OCS-A 0501 MASS USA

VINEYARD WIND

Response to Request for Information on Vessel Activities

As a follow-up to our discussions on June 13, 2024, Vineyard Wind provides this response to NMFS' request for information regarding project vessels and noise producing installation activities occurring within and around the Bureau of Ocean Energy Management (BOEM) Lease Area OCS-A 0501 (the Lease Area) generally, and more specifically on November 2, 2023, coincidental to the Rand Pile Driving Noise Study (Rand, 2024) acoustic monitoring effort (the Study).

Vineyard Wind has reviewed vessel logs, including historical AIS data logs for Marine Traffic, to determine which vessels were active in the Lease Area on November 2, 2023. Of the vessels that were active in the Lease Area, Vineyard Wind compiled information regarding the type and quantity of propulsion systems that were in use on November 2, 2023, see the attached Vineyard Wind 1 Project Activities Summary. Vineyard Wind also consulted with DEME regarding the vessel propulsion system operation for Heavy Lift Vessel (HLV) Orion and the two Big Bubble Curtain (BBC) support vessels and also consulted with SMRU Consulting to contextualize and compare the claims asserted in the Rand study against Vineyard Wind's acoustic data sources (i.e., archival passive acoustic monitoring, final sound field verification results).

Based on our review, the most significant findings regarding vessel activities and ambient noise on November 2, 2023 include:

- Twelve project vessels were in and around the lease area. These included the Orion, two BBC support vessels, two safety vessels, two crew transfer vessels, two accommodation vessels (one of which was jacked-up), one jack-up vessel installing WTGs, one pipe burying vessel installing array cables, and one service operating vessel supporting WTG installation. Vessel activity on November 2 is representative of a typical construction day when foundation, WTG, and array-cable installation activities are conducted. The characteristics and activities of each vessel are detailed in Attachment 1.

- Non-project vessels that do not have AIS may have been around the lease area (including the Rand vessel) but could not be identified.

- The Orion was installing a monopile at AP-40. Monitoring and mitigation measures in place included three noise abatement systems, three PSOs on duty, PAM monitoring at 10 km, the Level B zone set at 5,720 meters (m), and shut down zones at any distance for North Atlantic right whales (NARW) and unidentified whales, 500m for non-NARW whales and 160m for dolphins, pinnipeds, etc.

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- During pile driving operations the Orion thrusters all operated below maximum rating (1100 kW/4500 kW) at approximately 25% capacity. This can be attributed to the favorable sea state conditions where wind speeds were approximately 5 meters/second (m/s), wave heights around 1.1-1.2 meter (m) Hs waves and 7s, and currents at 0.2 m/s.

- During the time the Rand study collected sound recordings, the two project safety vessels (the F/V Helen H and F/V Torbay) were conducting operations near the Rand hydrophones that measured ambient noise at 1.06 and 5.87 km from the Orion. As described in the SMRU Consulting letter (Attachment 2), these vessels more likely account for the ambient noise measurements Rand recorded.

- Further support for the ambient noise measurements recorded by Rand being attributable to vessels other than the Orion is the unrealistically small transmission loss coefficient between the two Rand ambient noise recording locations. *See* Attachment 2.

I. Summary of Project Vessel and Installation Activities Occurring on November 2, 2023

Throughout the duration of the Rand Study (e.g., between 1:36 PM and 2:34 PM on November 2, 2023), HLV Orion was actively pile driving a monopile at location AP-40 with noise abatement systems supported by OSV Odyssea Courage and TSV Atlantic Oceanic (e.g., the double Big Bubble Curtain and hydrosound damper). Concurrently, to the northwest at location AN-37, OSV Adhemar de st Venant was conducting positioning operations and laying rock for array cables around monopile location. To the southeast of AP-40, accommodation vessel OSV C-Pioneer was transiting near AV-39, and crew transfer vessel T/V Gaspee was transiting near AT-40 and elsewhere in the Lease Area. Two installation vessels were jacked up in the Lease Area at the time; the Seacor Hawk was jacked up near the Electrical Service Platform (ESP) and the Sea Installer was jacked up at AP-38. The Sea Installer was not conducting any installation activities at the time. Just southwest of AP-40, OSV Cade Candies was supporting Wind Turbine Generator (WTG) commissioning activities as a Service Operation Vessel (SOV) and was operating on Dynamic Positioning (DP) thrusters standing by near AQ-38. General crew transfer operations were supported by M/V Gateway Endeavor, which was standing by, drifting and transiting near AP-38 and AQ-38, which are located just west of AP-40. Two safety vessels were conducting safety patterns including F/V Helen H just north of AP-40 and F/V Torbay, which was running safety patterns to the northwest of AP-40. Notably, during this time only project vessels were operating within the Lease Area and just north of the lease area. Figure 1 below illustrates the location of all vessels operating in the area during the time of the Rand Study.

