



# Protecting Marine Mammals

## A Case Study in Offshore Wind Development

Vineyard Offshore is committed to developing, permitting, and deploying responsibly sited offshore wind projects. Through Vineyard Wind 1, the first commercial-scale offshore wind project in the U.S., the Vineyard Offshore team set the industry standard for environmental protection in offshore wind development. It is this proactive and conservative approach to environmental stewardship, as part of the overall Vineyard method of offshore wind development, that Vineyard Offshore brings to future projects.

Developed through consultation with federal, state, and local agencies, Tribes, environmental non-governmental organizations (NGOs), and multiple stakeholders, environmental protection measures prescribed for Vineyard Wind 1 cover all potential hazards to wildlife, their habitat, and human health, on land and in the ocean, as well as cultural and archaeological resources.

### Setting the Standard for Protection

In 2019, the Vineyard Wind team entered into a landmark agreement with national and regional environmental organizations to establish robust protections for the critically endangered North Atlantic right whale during the construction and operation of Vineyard Wind 1. This agreement set an initial bar for enhanced monitoring and mitigation to maximize protection for and minimize potential

Permits for Vineyard Wind 1 include over 3,000 specific compliance obligations that the project tracks, reports, and acts on to ensure the responsible installation of offshore wind. While fulfilling its obligation to address environmental hazards comprehensively, Vineyard Offshore devotes special attention to the issues of greatest concern to federal, state, and local officials as well as Tribes, environmental organizations, academics, and the scientific community, as well as other stakeholders.

Off the Northeast coast, that means a focus on endangered and threatened marine mammals. Chief among these is the North Atlantic right whale (NARW), and in the building of Vineyard Wind 1, Vineyard Offshore has shown what it means to ensure the highest level of protection for this endangered species.



North Atlantic right whale breaching.

threats to the North Atlantic right whale, and other marine mammals. These measures were adopted and built on by federal regulators as baseline mitigation, incorporating them into the project's permits and applying them to other offshore wind energy developments.

Enhanced measures were also adopted during construction to address real-time conditions and maximize protections. As a result, the project is providing the highest level of protection for marine mammals. Requirements include:

- No installation of monopile foundations from January 1 to April 30, the peak season of NARW presence in the area, and no initiation of pile-driving when visibility is limited (i.e., darkness, rain, fog), effectively limiting construction to roughly 25% of the available hours per year;
- Comprehensive acoustic and visual monitoring to ensure that no pile driving takes place when whales are in the vicinity (i.e., delaying pile driving or shutting down operations);
- Reducing pile driving noise that could potentially influence whale behavior through robust noise attenuation systems;
- Mandatory vessel speed limits to avoid vessel strikes (i.e., seasonal and spatial restrictions);
- Vessel corridors monitored using real-time passive acoustic monitoring; and
- Investments to support scientific research as well as innovative technologies to further safeguard marine mammals.

It is worth noting that offshore wind has the most heavily regulated fleet on the water, in terms of vessel speed restrictions for the protection of marine mammals. For other maritime industries, vessel speed restrictions are voluntary, while the offshore wind industry is required to adhere to all voluntary speed restrictions. Moreover, the Vineyard Wind project is subject to additional temporal speed restrictions for the protection of marine mammals. Vineyard Wind conducts robust environmental training to ensure the fleet understands these restrictions and regularly tracks detailed spatial data to ensure the fleet's compliance with vessel speed restrictions.

In addition, the project is required to have aboard its installation vessels Protected Species Observers (PSOs). PSOs have the authority to stop work if they visually detect the presence of a protected species, including marine mammals – and they use it. An example: On September 7, 2023, while pile driving was underway, an analyst monitoring the project's real-time passive acoustic monitoring system notified the PSOs of what seemed like the "moan" of a blue whale – the largest animal on the planet, and a species rarely seen in these waters – who immediately shut down pile driving operations. The PSOs could not confirm the sighting visually, and further analysis of the acoustic data found that the sound was not that of a blue whale. Although it turned out to be a false alarm, Vineyard Wind's conservative response to the detection stopped work on the project for 44 minutes, in the interest of protecting a majestic creature.

## Support for Science and Innovation

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Vineyard Offshore provides support for third party regional science to advance understanding of the impact offshore wind development may have on the environment. Our team sits on advisory boards for Project WOW (Wildlife and Offshore Wind) and the Wind Forecast Improvement Project (WFIP3) and provides industry guidance to

BOEM's RODEO II. As an industry leader, we collaborate with Principal Investigators to ensure the safe conduct of science in and around project operations. With our support, Project WOW was able to safely and successfully track and tag more than 10 individual fin whales near Vineyard Wind 1 during construction in 2023, which will

provide insight into cetacean behavior during pile driving operations in the Northwest Atlantic.

Vineyard Wind has also helped to advance marine mammal monitoring technologies and protection associated with offshore wind development. In collaboration with a world-leading expert at the University of New Hampshire, Vineyard Wind is using archival Passive Acoustic Monitoring to record and measure underwater sound prior to, during, and after construction, for subsequent analysis. UNH graduate students analyze the data to determine the source of noises present in the Vineyard Wind lease area, including vessel noise, pile driving, wind turbine operation, and marine mammal vocalization.

