards or comes within 10 m of equipment, Dominion Energy must cease operations until the marine mammal has moved more than 10 m on a path away from the activity to avoid direct interaction with equipment.

(13) All vessels must be equipped with an Automatic Identification System (AIS) and Dominion Energy must report all Maritime Mobile Service Identify (MMSI) numbers to NMFS Office of Protected Resources prior to initiating in-water activities.

(b) *Vessel strike avoidance measures.* The following measures apply to all vessels associated with the CVOW–C:

(1) Prior to the start of construction activities, all vessel operators and crew must receive a protected species identification training that covers, at a minimum:

(i) Identification of marine mammals and other protected species known to occur or which have the potential to occur in the Dominion Energy project area;

(ii) Training on making observations in both good weather conditions (*i.e.,* clear visibility, low winds, low sea states) and bad weather conditions (*i.e.,* fog, high winds, high sea states, with glare);

(iii) Training on information and resources available to the project personnel regarding the applicability of Federal laws and regulations for protected species;

(iv) Observer training related to vessel strike avoidance measures must be conducted for all vessel operators and crew prior to the start of in-water construction activities; and

(v) Confirmation of marine mammal observer training must be documented on a training course log sheet and reported to NMFS;

(2) All vessel operators and crews, regardless of their vessel's size, must maintain a vigilant watch for all marine mammals and slow down, stop their vessel, or alter course, as appropriate, to avoid striking any marine mammal;

(3) All vessels must have a visual observer on board who is responsible for monitoring the vessel strike avoidance zone for marine mammals. Visual observers may be a PSO or crew member, but crew members responsible for these duties must be provided sufficient training by Dominion Energy to distinguish marine mammals from other types of animals or objects and must be able to identify a marine mammal as a North Atlantic right whale, other whale (defined in this context as sperm whales or baleen whales other than North Atlantic right whales), or other marine mammal. Crew members serving as visual observers must not have duties other than observing for marine mammals while the vessel is operating over 10 knots (kts);

(4) Year-round and when a vessel is in transit, all vessel operators must continuously monitor U.S. Coast Guard VHF Channel 16, over which North Atlantic right whale sightings are broadcasted. At the onset of transiting and at least once every four hours, vessel operators and/or trained crew members must monitor the project's Situational Awareness System, WhaleAlert, and the Right Whale Sighting Advisory System (RWSAS) for the presence of North Atlantic right whales. Any observations of any large whale by any Dominion Energy staff or contractors, including vessel crew, must be communicated immediately to PSOs, PAM operator, and all vessel captains to increase situational awareness. Conversely, any large whale observation or detection via a sighting network (*e.g.,* Mysticetus) by PSOs or PAM operators must be conveyed to vessel operators and crew;

(5) Any observations of any large whale by any Dominion Energy staff or contractor, including vessel crew, must be communicated immediately to PSOs and all vessel captains to increase situational awareness;

(6) Nothing in this subpart exempts vessels from applicable speed regulations at 50 CFR 224.105;

(7) All vessels must transit active Slow Zones (*i.e.,* Dynamic Management Areas (DMAs) or acoustically-triggered slow zone), and Seasonal Management Areas (SMAs) at 10 kts or less;

(8) Between November 1st and April 30th, all vessels must transit at 10 kts or less;

(9) All vessels, regardless of size, must immediately reduce speed to 10 kts or less when any large whale, mother/calf pairs, or large assemblages of non-delphinid cetaceans are observed (within 500 m) of an underway vessel;

(10) All vessels, regardless of size, must immediately reduce speed to 10 kts or less when a North Atlantic right whale is sighted, at any distance, by anyone on the vessel;

(11) All transiting vessels operating at any speed must have a dedicated visual observer on duty at all times to monitor for marine mammals within a 180 degree direction of the forward path of the vessel (90 degrees port to 90 degree starboards) located at the best vantage point for ensuring vessels are maintaining appropriate separation distances from marine mammals. Visual observers must be equipped with alternative monitoring technology for periods of low visibility (*e.g.,* darkness, rain, fog, *etc.*). The dedicated visual observer must receive prior training on protected species detection and identification, vessel strike minimization procedures, how and when to communicate with the vessel captain, and reporting requirements. Visual observers may be third-party observers (*i.e.,* NMFS-approved PSOs) or crew members. Observer training related to these vessel strike avoidance measures must be conducted for all vessel operators and crew prior to the start of vessel use;

(12) All vessels must maintain a minimum separation distance of 500 m from North Atlantic right whales. If underway and making way, all vessels must steer a course away from any

sighted North Atlantic right whale at 10 kts or less such that the 500-m minimum separation distance requirement is not violated. If a North Atlantic right whale is sighted within 500 m of a transiting vessel, that vessel must shift the engine to neutral. Engines must not be engaged until the whale has moved outside of the vessel's path and beyond 500 m. If a whale is observed but cannot be confirmed as a species other than a North Atlantic right whale, the vessel operator must assume that it is a North Atlantic right whale;

(13) All vessels must maintain a minimum separation distance of 100 m from sperm whales and baleen whales other than North Atlantic right whales. If one of these species is sighted within 100 m of a transiting vessel, that vessel must shift the engine to neutral. Engines must not be engaged until the whale has moved outside of the vessel's path and beyond 100 m;

(14) All vessels must maintain a minimum separation distance of 50 m from all delphinoid cetaceans and pinnipeds, with an exception made for those that approach the vessel (*e.g.,* bow-riding dolphins). If a delphinid cetacean or pinniped is sighted within 50 m of a transiting vessel, that vessel must shift the engine to neutral, with an exception made for those that approach the vessel (*e.g.,* bow-riding dolphins). Engines must not be engaged until the animal(s) has moved outside of the vessel's path and beyond 50 m;

(15) When a marine mammal(s) is sighted while a vessel is transiting, the vessel must take action as necessary to avoid violating the relevant separation distances (*e.g.,* attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area). If a marine mammal(s) is sighted within the relevant separation distance, the vessel must shift the engine to neutral and not engage the engine(s) until the animal(s) outside and on a path away from the separation area. This does not apply to any vessel towing gear or any situation where respecting the relevant separation distance would be unsafe (*i.e.,* any situation where the vessel is navigationally constrained);

(16) All vessels underway must not divert or alter course to approach any marine mammal. If a separation distance is triggered, any vessel underway must avoid abrupt changes in course direction and transit at 10 kts or less until the animal is outside the relevant separation distance; and

(17) Dominion Energy must submit a North Atlantic right whale vessel strike avoidance plan 180 days prior to the commencement of vessel use. This plan must describe, at a minimum, how PAM, in combination with visual observations, would be conducted to ensure the transit corridor is clear of right whales and would also provide details on the vessel-based observer protocols on transiting vessels.