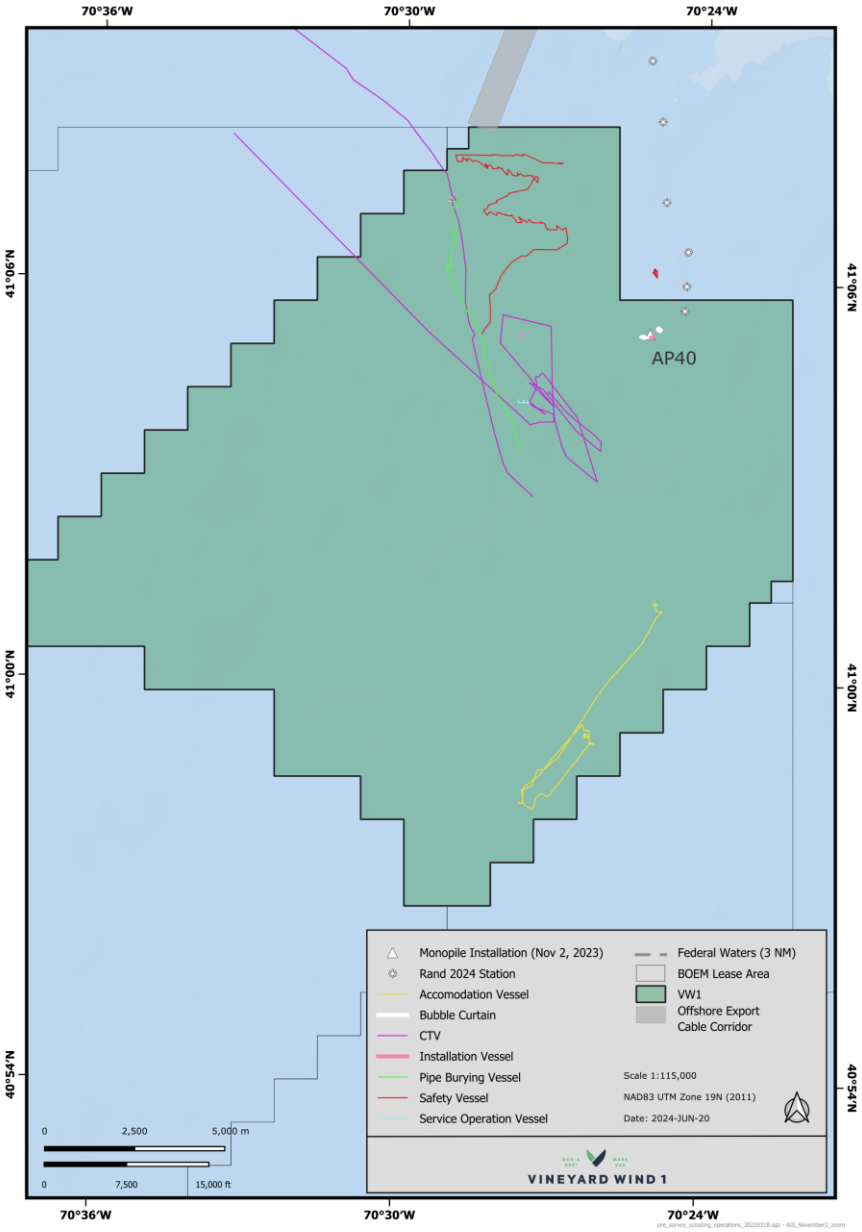

Figure 1. Vessel Activity in Vineyard Wind 1 Lease Area on November 2, 2023.

