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Save Long Beach Island, Inc.
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BEFORE THE SECRETARY OF COMMERCE

PETITION TO ABROGATE ATLANTIC SHORES SOUTH LETTER OF AUTHORIZATION, REINITIATE CONSULTATION, AND FOR RULEMAKING TO PROMULGATE NEW STANDARDIZED METHODOLOGY FOR TAKE CALCULATIONS

November 8, 2025

The Honorable Howard Lutnick
Secretary of Commerce
U.S. Department of Commerce
1401 Constitution Ave NW
Washington, DC 20230
Email: TheSec@doc.gov

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Matthew N. Giacona, Acting Director
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U.S. Department of the Interior
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Dear Secretary Lutnick:

I write on behalf of Save Long Beach Island, Inc. ("SLBI"). This Petition requests three actions be taken:

1. First, pursuant to 5 U.S.C. § 553(e), "Each agency shall give an interested person the right to petition for the issuance, amendment, or repeal of a rule," SLBI respectfully requests that NOAA exercise its authority to revoke the Atlantic Shores Offshore Wind South ("ASOW South") Letter of Authorization under the Marine Mammal Protection Act ("MMPA"). 50 C.F.R. § 216.106(e) provides, "Letters of Authorization shall be withdrawn or suspended, either on an individual or class basis, as appropriate, if, after notice and opportunity for public comment, the Assistant Administrator determines that . . . (2) The taking allowed is having, or may have, more than a negligible impact on the species or stock or, where relevant, an unmitigable adverse impact on the availability of the species or stock for subsistence uses." This Petition provides substantial evidence that 50 C.F.R. § 216.106(e) has and continues to be contravened due to systematic underestimations in Level A and B take quantities, for the reasons delineated hereunder.

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Thus, the taking allowed is having more than a negligible impact on the North Atlantic Right Whale ("NARW") specifically, the factual predicate of this assertion of regulatory violation.

2. Secondly, SLBI requests that NOAA reinitiate consultation pursuant to 50 C.F.R. § 402.16(a)(2), which provides that reinitiation of consultation is required and shall be requested by the federal agency, "If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered." SLBI maintains that this provision is implicated here, as new information reveals, as presented in this Petition, that the effects of the ASOW South project will impact NARW to a degree previously unconsidered.

3. Thirdly and finally, SLBI requests that NOAA, using SLBI's scientifically appropriate calculation methodology presented herein, a) undertake a retrospective review of all Letters of Authorization issued, not only for ASOW South, but for all offshore wind projects, and b) revoke and/or amend any and all Letters of Authorizations to the extent they no longer satisfy the MMPA standards in the regulations (i.e., including but not limited to 50 C.F.R. § 216.106). **SLBI requests formal rulemaking be initiated with attendant public comment on SLBI's new, standardized method for Level A and B take calculations**.

In accordance with 5 U.S.C. § 555(e), SLBI requests that NOAA publish a written determination in the Federal Register in response to this petition. In response to #3 of the Petition's request above, SLBI requests formal rule-making be initiated regarding SLBI's scientifically supported calculation method. SLBI reserves the right to pursue relief under the Administrative
Procedure Act, including 5 U.S.C. § 555(b) and § 706(1), should NOAA fail to act on this petition within a reasonable time.

The relevant enclosures of this Petition are appended hereto. An overview letter recapitulating the appended enclosures is provided from SLBI – see below.

Thank you very much for your careful consideration of these important matters.

Sincerely,

/s/ Thomas Stavola Jr. Esq.

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Howard Lutnick, Secretary
Commerce Department
1401 Constitution Ave, NW
Washington D.C. 20230

November 7, 2025

Dear Secretary Lutnick,

On behalf of the 10,000-person Save Long Beach Island, New Jersey, organization, I bring to your attention the following material regarding how instances of serious harm and fatality, and disturbance, to marine mammals have been estimated in the past to support prior approvals of Letters of Authorization and Biological Opinions for various offshore wind projects.

Our professional level review of various vessel survey IHA's, project construction ITA's Biological Assessments and Opinions over the last several years indicates to us that:

(1) the impacts from pile driving have not considered reasonable migration animal movement patterns that would significantly increase the predicted number of Level A Takes.
(2) The expected number of Level A and B Takes from turbine operational noise to whales in migratory patterns were not assessed, and that
(3) The impacts assessed for vessel surveying and pile driving have been significantly and systematically underestimated,

1. Failure to consider obvious migratory movement patterns;

The calculations and discussion in Enclosure 1 describes expected scenarios of a North Atlantic right whale (NARW) passing by a pile driving operation during migration and incurring permanent and temporary hearing damage from accumulated sound energy. That accumulated energy results from the elevated sound level it encounters and a decibel component from the time it takes to move past that.