(c) *WTG and OSS foundation installation.* The following requirements apply to pile driving activities associated with the installation of WTG and OSS foundations:

(1) Foundation vibratory and impact pile driving may not occur November 1st through April 30th;

(2) Monopiles must be no larger than 9.5-m in diameter, representing the larger end of the tapered 9.5/7.5-m monopile design. Pin piles must be no larger than 2.8-m in diameter. During all monopile and pin pile installation, the minimum amount of hammer energy necessary to effectively and safely install and maintain the integrity of the piles must be used. Hammer energies must not exceed 4,000 kilojoules (kJ) for monopile installations and 3,000 kJ for pin pile installation. No more than two monopile foundation or two pin piles for jacket foundations may be installed per day;

(3) Dominion Energy must not initiate pile driving earlier than 1 hour after civil sunrise or later than 1.5 hours prior to civil sunset, unless Dominion Energy submits, and NMFS approves an Alternative Monitoring Plan as part of the Pile Driving and Marine Mammal Monitoring Plan that reliably demonstrates the efficacy of their night vision devices;

(4) Dominion Energy must utilize a soft-start protocol for each impact pile driving event of all monopiles and pin piles by performing 4–6 strikes per minute at 10 to 20 percent of the maximum hammer energy, for a minimum of 20 minutes;

(5) Soft-start must occur at the beginning of monopile and pin pile installation and at any time following a cessation of impact pile driving of 30 minutes or longer;

(6) If a marine mammal is detected, visually or acoustically, within or about to enter the applicable clearance zones, prior to the beginning of soft-start procedures, impact pile driving must be delayed until the animal has been visually observed exiting the clearance zone or until a specific time period has elapsed with no further sightings. The specific time periods are 15 minutes for small odontocetes and pinnipeds and 30 minutes for all other species;

(7) Dominion Energy must deploy dual noise abatement systems that are capable of achieving, at a minimum, 10 decibel (dB) of sound attenuation, during all vibratory and impact pile driving of monopiles and pin piles and comply with the following requirements related noise abatement:

(i) A single bubble curtain must not be used unless paired with another noise attenuation device;

(ii) A big double bubble curtain may be used without being paired with another noise attenuation device;

(iii) The bubble curtain(s) must distribute air bubbles using an air flow rate of at least 0.5 $m^3/(min*m)$. The bubble curtain(s) must surround 100 percent of the piling perimeter throughout the full depth of the water column. In the unforeseen event of a single compressor malfunction, the offshore personnel operating the bubble curtain(s) must make appropriate adjustments to the air supply and operating pressure such that the maximum possible sound attenuation performance of the bubble curtain(s) is achieved;

(iv) The lowest bubble ring must be in contact with the seafloor for the full circumference of the ring, and the weights attached to the bottom ring must ensure 100-percent seafloor contact;

(v) No parts of the ring or other objects may prevent full seafloor contact;

(vi) Construction contractors must train personnel in the proper balancing of airflow to the ring. Construction contractors must submit an inspection/performance report for approval by Dominion Energy within 72 hours following the performance test. Dominion Energy must then submit that report to NMFS; and

(vii) Corrections to the bubble ring(s) to meet the performance standards in this paragraph (c)(7) must occur prior to impact pile driving of monopiles and pin piles. If Dominion Energy uses a noise mitigation device in addition to the bubble curtain, Dominion Energy must maintain similar quality control measures as described in this paragraph (c)(7);

(8) Dominion Energy must conduct sound field verification (SFV) during all vibratory and impact pile driving of the first three monopiles and all piles associated with the first OSS foundation installed. Subsequent SFV is required should additional piles be driven that are anticipated to produce louder sound fields than those previously measured;

(9) Dominion Energy must conduct SFV after construction is complete to estimate turbine operational source levels based on measurements in the near and far-field at a minimum of three locations from each foundation

monitored. These data must be used to also identify estimated transmission loss rates;

(10) Dominion Energy must submit a sound field verification (SFV) plan to NOAA Fisheries for review and approval at least 180 days prior to planned start of pile driving that identifies how Dominion Energy will comply with the following requirements:

(i) Dominion Energy must empirically determine source levels, the ranges to the isopleths corresponding to the Level A harassment and Level B harassment thresholds in meters, and the transmission loss coefficient(s). Dominion Energy may estimate ranges to the Level A harassment and Level B harassment isopleths by extrapolating from *in situ* measurements conducted at several distances from the piles monitored;

(ii) Dominion Energy must perform sound field measurements at four distances from the pile being driven, including, but not limited to, 750 m and the modeled Level B harassment zones to verify the accuracy of those modeled zones;

(iii) The recordings must be continuous throughout the duration of all impact and vibratory hammering of each pile monitored;

(iv) The measurement systems must have a sensitivity appropriate for the expected sound levels from pile driving received at the nominal ranges throughout the installation of the pile;

(v) The frequency range of the system must cover the range of at least 20 hertz (Hz) to 20 kilohertz (kHz);

(vi) The system will be designed to have omnidirectional sensitivity and will be designed so that the predicted broadband received level of all impact pile-driving strikes exceeds the system noise floor by at least 10 dB. The dynamic range of the system must be sufficient such that at each location, pile driving signals are not clipped and are not masked by noise floor; and

(vii) Identify operational noise levels and transmission loss rates;

(11) If acoustic field measurements collected during installation of foundation piles indicate ranges to the isopleths, corresponding to Level A harassment and Level B harassment thresholds, are greater than the ranges predicted by modeling (assuming 10 dB attenuation), Dominion Energy must implement additional noise mitigation measures prior to installing the next monopile. Each modification must be evaluated empirically by acoustic field measurements;

(12) In the event that field measurements indicate ranges to isopleths, corresponding to Level A harassment and Level B harassment thresholds, are greater than the ranges predicted by modeling (assuming 10 dB attenuation), NMFS may expand the relevant harassment, clearance, and shutdown zones and associated monitoring protocols;

(13) If the harassment zones are expanded beyond an additional 1,500 m, additional PSOs must be deployed on additional platforms, with each observer responsible for maintaining watch in no more than 180 degrees and of an area with a radius no greater than 1,500 m;

(14) If acoustic measurements indicate that ranges to isopleths corresponding to the Level A harassment and Level B harassment thresholds are less than the ranges predicted by modeling (assuming 10 dB attenuation), Dominion Energy may request to NMFS a modification of the clearance and shutdown zones for impact pile driving of monopiles and pin piles;

(15) For NMFS to consider a modification request for reduced zone sizes, Dominion Energy must have had to conduct SFV on three or more monopiles and four or more pin piles to verify that zone sizes are consistently smaller than those predicted by modeling (assuming 10 dB attenuation) and subsequent piles would be installed within and under similar conditions (*e.g.,* monitoring data collected during installation of a typical pile cannot be used to adjust difficult-to-drive pile ranges);

(16) If a subsequent monopile installation location is selected that was not represented by the previous three locations (*i.e.,* substrate composition, water depth), SFV is required;

(17) Dominion Energy must utilize, at minimum, four PSOs who must be actively observing for marine mammals before, during, and after pile driving. At least two PSOs must be stationed on the primary pile driving vessel and at least two PSOs must be stationed on a secondary, dedicated PSO vessel. The dedicated PSO vessel must be positioned approximately 3 km from the pile being driven and must circle the pile at a speed of less than 10 knots;