II. Vessels Operating Closest to Robert Rand Monitoring Locations

As summarized by SMRU in Attachment 2, Rand (2024) measured ambient noise levels without pile driving activity to assess noise levels from propulsion and DP thrusters at two locations, at 5.87 and 1.06 kilometers (km) from HLV Orion, as measured by onboard radar. Lp,rms is reported at these locations as 122.93 and 126.52 dB re 1µPa, respectively. Rand details hearing vessel propulsion and DP thruster noise while making the 20 minutes of acoustic recordings used in this analysis and inferred that the source of this sound is the HLV Orion and immediately adjacent support vessels, OSV Odyssea Courage and TSV Atlantic Oceanic. As SMRU notes, noise recorded at a single location is dominated by noise from the closest source, considering transmission loss. In this case the closest vessel(s) included the F/V Helen H, which was approximately just over 1 km from the 1.06 km monitoring station, and F/V Torbay, which was approximately 2.9 km from the 5.87 km monitoring station. F/V Helen H is a recreational charter fishing vessel that operates on three engines (500 hp) and does not utilize DP thrusters. During the Study, F/V Helen H was running safety patterns to the north of AP-40 and just west of the Rand monitoring station to monitor a safety zone for the installation activities. F/V Torbay is a fishing vessel that operates on two engines (1,700 hp) and does not have DP capabilities. During the Rand Study, F/V Torbay was also monitoring a safety zone for installation activities to the northwest of the Rand monitoring location.

III. Monopile Installation Logistics and Ramp-up

The required logistical sequencing of vessel arrival and propulsion system utilization during monopile installation is intrinsically protective of marine mammals, as each vessels arrival to the site is staggered from the previous location to allow for safe and precise equipment deployment, testing/verification, and commencement of full installation operations. These logistics ensure that DP thruster noise is gradually increased at each installation location, providing a "ramp-up" style mitigation approach to the introduction of propulsion noise.

Specifically, prior to the arrival of HLV Orion, the two BBC support vessels arrive onsite, and each deploy a single BBC hose to the sea floor. Once deployed, the BBC support vessels connect to the hoses and perform a hose flush followed by a full pressure test. Vessels then disconnect from the hose and move at least 500m away from the site to allow Orion to move into its position. Once the Orion is in position, BBC vessels return, reconnect to their hoses, and ramp up to minimum (or standby) pressure until the piling notice, where then hoses are further ramped up to full pressure. On average, full pressurization of the BBC hose can take approximately 30 minutes. Once fully pressurized, the Orion performs MP installation. Once installation is complete, the BBC vessels disconnect from the hoses and move away from installation site to allow Orion to exit.

Thereafter, BBC vessels return to site, recover hoses, disengage DP operations and transit to next location or to port.

IV. HLV Orion Propulsion System Summary

HLV Orion is a DP3 vessel, which means there is a high level of redundancy (or back-up systems) in place should a thruster(s) breakdown or malfunction. The Orion is equipped with eight thrusters, see Figure 2 below. The thrusters include four azimuth thrusters at the aft of the vessel, which are used for both DP operations and for sailing. Two retractable thrusters at the forward, center of the vessel, which are used for both DP operations and sailing as well. Finally, there are two bow thrusters at the forward of the vessel, both port and starboard sides, which are used for DP operations.