The results of those calculations are summarized in the Table below.

Calculated Exposure Ranges from Pile Driving and Turbine Operation in miles-the Atlantic Shores South project.

Activity	Permanent Hearing Loss, Accumulated Sound Energy greater than 183 decibels (dB)- permanent hearing loss	Temporary Hearing Loss, Accumulated Sound Energy greater than 168 dB- temporary hearing loss
Pile driving-with a 10 dB noise source reduction	5 miles	9.6
Turbine Operation	Within the wind complex and 2.25 miles from its perimeter.	Within 12 miles of the wind complex perimeter, extending seaward across the entirety of the NARW's historical migration corridor

Even assuming an unsupported 10 dB noise source reduction, the exceedance of the 183 dB sound energy criteria **for permanent hearing loss from pile driving** extends out to an exposure range of about 7.8 km (6th column of Table 1 in Enclosure 1) or **5 miles** in all directions (assuming a circular area) from the pile driver. This creates a **10-mile-wide danger zone** for permanent hearing loss across the whale's migration path. A 10-mile-wide zone is significant compared to the whale's historic 50-mile-wide corridor. Since the noise exposure modeling report says that noise avoidance was not considered in the modeling, the modeling should have included the whale proceeding within the 10-mile zone and produced a significant number of Level A Takes from permanent hearing loss.

However, the Jasco August 10,2022 Noise Exposure Modeling report in Table 34 states an exposure range for permanent hearing loss of only 0.45 miles for a 10 dB noise source reduction. At that close distance, the sound exposure level is already close to the limit of 183 dB so the time factor comes into play. Therefore, it appears that the modeling has not considered the whale's migratory movement past the pile driver at farther out distances where the sound exposure level is less, but the time component of the energy accumulated is greater, with the sum exceeding the 183 dB level. This larger range across the whale's migration would have increased the number of whales affected and the number of Level A takes significantly.

With a 10 dB noise source reduction, the exceedance of the 168 dB criteria for **temporary hearing loss** extends out to an exposure range of **9.6 miles** creating a

danger zone of 19 miles, which also should have been accounted fo in the modeling report.

2. Failure to Consider Level A and B Takes from Operational Noise

A quantitative analysis of the impact of operational turbine noise on behavioral disturbance and permanent and temporary hearing loss is presented in Enclosure 2.

As shown in Table 3 of that document (page 40) and above, for a whale passing by an operating wind complex, the **operational** noise creates a significant zone of **permanent hearing loss**, i.e., the **width of the complex itself, plus 2.25 miles from its perimeter.** The zone for **temporary hearing loss and behavioral disturbance of 12 miles from the perimeter** creates even further impediments to the right whale's migration as this extends across its entire historic migration corridor adjacent to the Atlantic Shores South project in the seaward direction. Yet operational noise was not considered in any meaningful way in the approvals of the LOA and the Biological Opinion.

3. Systemic Underestimation of Level A and B Takes for Vessel Surveys, Pile Driving and Operational Noise.

The discussion in Enclosure 3 (which we previously provided) points to omissions and assumptions made at every step of calculations that are mathematically and scientifically unsupported, and result in significantly underestimated dB numbers, exposure ranges, and the number of animals affected.

The decibel scale is a logarithmic one, so that an underestimate of 10 dB from an actual value of say 180 dB does not represent a 6 percent reduction in impact to the animal, but rather an erroneous tenfold reduction in the actual noise energy received.

To summarize, those underestimates come from:

- For vessel surveys, the use of a high 20 dB noise transmission loss factor everywhere that simply cannot physically occur beyond distances about the same as the water depth, versus a 15 dB rate that the NMFS used previously and has been verified by near-field measurements.
- For vessel surveys, the use of lower noise source levels from surrogate devices as opposed to interpolations of measured values from the actual devices used,
- For pile driving, the reliance on a 10 dB noise source reduction from bubble curtains or similar systems that is not supported scientifically for the large
- foundations and low frequency noise emitted here, or verified by measurement over sustained periods.

- For pile driving, the use of unusually high dB noise transmission loss rates above 30 dB per decade of distance that are unsupported by mathematical derivation or by far-field measurements showing less than a 20 dB rate,
- For estimates of the number of disturbing incidents, the use of a single numerical criteria of 160 dB that does not reflect observed probabilities of such disturbance at lower noise levels (applicable to vessel surveying and pile driving),
- For certain animal presence, e.g., off New Jersey for the NARW, the use of limited, recent low-density numbers that do not reflect the number of NARW migrating and are not recommended for use by the Duke University Laboratory that created them (applicable to all activities), and
- For low-frequency cetaceans, the use of auditory down-weighting functions derived by the NMFS in 2016 that were significantly revised a year later by the very people who prepared them while alluding to political influence in their original deviation, and that do not reflect actual whale behavior.