(18) PSOs must be able to visually clear (*i.e.,* confirm no marine mammals are present) an area that extends around the pile being driven as described in the LOA. The entire minimum visibility zone must be visible (*i.e.,* not obscured by dark, rain, fog, *etc.*) for a full 30 minutes immediately prior to commencing vibratory and impact pile driving (2,000 m);

(19) PSOs must visually monitor clearance zones for marine mammals for a minimum of 60 minutes prior to commencing pile driving. Prior to initiating soft-start procedures, all clearance zones must be visually confirmed to be free of marine mammals for 30 minutes before pile driving can begin;

(20) At least one PAM operator must review data from at least 24 hours prior to pile driving and actively monitor hydrophones for 60 minutes prior to pile driving. All clearance zones must be acoustically confirmed to be free of marine mammals for 60 minutes before activities can begin immediately prior to starting a soft-start of impact pile driving;

(21) If a marine mammal is observed entering or within the relevant clearance zone prior to the initiation of vibratory and/or impact pile driving activities, pile driving must be delayed and must not begin until either the marine mammal(s) has voluntarily left the specific clearance zones and have been visually or acoustically confirmed beyond that clearance zone, or, when specific time periods have elapsed with no further sightings or acoustic detections. The specific time periods are 15 minutes for small odontocetes and 30 minutes for all other marine mammal species;

(22) For North Atlantic right whales, any acoustic detection must trigger a delay to the commencement of pile driving. The clearance zone may only be declared clear if no confirmed North Atlantic right whale acoustic detections (in addition to visual) have occurred within the PAM clearance zone during the 60-minute monitoring period. Any large whale sighting by a PSO or detected by a PAM operator that cannot be identified by species must be treated as if it were a North Atlantic right whale;

(23) If a marine mammal is observed entering or within the respective shutdown zone, as defined in the LOA, after pile driving has begun, the PSO must call for a temporary shutdown of pile driving;

(24) Dominion Energy must immediately cease pile driving when a marine mammal is detected within a shutdown zone, unless shutdown is not practicable due to imminent risk of injury or loss of life to an individual, pile refusal, or pile instability. In this situation, Dominion Energy must reduce hammer energy to the lowest level practicable and the reason(s) for not shutting down must be documented and reported to NMFS;

(25) If pile driving has been shut down due to the presence of a North Atlantic right whale, pile driving may not restart until the North Atlantic right

whale is no longer observed or 30 minutes has elapsed since the last detection;

(26) Upon restarting impact pile driving, soft-start protocols must be followed; and

(27) Pile driving must not restart until either the marine mammal(s) has voluntarily left the specific clearance zones and has been visually or acoustically confirmed beyond that clearance zone, or, when specific time periods have elapsed with no further sightings or acoustic detections have occurred. The specific time periods are 15 minutes for small odontocetes and 30 minutes for all other marine mammal species. In cases where these criteria are not met, pile driving may restart only if necessary to maintain pile stability at which time Dominion Energy must use the lowest hammer energy practicable to maintain stability.

(d) *Cable landfall construction.* The following requirements apply to cable landfall pile driving activities:

(1) Dominion Energy must conduct pile driving during daylight hours only.

(2) Dominion Energy must have a minimum of two PSOs on active duty during any installation and removal of the temporary cofferdams and goal posts. PSOs must be located at the best vantage point(s) on the pile driving platform or secondary platform in the immediate vicinity of the pile driving platform, in order to ensure that appropriate visual coverage is available for the entire visual clearance zone and as much of the Level B harassment zone, as possible.

(3) Prior to the start of pile driving activities, at least two PSOs must monitor the clearance zone for 30 minutes, continue monitoring during pile driving and for 30 minutes post-pile driving.

(4) If a marine mammal(s) is observed entering or is observed within the clearance zones, pile driving must not commence until the animal(s) has exited the zone or a specific amount of time has elapsed since the last sighting. The specific time periods are 15 minutes for small odontocetes and pinnipeds and 30 minutes for all other marine mammal species.

(5) If a marine mammal is observed entering or within the respective shutdown zone, as defined in the LOA, after pile driving has begun, the PSO must call for a temporary shutdown of pile driving.

(6) Dominion Energy must immediately cease pile driving when a marine mammal is detected within a shutdown zone, unless shutdown is not practicable due to imminent risk of injury or loss of life to an individual, pile refusal, or instability. In this situation, Dominion Energy must reduce hammer energy to the lowest level practicable and the reason(s) for not shutting down must be documented and reported to NMFS.

(7) Pile driving must not restart until either the marine mammal(s) has voluntarily left the specific clearance zones and has been visually or acoustically confirmed beyond that clearance zone, or, when specific time periods have elapsed with no further sightings or acoustic detections have occurred. The specific time periods are 15 minutes for small odontocetes and pinnipeds and 30 minutes for all other marine mammal species. In cases where the criteria in this paragraph (e)(7) is not met, pile driving may restart only if necessary to maintain pile stability at which time Dominion Energy must use the lowest hammer energy practicable to maintain stability.

(8) If pile driving has been shut down due to the presence of a North Atlantic right whale, pile driving may not restart until the North Atlantic right whale is no longer observed or 30 minutes has elapsed since the last detection.

(9) Dominion Energy must employ a soft-start for all impact pile driving. Soft start requires contractors to provide an initial set of three strikes at reduced energy, followed by a 30-second waiting period, then two subsequent reduced-energy strike sets.

(e) *HRG surveys.* The following requirements apply to HRG surveys operating sub bottom profilers (SBPs):

(1) Dominion Energy is required to have at least one PSO on active duty per vessel during HRG surveys that are conducted during daylight hours (*i.e.,* from 30 minutes prior to civil sunrise through 30 minutes following civil sunset) and at least two PSOs on active duty per vessel during HRG surveys that are conducted during nighttime hours.

(2) Dominion Energy must deactivate acoustic sources during periods where no data are being collected, except as determined to be necessary for testing. Unnecessary use of the acoustic source(s) is prohibited.

(3) Dominion Energy is required to ramp-up sub-bottom profilers (SBPs) prior to commencing full power, unless the equipment operates on a binary on/off switch. ensure visual clearance zones are fully visible (*e.g.,* not obscured by darkness, rain, fog, *etc.*) and clear of marine mammals, as determined by the Lead PSO, for at least 30 minutes immediately prior to the initiation of survey activities using acoustic sources specified in the LOA.

(4) Prior to a ramp-up procedure starting or activating SBPs, the operator must notify the Lead PSO of the planned start time. This notification time must not be less than 60 minutes prior to the planned ramp-up or activation as all relevant PSOs must monitor the clearance zone for 30 minutes prior to the initiation of ramp-up or activation.

(5) Prior to starting the survey and after receiving confirmation from the PSOs that the clearance zone is clear of any marine mammals, Dominion Energy must ramp-up sources to half power for 5 minutes and then proceed to full power, unless the source operates on a binary on/off switch in which case ramp-up is not required. Ramp-up and activation must be delayed if a marine mammal(s) enters its respective shutdown zone. Ramp-up and activation may only be reinitiated if the animal(s) has been observed exiting its respective shutdown zone or until 15 minutes for small odontocetes and pinnipeds, and 30 minutes for all other species, has elapsed with no further sightings.