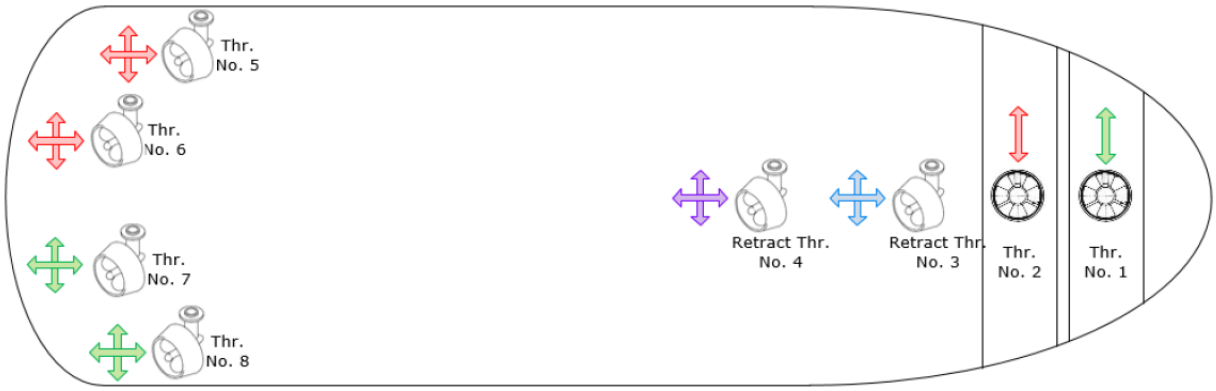

Figure 2. Overview of HLV Orion thrusters.

Thrusters 1-2 are bow thrusters. These are fixed to the hull and are used mainly while operating on DP. Their maximum power is 2500kW.

Thrusters 3-4 are retractable thrusters at the center of the vessel that can rotate 360° and can be retracted into the hull of the vessel. They are used for sailing and while on DP. Their maximum power is 4200kW.

Thrusters 5-8 are azimuth thrusters at the aft of the vessel. They can rotate 360° and are used for sailing and while on DP. Their maximum power is 4500kW

For monopile installation, the Orion switches propulsion operation to DP mode with all eight thrusters operational. On November 2, all thrusters were running at approximately 25percent of their maximum rating.

Table 1 below provides an overview of the parameters for each thruster, including the max power capabilities of each thruster aboard HLV Orion.

Parameter	Thr. 1	Thr. 2	Thr. 3	Thr. 4	Thr. 5	Thr. 6	Thr. 7	Thr. 8
Type (Makes name)	Wartsila WTT-36FP-DM	Wartsila WTT-36FP-DM	WST-45/3500M NR	WST-45/3500M NR	WST-55U	WST-55U	WST-55U	WST-55U
Switchboard	SB Out	PS Out	PS Mid	SB Mid	PS Out	PS Out	SB Out	SB Out
Max. power consumption [kW]	2677	2677	4519	4519	4842	4842	4842	4842
Max. power consumption in DP/ bollard pull, i.e. with torque and power limitations.[kW]	2677	2677	4519	4519	4842	4842	4842	4842
Max. Thurst [kN]	417.2	417.2	705.6	705.6	920	920	920	920
Diameter [m]	3.3	3.3	3.6	3.6	3.9	3.9	3.9	3.9
Type of thruster (Shaft line, azimuth, pod, tunnel thruster, water jet, cycloid)	Tunnel Thruster	Tunnel Thruster	Retractable Azimuth	Retractable Azimuth	Azimuth	Azimuth	Azimuth	Azimuth
Fixed pitch (FPP) or Controllable pitch (CPP)	FPP	FPP	FPP	FPP	FPP	FPP	FPP	FPP

Table 1. HLV Orion Thruster specifications

V. BBC Support Vessel Propulsion Systems and Proximity to HLV Orion

The BBC support vessels include DP capability to hold station during BBC operations. TSV Atlantic Oceanic has four thrusters and OSV Odyssea Courage has five. Depending on sea state conditions, both vessels operate their thrusters to some extent to maintain position throughout the installation process. While sailing, both vessels rely on their stern thrusters.

During installation, TSV Atlantic Oceanic was located 260 degrees from HLV Orion during installation at approximately 285 meters distance. TSV Atlantic Oceanic supported the inner BBC. OSV Odyssea Courage, supporting the outer BBC, was located at 55 degrees from HLV Orion, also at approximately 285 m distance during installation. Figure 3 below illustrates the logistics for vessel arrangement and orientation during the installation of monopile AP-40.