We ask that you have your scientific staff review this in depth in collaboration with independent mathematicians, and acoustic and marine mammal behavior specialists.

If we are incorrect in our analysis, please let us know why and we will revise our thinking. If we are correct however, then we would ask that you direct the NMFS to do the following,

- Remand the LOA and Biological Opinion approvals for the Atlantic Shores project due to their reliance on these prior flawed calculations,
- Develop standardized, scientifically sound, transparent mathematical methods and computer models for calculating Level A and B Takes and require their use for future offshore wind project applications. Exceptions can be made for unusual environmental conditions or noise source characteristics. This is the approach taken for dispersion modeling for Clean Air Act permits, and would be beneficial to employ here, and
- Upon completion of the standardized method, do a retrospective review of all prior offshore wind project LOAs and Biologic Opinions be and revoke/amend any that no longer satisfy MMPA or ESA standards under the corrected methodology.

Thank you for considering this. It is of great concern to us to get the Level A and B numbers right, not to mention to the whales and dolphins.

Please advise us whether you intend to pursue such a review, we would be glad to assist however we can.

Sincerely,

Bob Stern

Bob Stern, Ph.D., President
Save Long Beach Island Inc.
Info@savelbi.org
917-952-5016

Cc; Interior Secretary, Doug Burgum

Enclosure 1, Sample Calculation of Permanent Hearing Loss from Pile Driving.
Enclosure 2, Impact of Operational Turbine Noise on the Essential Migration of the NARW.
Enclosure 3, Systemic Underestimation of NARW Impact.

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ENCLOSURE 1

Permanent Hearing Loss Exposure Ranges from Pile Driving

Introduction & Summary

There are omissions and other flaws in the calculations of the number of marine mammals expected to suffer permanent hearing loss from offshore wind pile driving operations. Those truncated calculations resulting in artificially low estimates of marine mammal fatality and serious harm were a major factor supporting prior Letters of Authorization (LOA) and Biological Opinions.

Such permanent hearing loss occurs from the accumulation of sound energy received by the animal, which depends upon both the sound exposure level It experiences at a given distance from the pile driving source and the time it spends at that point. For low frequency cetaceans, such as the North Atlantic right whale, the critical level is 183 decibels(dB).

It appears that the noise modeling exposure reports by various consultants that have supported both the prior LOA's under the Marine Mammal Protection Act (MMPA), and the biological assessments and opinions under the Endangered Species Act (ESA) have considered only the scenario where the animal's normal movement patterns bring it close to the pile driving source where it experiences a high sound level, but then moves away quickly, so the time component does not play a major role.

However, as shown in Table 1 below, using as an example the single-strike sound exposure level vs distance data in the noise exposure modeling report for the Atlantic Shores South project, the 183 dB level can easily be exceeded at further distances where the sound exposure level is lower, but the received energy component due to the time needed for the slow-moving whale to pass by the pile driver is higher.

Limiting the calculation of permanent hearing damage or Level A takes to the close to source case results in a small area of concern. When that area is multiplied by animal densities the number of Level A Takes is often less than one and LOA's were authorized on that basis. Consideration of father out permanent hearing damage incidents involves larger areas which would result in a higher number of Level A Takes potentially invalidating those LOA's.

The noise modeling reports state that noise avoidance behavior was not considered in the modeling analysis, only normal movement patterns. In that case, particularly for animals migrating along the East Coast, it is perplexing as to why the straightforward whale travel scenarios presented here were apparently not considered.

Technical Background

Exposure to too much sound energy results in permanent hearing loss, which for marine mammals is akin to a fatality and a Level A Take. For low frequency cetaceans, such as the North Atlantic right whale, permanent hearing loss is expected for received cumulative sound levels above 183 decibels(dB).

The cumulative energy received by animal in the vicinity of a source depends on the sound exposure level (SEL) it encounters at a given point from the source plus a component due to the time the animal spends at that point.