(6) Dominion Energy must implement a 30-minute clearance period of the clearance zones immediately prior to the commencing of the survey or when there is more than a 30 minute break in survey activities or PSO monitoring. A clearance period is a period when no marine mammals are detected in the relevant zone.

(7) If a marine mammal is observed within a clearance zone during the clearance period, ramp-up or acoustic surveys may not begin until the animal(s) has been observed voluntarily exiting its respective clearance zone or until a specific time period has elapsed with no further sighting. The specific time period is 15 minutes for small odontocetes and seals, and 30 minutes for all other species.

(8) Any large whale sighted by a PSO within 1 km of the SBP that cannot be identified by species must be treated as if it were a North Atlantic right whale and Dominion Energy must apply the mitigation measure applicable to this species.

(9) In any case when the clearance process has begun in conditions with good visibility, including via the use of night vision equipment (infrared (IR)/thermal camera), and the Lead PSO has determined that the clearance zones are clear of marine mammals, survey operations would be allowed to commence (*i.e.,* no delay is required) despite periods of inclement weather and/or loss of daylight.

(10) Once the survey has commenced, Dominion Energy must shut down SBPs if a marine mammal enters a respective shutdown zone, except in cases when the shutdown zones become obscured

for brief periods due to inclement weather, survey operations would be allowed to continue (*i.e.,* no shutdown is required) so long as no marine mammals have been detected. The shutdown requirement does not apply to small delphinids of the following genera: Delphinus, Stenella, Lagenorhynchus, and Tursiops. If there is uncertainty regarding the identification of a marine mammal species (*i.e.,* whether the observed marine mammal belongs to one of the delphinid genera for which shutdown is waived), the PSOs must use their best professional judgment in making the decision to call for a shutdown. Shutdown is required if a delphinid that belongs to a genus other than those specified in this paragraph (e)(10) is detected in the shutdown zone.

(11) If SBPs have been shut down due to the presence of a marine mammal, the use of SBPs may not commence or resume until the animal(s) has been confirmed to have left the Level B harassment zone or until a full 15 minutes (for small odontocetes and seals) or 30 minutes (for all other marine mammals) have elapsed with no further sighting.

(12) Dominion Energy must immediately shutdown any SBP acoustic source if a marine mammal is sighted entering or within its respective shutdown zones. If there is uncertainty regarding the identification of a marine mammal species (*i.e.,* whether the observed marine mammal belongs to one of the delphinid genera for which shutdown is waived), the PSOs must use their best professional judgment in making the decision to call for a shutdown. Shutdown is required if a delphinid that belongs to a genus other than those specified in this paragraph (e)(12) is detected in the shutdown zone.

(13) If a SBP is shut down for reasons other than mitigation (*e.g.,* mechanical difficulty) for less than 30 minutes, it would be allowed to be activated again without ramp-up only if:

(i) PSOs have maintained constant observation; and

(ii) No additional detections of any marine mammal occurred within the respective shutdown zones.

(f) *Fisheries monitoring surveys.* The following measures apply to fishery monitoring surveys using trap/pot gear:

(1) All captains and crew conducting fishery surveys must be trained in marine mammal detection and identification. Marine mammal monitoring will be conducted by the captain and/or a member of the scientific crew before (within 1 nautical mile (nm) and 15 minutes prior to deploying gear), during, and after haul back.

(2) Survey gear will be deployed as soon as possible once the vessel arrives on station.

(3) Dominion Energy and/or its cooperating institutions, contracted vessels, or commercially-hired captains must implement the following ‘‘move-on’’ rule: If marine mammals are sighted within 1 nm of the planned location and 15 minutes before gear deployment, Dominion Energy and/or its cooperating institutions, contracted vessels, or commercially-hired captains, as appropriate, must move the vessel away from the marine mammal to a different section of the sampling area. If, after moving on, marine mammals are still visible from the vessel, Dominion Energy and/or its cooperating institutions, contracted vessels, or commercially-hired captains must move again or skip the station.

(4) If a marine mammal is deemed to be at risk of interaction after the gear is set, all gear must be immediately removed from the water.

(5) Dominion Energy must maintain visual monitoring effort during the entire period of time that gear is in the water (*i.e.,* throughout gear deployment, fishing, and retrieval).

(6) All fisheries monitoring gear must be fully cleaned and repaired (if damaged) before each use.

(7) All lost gear must be reported to NOAA Greater Atlantic Regional Fisheries Office Protected Resources Division (*nmfs.gar.incidental-take@noaa.gov*) within 24 hours of the documented time of missing or lost gear. This report must include information on any markings on the gear and any efforts undertaken or planned to recover the gear. All reasonable efforts, that do not compromise human safety, must be undertaken to recover gear.

(8) Dominion Energy must implement measures within the Atlantic Large Whale Take Reduction Plan at 50 CFR 229.32.

§ 217.295 Requirements for monitoring and reporting.

(a) *Protected species observer (PSO) and passive acoustic monitoring (PAM) operator qualifications.* Dominion Energy must implement the following measures applicable to PSOs and PAM operators:

(1) Dominion Energy must use independent, dedicated, qualified PSOs, meaning that the PSOs must be employed by a third-party observer provider, must have no tasks other than to conduct observational effort, collect data, and communicate with and instruct relevant vessel crew with regard to the presence of protected species and mitigation requirements;

(2) PSOs must successfully complete relevant training, including completion of all required coursework and passing a written and/or oral examination developed for the training;

(3) PSOs must have successfully attained a bachelor's degree from an accredited college or university with a major in one of the natural sciences, a minimum of 30 semester hours or equivalent in the biological sciences, and at least one undergraduate course in math or statistics. The educational requirements may be waived if the PSO has acquired the relevant skills through alternate experience. Requests for such a waiver shall be submitted to NMFS and must include written justification. Alternate experience that may be considered includes, but is not limited to: Secondary education and/or experience comparable to PSO duties; previous work experience conducting academic, commercial, or government sponsored marine mammal surveys; or previous work experience as a PSO; the PSO should demonstrate good standing and consistently good performance of PSO duties;

(4) PSOs must have visual acuity in both eyes (with correction of vision being permissible) sufficient enough to discern moving targets on the water's surface with the ability to estimate the target size and distance (binocular use is allowable); ability to conduct field observations and collect data according to the assigned protocols; sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations; writing skills sufficient to document observations, including but not limited to, the number and species of marine mammals observed, the dates and times of when in-water construction activities were conducted, the dates and time when in-water construction activities were suspended to avoid potential incidental injury of marine mammals from construction noise within a defined shutdown zone, and marine mammal behavior; and the ability to communicate orally, by radio, or in-person, with project personnel to provide real-time information on marine mammals observed in the area, as necessary;