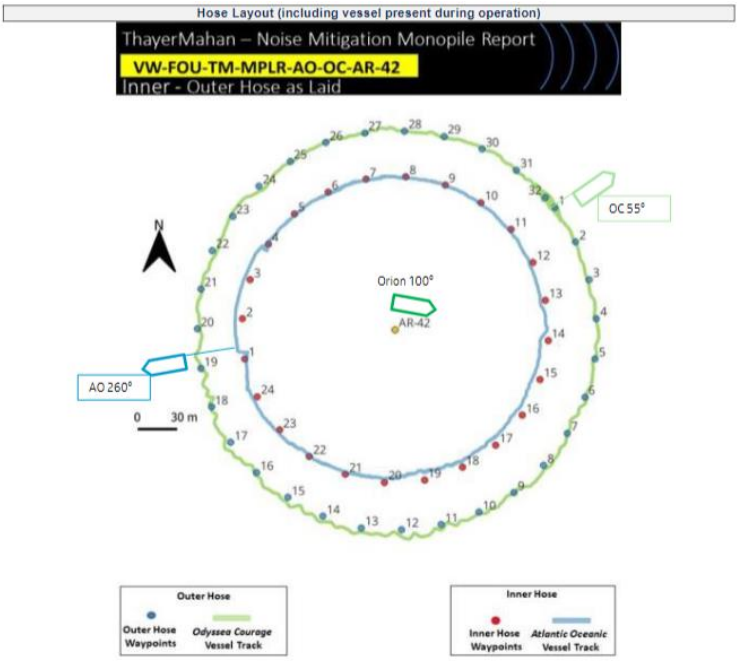

Figure 3. BBC hose layout for AP-40

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Attachment 1

Vineyard Wind 1 Project Activities Summary

November 2, 2023

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Vineyard Wind 1 Project Vessel Activity Within WDA - November 2, 2023													
Vessel Type	**Vessel Name (or similar)**	**MMSI**	**Type/Purpose of Vessel**	**Construction Scope**	**Activity General Description**	**Vessel Propulsion Activity during Rand Effort (13:36 - 14:34)**	**Other Noise Producing Activities per Project Vessel and Duration**	**Location**	**Main Propulsion Type**	**DP Vessel Type**	**# of DP Thrusters**	**Thruster Types**	**Thruster Locations**	**Additional Comments**
HLV	Orion	205755000	Pile Driving	Monopile Installation	Pile driving monopile	Pile driving at monopile AP-40 utilizing DP thruster support. Orion oriented at 100 degrees	7:15-9:00 Orion in position and lowing MP to seabed 9:00-10:44 adding/removing MP buoyancy using MPIT 10:44-11:10 removing MPIT 11:10-12:21 Hammer positioning 12:22 - 14:38 Impact hammering 14:38-15:01 Hammer and HSD net retrieved	AP-40	4 Azimuth Thrusters (4,500 kW)	DP3	8	4 (4,500 kW) Azimuth Thrusters at the aft of the vessel. These can rotate 360° and are used both for DP and while sailing. 2 (4,200 kW) Rectractable Thrusters at the FWD – Center of the vessel. These can rotate 360° as well and be retracted in the hull of the vessel. These are used as well while sailing and while on DP. 2 (2,500 kW) Bow Thrusters at the FWD of the vessel (alongside both SB and PS). These cannot rotate and are installed fixed in the hull and are mainly used while on DP.	4 Aft of vessel, 2 in front, 2 in back	Transit from AR41 to AP40: 5:40-7:00 Transit from AP40 to AN38: 18:00-19:00 (avg. 3 knots)
TSV	Atlantic Oceanic	366907000	Big Bubble Curtain	Monopile Installation	Operating inner Big Bubble Curtain	DP thruster supported propulsion. Approximately 285 m from Orion at 260 degrees	Hose Flush: 10:58-11:30 Full Pressure: 11:30-14:45	AP-40	2 Main Engines (1,566 kW)	DP2	4	1a (bow tunnel thruster) – 746 kW (1000 hp) CPP at 1,200 rpm 1b (bow tunnel thruster) – 746 kW (1000 hp) CPP at 1,200 rpm 2P (stern azimuthing thruster) – 1,566 kW (2,100 hp) Z drive, 360 degree azimuthing 2S (stern azimuthing thruster) – 1,566 kW (2,100 hp) Z drive, 360 degree azimuthing	Bow & Stern	Deployed hose: 11/1 @ 2:50