For pile driving, the equation for the cumulative sound energy is provided below,

Cumulative Sound Energy = the SEL at a given point from one pile driving strike +10 times the logarithm (N),

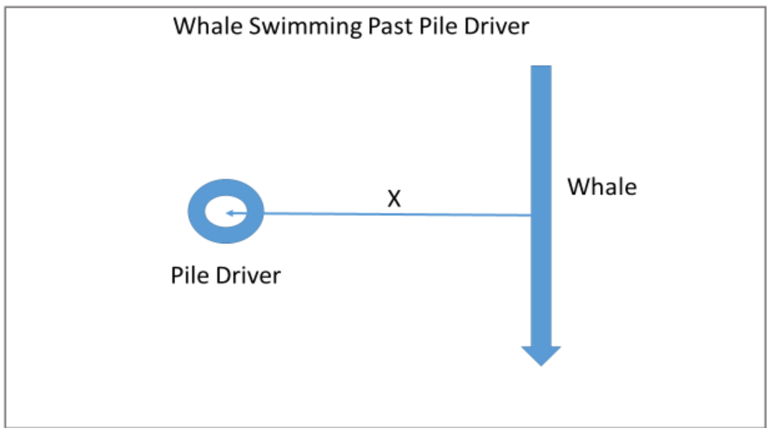
where N is the number of pile driving strikes that occur while the animal remains at that place. For the pile driving for the Atlantic Shores project illustrated below, and many others, those strikes occur once every two seconds.

It appears that the noise modeling exposure reports by various consultants that have supported both the prior letters of authorization (LOA's) under the Marine Mammal Protection Act, and the biological assessments and opinions under the Endangered Species Act (ESA) have considered only the scenario where the animal comes close to the pile driving source, experiences a high SEL, but moves away very quickly, so the time -or number of strikes- component does not play a major role.

That time component can be significant. For perspective, an exposure time of just a minute adds 15 decibels (dB) to the cumulative energy, an exposure of 10 minutes adds 25 dB, and an exposure of an hour adds 33 dB. The number of decibels added is also very sensitive to the exposure time, particularly for short periods.

To illustrate how the current modeling does not represent all the level A takes to be encountered, a calculation is shown below for a whale passing by a pile driving operation as depicted below, a scenario which would seem to be a common occurrence, especially during migration.

Figure 1



Exceedances of the Permanent Hearing Loss Cumulative Energy Level

As an example, the cumulative sound energy was calculated and tabulated below for the case of a North Atlantic right Whale passing by a pile driving source, using the sound exposure levels versus distance in the noise exposure modeling report done by Jasco applied sciences of August 10, 2022 for the Atlantic Shores South wind project

Table 1. Pile Driving- Cumulative Sound Exposure

Distance of closest approach, meters[1]	Single-Strike (every 2 seconds) sound exposure level (SEL)[1.] No source attenuation	Whale Travel Time, in seconds	SEL contribution from travel time =10 x $\log_{10}$ (travel time/2 seconds per strike)	Total SEL, Column 2 plus 4	Total SEL, with a 10 dB source attenuation
190	190	259	21	211	201
960	180	2658	31	211	201
2850	170	7892	36	206	196

5400	160	14954	39	199	189
8740	150	24203	41	191	181
12,910	140	35723	42	182	

(1) from Table F-12, Project Noise Modeling Report, 15-meter diameter foundation, R 95% distances, Jasco Applied Sciences, Aug 10, 2022

The distances and single strike sound exposure levels (SEL's) in the first two columns were taken from the project's noise exposure modeling reports. They depict the case for a 15-meter diameter monopile foundation being driven at a high energy level of 4,400 kilojoules because most of the strikes take place toward the end of the pile driving cycle at the higher energies. The fifth column results are for the case of no noise source attenuation and no auditory weighting. The effect of the NMFS assumed noise source attenuation of 10 dB is presented in the 6th column and discussed below. Auditory weighting is not relevant here because whether the whale " hears" the noise or not, the noise energy is still reaching its eardrums.

The travel time in the third column for the whale to pass the pile driving was obtained by dividing the distance it needs to go to pass the pile driving operation (assumed to be about the same as its closest distance to the pile driver) divided by a mean swim speed of 1.3 kilometers per hour. That is typical for right whale mothers and calves, and groups larger than three (Hains, Swim Speed Behavior and Movement of North Atlantic right whales in Coastal Waters of Northeastern Florida, January 10th 2013, Figure 2).

The additional decibel exposure due to that travel time in the fourth column was then calculated based on the formula of 10 times the logarithm of the travel time in seconds divided by 2 to account for 2 second cycle of the pile driving.

The total or cumulative sound energy received by the animal is shown in the 5th column. and was obtained by adding the single strike SEL in column 2 to the energy received due to the time duration in column 4.

A similar addition is shown In column 6 where the effect of a noise source reduction of 10 dB are considered even though we do not believe that assumption to be scientifically valid, as explained in our comments on the Atlantic Shores LOA rulemaking.