(5) All PSOs must be approved by NMFS. Dominion Energy must submit PSO resumes for NMFS' review and approval at least 60 days prior to commencement of in-water construction activities requiring PSOs. Resumes must include dates of training and any prior NMFS approval, as well as dates and description of last experience, and must

be accompanied by information documenting successful completion of an acceptable training course. NMFS shall be allowed three weeks to approve PSOs from the time that the necessary information is received by NMFS, after which PSOs meeting the minimum requirements will automatically be considered approved;

(6) All PSOs must be trained in marine mammal identification and behaviors and must be able to conduct field observations and collect data according to assigned protocols. Additionally, PSOs must have the ability to work with all required and relevant software and equipment necessary during observations;

(7) At least one PSO on active duty for each activity (*i.e.,* foundation installation, cable landfall activities, and HRG surveys) must be designated as the ''Lead PSO''. The Lead PSO must have a minimum of 90 days of at-sea experience working in an offshore environment and is required to have no more than eighteen months elapsed since the conclusion of their last at-sea experience;

(8) PAM operators must complete specialized training for operating PAM systems and must demonstrate familiarity with the PAM system on which they must be working. PSOs may act as both acoustic operators and visual observers (but not simultaneously), so long as they demonstrate that their training and experience are sufficient to perform each task; and

(9) PAM operators may additionally function as PSOs, assuming all qualifications and requirements in paragraphs (a)(1) through (7) of this section are met, but may only perform one role at any one time and must abide by the requirements specified for that role.

(b) *General PSO requirements.* The following measures apply to PSOs during all project activities and must be implemented by Dominion Energy:

(1) PSOs must monitor all clearance and shutdown zones prior to, during, and following pile driving, cable landfall construction activities, and during HRG surveys that use boomers, sparkers, and CHIRPs (with specific monitoring durations and needs described in paragraphs (c) through (e) of this section, respectively). PSOs must also monitor the Level B harassment zones and document any marine mammals observed within these zones, to the extent practicable. PSOs must ensure that there is appropriate visual coverage for the entire clearance and shutdown zones and as much of the Level B harassment zone as possible;

(2) All PSOs must be located at the best vantage point(s) on the primary vessel, pile driving platform, or secondary platform, whichever is most appropriate to the activity occurring, in order to obtain 360 degree visual coverage of the entire clearance and shutdown zones around the activity area, and as much of the Level B harassment zone as possible. PAM operators may be located on a vessel or remotely on-shore but must have the appropriate equipment (*i.e.,* computer station equipped with a data collection software system (*i.e.,* Mysticetus or similar system and acoustic data analysis software)) available wherever they are stationed;

(3) During all visual observation periods, PSOs must use high magnification (25x) binoculars, standard handheld (7x) binoculars, and the naked eye to search continuously for marine mammals. During impact pile driving, at least one PSO on the primary pile driving vessel must be equipped with functional Big Eye binoculars (*e.g.,* 25 x 150; 2.7 view angle; individual ocular focus; height control). These must be pedestal mounted on the deck at the best vantage point that provides for optimal sea surface observation and PSO safety;

(4) During periods of low visibility (*e.g.,* darkness, rain, fog, poor weather conditions, *etc.*), PSOs must use alternative technology (*i.e.,* infrared or thermal cameras) to monitor the clearance and shutdown zones;

(5) PSOs must not exceed four consecutive watch hours on duty at any time, must have a two-hour (minimum) break between watches, and must not exceed a combined watch schedule of more than 12 hours in a 24-hour period;

(6) Any PSO has the authority to call for a delay or shutdown of project activities;

(7) Any observations of marine mammals must be communicated to PSOs on all nearby project vessels during construction activities and surveys;

(8) PSOs must remain in contact with the PAM operator currently on duty regarding any animal detection that would be approaching or found within the applicable zones no matter where the PAM operator is stationed (*i.e.,* onshore or on a vessel);

(9) During daylight hours when 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 monitoring reports; and

(10) Dominion Energy's personnel and PSOs are required to use available sources of information on North Atlantic right whale presence to aid in monitoring efforts. These include daily monitoring of the Right Whale Sightings Advisory System, consulting of the WhaleAlert app, and monitoring of the Coast Guard's VHF Channel 16 throughout the day to receive notifications of any sightings and information associated with any Dynamic Management Areas, to plan construction activities and vessel routes, if practicable, to minimize the potential for co-occurrence with North Atlantic right whales.

(c) *PSO and PAM operator requirements during WTG and OSS foundation installation.* The following measures apply to PSOs and PAM operators during monopile and OSS foundation installation and must be implemented by Dominion Energy:

(1) At least four PSOs must be actively observing marine mammals before, during, and after installation of foundation piles (*i.e.,* monopiles and pin piles for jacket foundations). At least two PSOs must be stationed and observing on the pile driving vessel and at least two PSOs must be stationed on a secondary, PSO-dedicated vessel. Concurrently, at least one acoustic monitoring PSO (*i.e.,* passive acoustic monitoring (PAM) operator) must be actively monitoring for marine mammals with PAM before, during, and after impact pile driving;

(2) All on-duty visual PSOs must remain in contact with the on-duty PAM operator, who would monitor the PAM systems for acoustic detections of marine mammals in the area, regarding any animal detection that might be approaching or found within the applicable zones no matter where the PAM operator is stationed (*i.e.,* onshore or on a vessel);

(3) If PSOs cannot visually monitor the minimum visibility zone at all times using the equipment described in paragraphs (b)(3) and (4) of this section, pile driving operations must not commence or must shutdown if they are currently active;

(4) All PSOs must begin monitoring 60 minutes prior to pile driving, during, and for 30 minutes after the activity. Pile driving must only commence when the minimum visibility zone is fully visible (*e.g.,* not obscured by darkness, rain, fog, *etc.*) and the clearance zones are clear of marine mammals for at least 30 minutes, as determined by the Lead PSO, immediately prior to the initiation of pile driving. PAM operators must

assist the visual PSOs in monitoring by conducting PAM activities 60 minutes prior to any pile driving, during, and after for 30 minutes for the appropriate size PAM clearance zone (dependent on season). The entire minimum visibility zone must be clear for at least 30 minutes, with no marine mammal detections within the visual or PAM clearance zones prior to the start of pile driving;

(5) For North Atlantic right whales, any visual or acoustic detection must trigger a delay to the commencement of pile driving. In the event that a large whale is sighted or acoustically detected that cannot be confirmed by species, it must be treated as if it were a North Atlantic right whale;

(6) Dominion Energy must conduct PAM for at least 24 hours immediately prior to pile driving activities;

(7) During use of any real-time PAM system, at least one PAM operator must be designated to monitor each system by viewing data or data products that would be streamed in real-time or in near real-time to a computer workstation and monitor;

(8) Dominion Energy must use a minimum of one PAM operator to actively monitor for marine mammals before, during, and after pile driving activities. The PAM operator must assist visual PSOs in ensuring full coverage of the clearance and shutdown zones. The PAM operator must inform the Lead PSO(s) on duty of animal detections approaching or within applicable ranges of interest to the pile driving activity via the data collection software system (*i.e.,* Mysticetus or similar system) who will be responsible for requesting that the designated crewmember implement the necessary mitigation procedures (*i.e.,* delay or shutdown);

(9) PAM operators must be on watch for a maximum of four consecutive hours, followed by a break of at least two hours between watches, and may not exceed a combined watch schedule of more than 12 hours in a single 24-hour period;

(10) Dominion Energy must prepare and submit a Pile Driving and Marine Mammal Monitoring Plan to NMFS for review and approval at least 180 days before the start of any pile driving. The plan must include final pile driving project design (*e.g.,* number and type of piles, hammer type, noise abatement systems, anticipated start date, *etc.*) and all information related to PAM PSO monitoring protocols for pile-driving and visual PSO protocols for all activities; and

(11) A Passive Acoustic Monitoring (PAM) Plan must be submitted to NMFS for review and approval at least 180 days prior to the planned start of WTG or OSS installation. The authorization to take marine mammals would be contingent upon NMFS' approval of the PAM Plan.