OSV	Odyssea Courage	366677000	Big Bubble Curtain	Monopile Installation	Operating outer Big Bubble Curtain	DP thruster supported propulsion. Approximately 285 m from Orion at 55 degrees	Hose Flush: 11:10-11:05 Full Pressure: 11:05 - 14:40	AP-40	2 Main Engines	DP2	5	1 x KTA Cummins 1,000 hp engine powers the bow tunnel thrusters 1a (bow tunnel thruster) 1b (bow tunnel thruster) 1 x KTA Cummins 600 hp engine powers the stern tunnel thruster 1c (stern tunnel thruster) 2P (fixed propeller) – 6,000 hp engine output before gear box 2S (fixed propeller) – 6,000 hp engine output before gear box	Bow & Stern	Deployed hose: 11/1 @ 1:14
T/V	Gaspee	367584050	Crew Transfer Vessel	Array Cable Installation	Crew Transfer	Transiting near and within the Lease Area	Transit within the WDA to AT40 and back out: 13:57-19:17	NB to AT40 & back	4 Main Engines CAT 3412 (550 kW)	N/A	N/A	N/A		
OSV	C-Pioneer	368291370	Accomodation Vessel	Array Cable Installation	Crew Transfer	13:35-14:12 DP near AV39 14:12-14:45 Transit near AV39 (avg. 1 knot)	N/A	Southern End of WDA	2 Ulstein 1650 HD Azimuth Drives w/4 Blade FPP Propellers (total 5400HP)	DP2	2	Bow (1) - Schottel STT 550 Tunnel Thruster Retractable (1) - Ulstein TCNC 73/M-180 Swing Down Combination Thruster, 1100 BHP @ 300 RPM		
OSV	Adhemar de st Venant	253351000	Pipe Burying Vessel	Array Cable Installation	Rock Installation	13:24-13:39 Positioning 13:39-13:48 Processing survey 13:48-13:57 Installing Rock at AN37 13:57-14:00 Positioning 14:00-14:18 Postsurvey at AN37 14:18- 15:26 Transit on DP to AR38 (avg. 0.7 knots)	N/A	AN-37	2 Main Engines (1250 kW)	DP2	2	Bow (2) @ 1250 kW		
OSV	Seacor Hawk	367593340	Accomodation Vessel	Offshore Electrical Service Platform	Jacked up	Jacked up near ESP	N/A	ESP	N/A	DP2	N/A	N/A		
WIV	Sea Installer	219456000	Jack-Up Installation Vessel	WTG Installation	Jacked up	Jacked up at AP-38 with no installation activities occuring.	N/A	AP-38	N/A	DP2	N/A	N/A		
OSV	Cade Candies	369108000	Service Operation Vessel	WTG Commissioning	Transiting	11:50 - 15:40 standby on DP near AQ38	N/A	Central WDA	4 Main Engines @ 2350kW (3516C Cat)	DP2	2	Tunnel (3) - 910 kW STT 3FP, Schottel Stern (2) - 2500kW Combi Drive, Schottel		
M/V	Gateway Endeavor	367327910	Crew Transfer Vessel	General Operations	Crew Transfer	12:20-16:00 standby, drifting & transiting within WDA 13:36-14:34 transiting near AP38 & AQ38 (avg. 5 knots) (no DP)	N/A	Central WDA	4 Main Engines @690HP (Cummins KTA 19)	DP1 (?)	1	Bow (1) - 125 HP AC Motor, Proportional Control		
F/V	Torbay	368254690	Safety Vessel	General Operations	Monitoring Safety Zone	Transit within WDA near AM38 & AN38 (avg. 0.6 knots)	N/A	Northeastern WDA	2 CAT 3408 (1,700 hp)	N/A	N/A	N/A		
F/V	Helen H	367554870	Safety Vessel	General Operations	Monitoring Safety Zone	Safety patterns north of AP40 (avg. 0.3 knots)	N/A	Just North of AP-40	3 Main Engines MTU S60 (500 hp)	N/A	N/A	N/A		