Similarly, through its \$3 million Wind and Whales fund, Vineyard Wind partnered with Charles River Analytics to deploy artificial intelligence (AI) detection software integrated thermal camera technology to detect, analyze, and report on the presence of whales, ships, and other objects, including fishing gear and equipment, during offshore wind construction. The goal is to train the software and test the system's capability to augment the required visual monitoring aboard

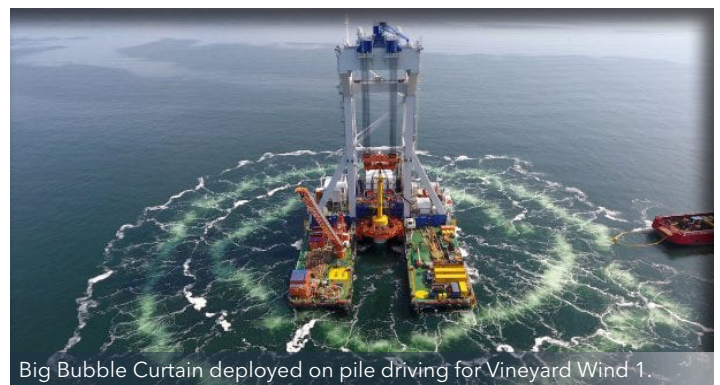
project vessels, particularly for Protected Species Observers, who have the authority to delay and shut down pile driving if marine mammals are sighted within an exclusion zone. Through this fund, Vineyard Wind also supports advancement of the acoustic detection capabilities of a best-in-class, sophisticated 32 hydrophone array – underwater microphones – to detect whale noise.

In addition to the Wind and Whales fund, the project also partnered with Greentown Labs, North America's largest climate tech incubator, to deliver two technology accelerator programs, with support from the Massachusetts Clean Energy Center (MassCEC). In 2021, the Offshore Wind Challenge focused on marine mammal monitoring, specifically data collection and real-time transmission or data analysis. In 2023, a second challenge in partnership with Greentown Labs, called Go Energize 2023, supported start-ups in offshore turbine monitoring and ecological data collection. Between the two programs, eight innovative technology companies received mentoring, business training, and access to resources to advance their technological and commercial development.

## Going Big on Bubble Curtains

Vineyard Wind's dedication to reducing underwater noise produced by offshore wind construction also brought a new manufacturing operation to the United States.

Vineyard Wind 1 deployed a hydrosound damper system and Big Bubble Curtain to reduce the distance that the sound produced by driving monopile foundations into the seabed travels. The hydrosound damper is a net containing noise reducing material (e.g., rubber or foam spheres) that wraps around the entire length of the monopile underwater. The bubble curtain creates a sound-reducing barrier by means of a large hose placed in



Big Bubble Curtain deployed on pile driving for Vineyard Wind 1.

a circle on the seafloor around the monopile, from which compressed air escapes through perforations. While this combination of measures was expected to be sufficient, the team had some concern that a secondary bubble curtain might be needed to meet



the project's strict sound thresholds, and a global shortage of the equipment might result in costly delays. Turning this challenge into an opportunity, Vineyard Wind provided \$5 million from its Industry Accelerator Fund, administered by MassCEC, for a pilot program to deploy a second bubble curtain. ThayerMahan, a Connecticut-based firm specializing in seabed surveys and other maritime services

- which also provides the acoustic monitoring system - partnered with the European leader in bubble curtain technology to develop the program, then agreed to set up its headquarters for the new product line in New Bedford. As a result, ThayerMahan became the first U.S. company to offer bubble curtain services, adding to the growing domestic supply chain for the offshore wind industry.

## Lessons Learned from Installation

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The bubble curtain investment turned out to be prescient. Once monopile installation began, Vineyard Wind learned that the modeled results upon which the permit conditions were based did not account for highly variable offshore conditions that can influence sound propagation. Working with federal agencies, Vineyard Wind employed an "adaptive mitigation" approach - making continual adjustments based on real-time conditions and data. This included adding the second bubble curtain to further attenuate sound, adjusting the visual and acoustic clearance and shut down zones, and having additional PSOs stand watch as needed.

Vineyard Wind also learned that standard protocols for maintaining bubble curtains between installations used in Europe were not as effective in New England waters. The team then developed enhanced protocols that included, among other things, flushing and redrilling hoses between each installation, limiting the time hoses are on the ocean floor, and confirming via drone footage that the bubble curtains were fully operational before installation began. These measures significantly improved performance and allowed the project to achieve the expected noise levels.

## Commitment to Environmental Protection

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"I can state unambiguously that I have never experienced any effort to understand, monitor and minimize risks to wildlife that compares to those efforts associated with [the Vineyard Wind 1] project," said **Chris Clark,**



**Ph.D., Senior Scientist Emeritus and Research Professor at Cornell University,** a world-renowned expert on marine mammals, and a consultant for the project. "From top to bottom, the Vineyard Wind 1 team, which is led and staffed by Vineyard Offshore, is genuinely devoted to doing everything they can to protect the environment."

In all, the protective measures spearheaded by the Vineyard Offshore team and incorporated into the Vineyard Wind 1 permits have set an environmental standard for offshore wind development that in many ways exceeds that of any other industry operating offshore. It is this highly conservative, highly protective approach to environmental stewardship - with measures developed through wide consultation, incorporated into permits, and adapted as necessary during construction - that Vineyard Offshore carries from Vineyard Wind 1 to future projects on the East and West Coasts. It's a core component of the Vineyard method of offshore wind development.