(d) *PSO requirements during cable landfall construction.* The following measures apply to PSOs during pile driving associated with cable landfall construction activities and must be implemented by Dominion Energy:

(1) At least two PSOs must be on active duty during all activities related to the installation and removal of cofferdams, goal posts, and casing pipes;

(2) The PSOs must be located at the best vantage points on the pile driving platform or secondary platform in the immediate vicinity of the pile driving; and

(3) PSOs must monitor the clearance zone for the presence of marine mammals for 30 minutes before, throughout the installation of the sheet piles and casing pipes, and for 30 minutes after all pile driving activities have ceased. Pile driving must only commence when visual clearance zones are fully visible (*e.g.,* not obscured by darkness, rain, fog, *etc.*) and clear of marine mammals, as determined by the Lead PSO, for at least 30 minutes immediately prior to initiation of impact or vibratory pile driving.

(e) *PSO requirements during HRG surveys.* The following measures apply to PSOs during HRG surveys using SBPs and must be implemented by Dominion Energy:

(1) Between four and 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;

(2) At least one PSO must be on active duty monitoring during HRG surveys conducted during daylight (*i.e.,* from 30 minutes prior to civil sunrise through 30 minutes following civil sunset) and at least two PSOs must be on activity duty monitoring during HRG surveys conducted at night;

(3) PSOs on HRG vessels must begin monitoring 30 minutes prior to activating SBPs during the use of these acoustic sources, and for 30 minutes after use of these acoustic sources has ceased;

(4) 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 monitoring reports; and

(5) Any acoustic monitoring would complement visual monitoring efforts and would cover an area of at least the Level B harassment zone around each acoustic source.

(f) *Reporting.* Dominion Energy must comply with the following reporting measures:

(1) Prior to initiation of project activities, Dominion Energy must demonstrate in a report submitted to NMFS Office of Protected Resources that all required training for Dominion Energy personnel (including the vessel crews, vessel captains, PSOs, and PAM operators) has been completed.

(2) Dominion Energy must use a standardized reporting system during the effective period of this subpart and LOA. All data collected related to the CVOW–C project must be recorded using industry-standard softwares (*e.g.,* Mysticetus or a similar software) that is installed on field laptops and/or tablets. Dominion Energy must submit weekly (during foundation installation only), monthly, and annual reports as described in paragraphs (f)(5) through (8) of this section. For all monitoring efforts and marine mammal sightings, the following information must be collected and made available to NMFS:

(i) Date and time that monitored activity begins or ends;

(ii) Construction activities occurring during each observation period;

(iii) Watch status (*i.e.,* sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform);

(iv) PSO who sighted the animal;

(v) Time of sighting;

(vi) Weather parameters (*e.g.,* wind speed, percent cloud cover, visibility);

(vii) Water conditions (*e.g.,* sea state, tide state, water depth);

(viii) All marine mammal sightings, regardless of distance from the construction activity;

(ix) Species (or lowest possible taxonomic level possible);

(x) Pace of the animal(s);

(xi) Estimated number of animals (minimum/maximum/high/low/best);

(xii) Estimated number of animals by cohort (*e.g.,* adults, yearlings, juveniles, calves, group composition, *etc.*);

(xiii) Description (*i.e.,* as many distinguishing features as possible of each individual seen, including length, shape, color, pattern, scars or markings, shape and size of dorsal fin, shape of head, and blow characteristics);

(xiv) Description of any marine mammal behavioral observations (*e.g.,* observed behaviors such as feeding or traveling) and observed changes in behavior, including an assessment of behavioral responses thought to have resulted from the specific activity;

(xv) Animal's closest distance and bearing from the pile being driven or specified HRG equipment and estimated time entered or spent within the Level A harassment and/or Level B harassment zones;

(xvi) Activity at time of sighting (*e.g.,* vibratory installation/removal, impact pile driving, construction survey), use of any noise attenuation device(s), and specific phase of activity (*e.g.,* ramp-up of HRG equipment, HRG acoustic source on/off, soft-start for pile driving, active pile driving, *etc.*);

(xvii) Marine mammal occurrence in Level A harassment or Level B harassment zones;

(xviii) Description of any mitigation-related action implemented, or mitigation-related actions called for but not implemented, in response to the sighting (*e.g.,* delay, shutdown, *etc.*) and time and location of the action; and

(xix) Other human activity in the area.

(3) If a marine mammal is acoustically detected during PAM monitoring, the following information must be recorded and reported to NMFS:

(i) Location of hydrophone (latitude & longitude; in Decimal Degrees) and site name;

(ii) Bottom depth and depth of recording unit (in meters);

(iii) Recorder (model & manufacturer) and platform type (*i.e.,* bottom-mounted, electric glider, *etc.*), and instrument ID of the hydrophone and recording platform (if applicable);

(iv) Time zone for sound files and recorded date/times in data and metadata (in relation to Universal Coordinated Time (UTC); *i.e.,* Eastern Standard Time (EST) time zone is UTC–5);

(v) Duration of recordings (start/end dates and times; in International Organization for Standardization (ISO) 8601 format, yyyy–mm–ddTHH:MM:SS.sssZ);

(vi) Deployment/retrieval dates and times (in ISO 8601 format);

(vii) Recording schedule (must be continuous);

(viii) Hydrophone and recorder sensitivity (in dB re. 1 microPascal (μPa));

(ix) Calibration curve for each recorder;

(x) Bandwidth/sampling rate (in Hz);

(xi) Sample bit-rate of recordings; and,

(xii) Detection range of equipment for relevant frequency bands (in meters).

(4) Information required for each detection, the following information must be noted:

(i) Species identification (if possible);

(ii) Call type and number of calls (if known);

(iii) Temporal aspects of vocalization (date, time, duration, *etc.*; date times in ISO 8601 format);

(iv) Confidence of detection (detected, or possibly detected);

(v) Comparison with any concurrent visual sightings;

(vi) Location and/or directionality of call (if determined) relative to acoustic recorder or construction activities;

(vii) Location of recorder and construction activities at time of call;

(viii) Name and version of detection or sound analysis software used, with protocol reference;

(ix) Minimum and maximum frequencies viewed/monitored/used in detection (in Hz); and

(x) Name of PAM operator(s) on duty.