Non-Project Vessels within 50 miles of the WDA (entire day)		
Vessel Name (or similar)	MMSI	Type of Vessel
ATLANTIC EXPRESS	304221000	Cargo/Containership
BERTO MILLER	338454000	Offshore Supply Ship
NEIL ARMSTRONG	338767000	Research/Survey Vessel
AWARE	366779430	Fire Fighting Vessel
IYANOUGH	367145870	STEAMSHIP AUTHORITY High Speed Craft
EXCALIBUR	367162510	Fishing
EAGLE	367174060	PASSENGER FERRY
JOHN & NICHOLAUS	367181750	Fishing
CONNECTICUT	367359940	Research (27m A-frame)
HUSTLER	367501450	Fishing
NORTHSTAR CHALLENGER	367546220	UTILITY VESSEL
WOODS HOLE	367691010	PASSENGER FERRY
GREY LADY IV	367720690	HIGH SPEED CRAFT
EAGLE	367733350	Fishing
CAMDYN	368149190	TUG
DRIX18 UNCREW VESSEL	227690579	Pleasure craft
THE BLUE PETER	235095651	Sailing
ARCHIMEDES TENDER1	310563050	Pleasure craft
FERMATA	316053158	Pleasure craft
N/A	338165516	N/A
FIRST LIGHT	338231032	Sailing
ELENI	338238608	N/A
ROCK AND ROLL	338308973	Fishing
TAKE ONE	338336234	Fishing
FAITHFUL	338356627	Fishing
ZADA MAC	338395297	N/A
ERICA KNIGHT	338402566	Fishing
BLACK EARL	338413783	Fishing
	338431456	
	338437411	
	338440616	
	338444001	
	338450458	
	338455437	
	338468867	
	338472891	
	338492105	
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	367539150	
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	368259850	
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	368338310	
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Attachment 2

SMRU Consulting Letter

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6/14/2024

Jaclyn Daly
Office of Protected Resources
National Marine Fisheries Service

Subject: Robert Rand Vineyard Wind 1 Acoustic Monitoring Concerns

Dear Ms. Daly,

It is difficult to assess, interpret, and draw conclusions about a complex underwater soundscape from a single location and time. Rand (2024)[1] attempts to do just that by sampling at successive points along a transect line towards the Orion on November 2, 2023, while the Orion was installing pile AP-40. Rand (2024) reports ambient noise levels without pile driving activity to assess noise levels from propulsion and DP thrusters at two locations (5.87 and 1.06 km from the Orion, as measured by onboard radar). $L_{p,rms}$ is reported at these locations as 122.93 and 126.52 dB re 1µPa, respectively. The author reports hearing vessel propulsion and DP thruster noise while making the 20 minutes of acoustic recordings used in this analysis and infer that the source of this sound is the Orion and immediately adjacent support vessels.

Vessel source levels are driven by design characteristics (e.g. propeller type) and operational characteristics (e.g. rpm, speed, etc.). This vessel noise is affected by a variety of other factors as it propagates in the ocean (e.g. sound speed profile, depth, bottom type, etc.) a t a single location (e.g. a hydrophone) noise from different vessels combine. Often the noise recorded at this single location is dominated by the noise from the closest vessel because that noise source has traveled the shortest distance and therefore has been affected the least by transmission loss.

[1] Pile Driving Noise Survey: Technical Report. March 28, 2024. Rand Acoustics, LLC.

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This appears to be what is happening with the Rand (2024) ambient noise measurements. A calculation of transmission loss between the two Rand (2024) ambient noise recording locations and the reported $L_{p,rms}$ results in the following transmission loss model.

*Received Level = 141.09 - 4.819 * log10(range in m)*

This transmission loss coefficient (4.819) is simply too small to be believable (i.e. from the same noise source, the Orion). Spherical spreading has a transmission loss coefficient of 20 while NMFS typically suggests the use of 15 for 'practical spreading' as explained in Rand (2024).

This unrealistically small transmission loss coefficient strongly suggests that one or both of the ambient noise recordings was affected by other vessels that were nearer to the hydrophone than the Orion and it's support vessels were or that ambient noise levels changed drastically between recording times. A map generated by Vineyard Wind based on AIS data recorded on November 2, 2023, is provided below and demonstrates the dynamic nature of multiple vessels offshore during this day. At certain times the F/V Helen H and F/V Torbay (both running safety operations) may have been closer to the Rand (2024) hydrophone than the Orion was. Unfortunately, it is not possible to determine if these or other vessels might have been close by and at what ranges they were because there are discrepancies in Rand (2024) as to the timing of recordings. The reported time of the ambient noise data does not correspond to the times provided for recordings of pile driving noise data, at the same distance from Orion.