(5) Dominion Energy must compile and submit weekly reports to NMFS Office of Protected Resources that document the daily start and stop of all pile driving and HRG survey, the start and stop of associated observation periods by PSOs, details on the deployment of PSOs, a record of all detections of marine mammals (acoustic and visual), any mitigation actions (or if mitigation actions could not be taken, provide reasons why), and details on the noise attenuation system(s) used and its performance. Weekly reports are due on Wednesday for the previous week (Sunday–Saturday) and must include the information required under this section. The weekly report must also identify which turbines become operational and when (a map must be provided). Once all foundation pile installation is completed, weekly reports are no longer required.

(6) Dominion Energy must compile and submit monthly reports to NMFS (at *itp.potlock@noaa.gov* and *PR.ITP.monitoringreports@noaa.gov*) that include a summary of all information in the weekly reports, including project activities carried out in the previous month, vessel transits (number, type of vessel, and route), number of piles installed, all detections of marine mammals, and any mitigative action taken. Monthly reports are due on the 15th of the month for the previous month. The monthly report must also identify which turbines become operational and when (a map must be provided). Once foundation installation is complete, monthly reports are no longer required.

(7) Dominion Energy must submit a draft annual report to NMFS Office of Protected Resources no later than 90 days following the end of a given calendar year. Dominion Energy must provide a final report within 30 days following resolution of comments on the draft report. The draft and final reports must detail the following information:

(i) The total number of marine mammals of each species/stock detected and how many were within the designated Level A harassment and Level B harassment zones with comparison to authorized take of marine mammals for the associated activity type;

(ii) Marine mammal detections and behavioral observations before, during, and after each activity;

(iii) What mitigation measures were implemented (*i.e.,* number of shutdowns or clearance zone delays, *etc.*) or, if no mitigative actions was taken, why not;

(iv) Operational details (*i.e.,* days of impact and vibratory pile driving, days/amount of HRG survey effort, *etc.*);

(v) Any PAM systems used;

(vi) The results, effectiveness, and which noise attenuation systems were used during relevant activities (*i.e.,* impact pile driving);

(vii) Summarized information related to situational reporting; and

(viii) Any other important information relevant to the CVOW–C project, including additional information that may be identified through the adaptive management process.

(ix) The final annual report must be prepared and submitted within 30 calendar days following the receipt of any comments from NMFS on the draft report. If no comments are received from NMFS within 60 calendar days of NMFS' receipt of the draft report, the report must be considered final.

(8) Dominion Energy must submit its draft final report to NMFS Office of Protected Resources on all visual and acoustic monitoring conducted under the LOA within 90 calendar days of the completion of activities occurring under the LOA. A final report must be prepared and submitted within 30 calendar days following receipt of any NMFS comments on the draft report. If no comments are received from NMFS within 30 calendar days of NMFS' receipt of the draft report, the report shall be considered final.

(9) Dominion Energy must submit a SFV plan at least 180 days prior to the planned start of vibratory and/or impact pile driving. The plan must describe how Dominion Energy would ensure that the first three WTG monopile and OSS jacket (using pin piles) foundation installation sites selected for SFV are representative of the rest of the monopile and pin pile installation sites. In the case that these sites/scenarios are not determined to be representative of all other monopile/pin pile installation sites, Dominion Energy must include information on how additional sites/scenarios would be selected for SFV. The plan must also include methodology for collecting, analyzing,

and preparing SFV data for submission to NMFS. The plan must describe how the effectiveness of the sound attenuation methodology would be evaluated based on the results. Dominion Energy must also provide, as soon as they are available but no later than 48 hours after each installation, the initial results of the SFV measurements to NMFS in an interim report after each monopile for the first three piles and after each OSS jacket foundation using pin piles are installed.

(i) The SFV plan must also include how operational noise would be monitored. Dominion Energy must estimate source levels (at 10 m from the operating foundation) based on received levels measured at 50 m, 100 m, and 250 m from the pile foundation. These data must be used to identify estimated transmission loss rates. Operational parameters (*e.g.,* direct drive/gearbox information, turbine rotation rate) as well as sea state conditions and information on nearby anthropogenic activities (*e.g.,* vessels transiting or operating in the area) must be reported.

(ii) Dominion Energy must provide the initial results of the SFV measurements to NMFS in an interim report after each monopile and pin pile foundation installation for the first three monopiles piles and/or two full OSS foundations (consisting of 8 total pin piles) as soon as they are available, but no later than 48 hours after each installation. Dominion Energy must also provide interim reports on any subsequent SFV on foundation piles within 48 hours. The interim report must include hammer energies used during pile driving, peak sound pressure level (SPL_{pk}) and median, mean, maximum, and minimum root-mean-square sound pressure level that contains 90 percent of the acoustic energy (SPL_{rms}) and single strike sound exposure level (SEL_{ss}).

(iii) The final results of SFV of foundation installations must be submitted as soon as possible, but no later than within 90 days following completion of pile driving of monopiles and pin piles. The final report must include, at minimum, the following:

(A) Peak sound pressure level (SPL_{pk}), root-mean-square sound pressure level that contains 90 percent of the acoustic energy (SPL_{rms}), single strike sound exposure level (SEL_{ss}), integration time for SPL_{rms}, spectrum, and 24-hour cumulative SEL extrapolated from measurements at specified distances (*e.g.,* 750 m);

(B) All these levels must be reported in the form of:

(*1*) Median;

(*2*) Mean;

(*3*) Maximum; and

(*4*) Minimum;

(C) The SEL and SPL power spectral density and one-third octave band levels (usually calculated as decidecade band levels) at the receiver locations should be reported;

(D) The sound levels reported must be in median and linear average (*i.e.,* average in linear space), and in dB;

(E) A description of depth and sediment type, as documented in the Construction and Operation Plan (COP), at the recording and pile driving locations;

(F) Hammer energies required for pile installation and the number of strikes per pile;

(G) Hydrophone equipment and methods (*i.e.,* recording device, bandwidth/sampling rate, distance from the pile where recordings were made; depth of recording device(s));

(H) Description of the SFV PAM hardware and software, including software version used, calibration data, bandwidth capability and sensitivity of hydrophone(s), any filters used in hardware or software, any limitations with the equipment, and other relevant information;

(I) Local environmental conditions, such as wind speed, transmission loss data collected on-site (or the sound velocity profile), baseline pre- and post-activity ambient sound levels (broadband and/or within frequencies of concern);

(J) Spatial configuration of the noise attenuation device(s) relative to the pile;

(K) The extents of the Level A harassment and Level B harassment zones; and

(L) A description of the noise abatement system and operational parameters (*e.g.,* bubble flow rate, distance deployed from the pile, *etc.*) and any action taken to adjust the noise abatement system.

(10) Dominion Energy must submit situational reports if the following circumstances occur:

(i) If a North Atlantic right whale is observed at any time by PSOs or personnel on or in the vicinity of any project vessel, or during vessel transit, Dominion Energy must immediately report sighting information to the NMFS North Atlantic Right Whale Sighting Advisory System (866) 755–6622, through the WhaleAlert app (*https://www.whalealert.org/*), and to the U.S. Coast Guard via channel 16, as soon as feasible but no longer than 24 hours after the sighting. Information reported must include, at a minimum: time of sighting, location, and number of North Atlantic right whales observed.