The conclusion of Rand (2024) that vessel propulsion and DP thruster noise from the Orion and immediately adjacent support vessels creates noise above 120 dB re 1µPa (the Level B threshold for non-impulsive noise) beyond 6 km is not supported by their data as it is likely their recordings near 6 km from the Orion were affected by nearer vessels.

Sincerely,

Jason Wood, PhD
Managing Director
SMRU Consulting

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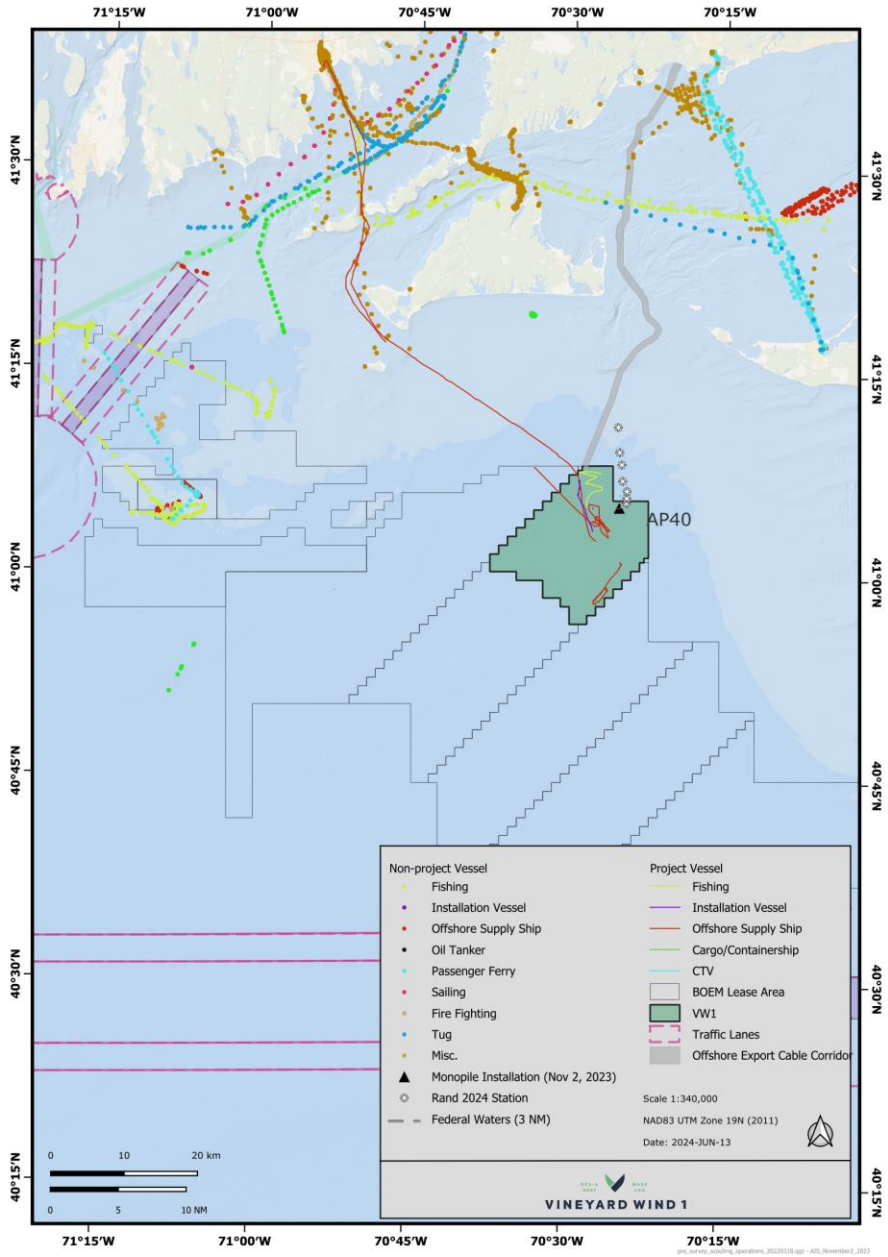

Figure 1. Map of vessel activity near Vineyard Wind 1 on November 2, 2023, during the acoustic monitoring effort conducted by Rand (2024), provided by Vineyard Wind and generated from AIS data. Acoustic sampling locations used by Rand (2024) are also provided.

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