(ii) When an observation of a large whale occurs during vessel transit, the following information must be recorded and reported to NMFS:

(A) Time, date, and location (latitude/longitude; in Decimal Degrees);

(B) The vessel's activity, heading, and speed;

(C) Sea state, water depth, and visibility;

(D) Marine mammal identification to the best of the observer's ability (*e.g.,* North Atlantic right whale, whale, dolphin, seal);

(E) Initial distance and bearing to marine mammal from vessel and closest point of approach; and

(F) Any avoidance measures taken in response to the marine mammal sighting.

(iii) If a North Atlantic right whale is detected via PAM, the date, time, location (*i.e.,* latitude and longitude of recorder) of the detection as well as the recording platform that had the detection must be reported to *nmfs.pacmdata@noaa.gov* as soon as feasible, but no longer than 24 hours after the detection. Full detection data and metadata must be submitted monthly on the 15th of every month for the previous month via the webform on the NMFS North Atlantic right whale Passive Acoustic Reporting System website at *https://www.fisheries.noaa.gov/resource/document/passive-acoustic-reporting-system-templates*.

(iv) In the event that the personnel involved in the activities defined in § 217.290(a) discover a stranded, entangled, injured, or dead marine mammal, Dominion Energy must immediately report the observation to the NMFS Office of Protected Resources (OPR), the NMFS Greater Atlantic Stranding Coordinator for the New England/Mid-Atlantic area (866–755–6622), and the U.S. Coast Guard within 24 hours. If the injury or death was caused by a project activity, Dominion Energy must immediately cease all activities until NMFS 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 LOA. NMFS may impose additional measures to minimize the likelihood of further prohibited take and ensure MMPA compliance. Dominion Energy may not resume their activities until notified by NMFS. The report must include the following information:

(A) Time, date, and location (latitude/longitude; in Decimal Degrees) of the first discovery (and updated location information if known and applicable);

(B) Species identification (if known) or description of the animal(s) involved;

(C) Condition of the animal(s) (including carcass condition if the animal is dead);

(D) Observed behaviors of the animal(s), if alive;

(E) If available, photographs or video footage of the animal(s); and

(F) General circumstances under which the animal was discovered.

(v) In the event of a vessel strike of a marine mammal by any vessel associated with the CVOW–C project, Dominion Energy must immediately report the strike incident to the NMFS OPR and the NMFS Greater Atlantic Regional Fisheries Office (GARFO) within and no later than 24 hours. Dominion Energy must immediately cease all on-water activities until NMFS 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 LOA. NMFS may impose additional measures to minimize the likelihood of further prohibited take and ensure MMPA compliance. Dominion Energy may not resume their activities until notified by NMFS. The report must include the following information:

(A) Time, date, and location (latitude/longitude; in Decimal Degrees) of the incident;

(B) Species identification (if known) or description of the animal(s) involved;

(C) Vessel's speed leading up to and during the incident;

(D) Vessel's course/heading and what operations were being conducted (if applicable);

(E) Status of all sound sources in use;

(F) 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;

(G) Environmental conditions (*e.g.,* wind speed and direction, Beaufort sea state, cloud cover, visibility) immediately preceding the strike;

(H) Estimated size and length of animal that was struck;

(I) Description of the behavior of the marine mammal immediately preceding and following the strike;

(J) If available, description of the presence and behavior of any other marine mammals immediately preceding the strike;

(K) Estimated fate of the animal (*e.g.,* dead, injured but alive, injured and moving, blood or tissue observed in the water, status unknown, disappeared); and

(L) To the extent practicable, photographs or video footage of the animal(s).

§ 217.296 Letter of Authorization.

(a) To incidentally take marine mammals pursuant to this subpart, Dominion Energy must apply for and obtain an LOA.

(b) An LOA, unless suspended or revoked, may be effective for a period of time not to exceed February 4, 2029, the expiration date of this subpart.

(c) In the event of projected changes to the activity or to mitigation and monitoring measures required by an LOA, Dominion Energy must apply for and obtain a modification of the LOA as described in § 217.297.

(d) The LOA must set forth:

(1) Permissible methods of incidental taking;

(2) Means of effecting the least practicable adverse impact (*i.e.,* mitigation) on the species, its habitat, and on the availability of the species for subsistence uses; and

(3) Requirements for monitoring and reporting.

(e) Issuance of the LOA must be based on a determination that the level of taking must be consistent with the findings made for the total taking allowable under the regulations of this subpart.

(f) Notice of issuance or denial of an LOA must be published in the **Federal Register** within 30 days of a determination.

§ 217.297 Modifications of Letter of Authorization.

(a) An LOA issued under §§ 217.292 and 217.296 or this section for the activity identified in § 217.290(a) shall be modified upon request by the applicant, provided that:

(1) The proposed specified activity and mitigation, monitoring, and reporting measures, as well as the anticipated impacts, are the same as those described and analyzed for this subpart (excluding changes made pursuant to the adaptive management provision in paragraph (c)(1) of this section); and

(2) NMFS determines that the mitigation, monitoring, and reporting measures required by the previous LOA under this subpart were implemented.

(b) For a LOA modification request by the applicant that include changes to the activity or the mitigation, monitoring, or reporting (excluding changes made pursuant to the adaptive management provision in paragraph (c)(1) of this section) that do not change the findings made for the regulations in this subpart or result in no more than a minor change in the total estimated number of takes (or distribution by species or years), NMFS may publish a notice of proposed LOA in the **Federal Register**, including the associated analysis of the change, and solicit public comment before issuing the LOA.

(c) An LOA issued under §§ 217.292 and 217.296 or this section for the activities identified in § 217.290(a) may be modified by NMFS under the following circumstances:

(1) Through adaptive management, NMFS may modify (including augment) the existing mitigation, monitoring, or reporting measures (after consulting with Dominion Energy regarding the practicability of the modifications), if doing so creates a reasonable likelihood of more effectively accomplishing the goals of the mitigation and monitoring.

(i) Possible sources of data that could contribute to the decision to modify the mitigation, monitoring, or reporting measures in an LOA are:

(A) Results from Dominion Energy's monitoring from the previous year(s);

(B) Results from other marine mammals and/or sound research or studies;

(C) Any information that reveals marine mammals may have been taken in a manner, extent, or number not authorized by the regulations in this subpart or subsequent LOA; and

(ii) If, through adaptive management, the modifications to the mitigation, monitoring, or reporting measures are substantial, NMFS shall publish a notice of proposed LOA in the **Federal Register** and solicit public comment.

(2) If NMFS determines that an emergency exists that poses a significant risk to the well-being of the species or stocks of marine mammals specified in the LOA issued pursuant to §§ 217.292 and 217.296 or this section, an LOA may be modified without prior notice or opportunity for public comment. Notice would be published in the **Federal Register** within thirty days of the action.

§§ 217.298–217.299 [Reserved]

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