Results

For no noise source reduction, the 183 dB permanent hearing loss criteria is exceeded out to 15.8 km (5th column).

Even in the case where the 10 dB noise source reduction is considered, the exceedance of the 183 dB extends out to about 8.5 km (6th column).

The Jasco Applied Sciences report in Table 34 presents a number of 2.6 km or 2610 meters as the exposure range for permanent hearing loss whale due to cumulative sound exposure. That value appears to come from the data in the third row of Table 1 above, where for a distance of 2800 meters, the single-strike SEL, with a 10 dB noise source attenuation would be 160 dB. That leaves a 23 dB contribution from time exposure to reach the 183 dB threshold which calculating backwards means that the whale is only in that vicinity for 200 pile driving strikes or 7 minutes. That seems an unrealistically low time for the whale to move away from that area, since even if it moved radially away from the pile driver, it could only travel about 150 meters in 7 minutes.

In the physical world, some deviation from the straight-line paths assumed above would be expected as the animal tries to avoid elevated noise levels . However, the Jasco reports stated that such avoidance behavior was not considered in the modeling analysis, only normal movement patterns. In that case, particularly for animals migrating along the East Coast, it is just perplexing as to why the straightforward whale travel scenarios above are apparently not considered.

It is important to note that beyond certain distances, the noise experienced by the whale is less than the 160 dB sound pressure level (SPL) behavior disturbance criteria used by the NMFS. So, the whale is not disturbed below that, None. and has no reason to alter course. Based on a comparison of SEL and SPL values in the Jasco report, the SPL is about 5 dB higher than the SEL. Looking at the second column in the table above for no noise source attenuation, halfway between the 150 and 160 SEL's that distance is about 7,000 meters or 4.4 miles. With a 10 dB noise source attenuation, that no-disturbance distance is about 4,000 meters or 2.6 miles.

Conclusions

The noise exposure modeling reports that have supported previous LOA's under the Marine Mammal Protection Act (MMPA), and the biological assessments and opinions under the Endangered Species Act (ESA) do not appear to be addressing all reasonable scenarios that can result in permanent hearing loss. They have considered only the case where the animal comes close to the pile driving source, experiences a high sound exposure level, but moves away quickly, so the time component does not play a major role.

Even for the close to source cases they do consider, the assumptions being made in the noise modeling reports do not appear unrealistic.

As shown in Table 1 above, the 183 dB accumulated energy level can easily be exceeded at further distances where the sound energy level is lower, but the component due to the time needed for the slow-moving whale to pass by the pile driver is higher.

Limiting the calculation of permanent hearing damage or Level A takes to the close to source case results in a small area of concern. When that area is multiplied by animal densities the number of Level A Takes is often less than one and LOA's were authorized on that basis. Consideration of father out permanent hearing damage incidents involves larger areas which would result in a higher number of Level A Takes potentially invalidating those LOA's.

The number of level A takes is highly sensitive to animal behavior in the vicinity of the source. The modeling report speaks to the use of a JASMINE model to depict that animal behavior, including diving, foraging and traveling. It also states that noise avoidance behavior was not considered in the modeling analysis, only normal movement patterns. In that case, particularly for animals migrating along the East Coast, it is just perplexing as to why the straightforward whale travel scenarios above are apparently not considered.

ENCLOSURE 2

The Impact of Operational Turbine Noise on the Essential Migration of the North Atlantic right whale

from the

Atlantic Shores Offshore Wind and other Projects Planned off the New Jersey Coast

Save Long Beach Island, Inc.

October 15, 2025

The Impact of Operational Turbine Noise on the Migration of the North Atlantic right whale (NARW).

Executive Summary

A summary of the findings from this Report is provided below. Much of the analysis and concerns raised herein were previously provided to the agencies in Save LBI's comments on the draft environmental impact statement and on the proposed rule for Incidental Take Authorization for the project. Some updates to numbers are included here.

- The Atlantic Shores Offshore Wind project area lies partly in and adjacent to a primary migration corridor of the critically endangered North Atlantic right whale (NARW), based on historical data, the project application itself, and the density maps recently recommended by the Duke University organization largely responsible for the collection of such data.

- Based on reputable studies of measured noise intensity levels versus turbine power, an operational noise source level for the large Vesta-236 15 megawatt (mw) turbines with the monopile foundations to be used here, can be reliably predicted.

- Applying that noise source level to the 200 turbines of the wind complex results in a noise source that extends miles from the wind complex before it decreases to the 120 decibel (dB) continuous noise level criterion at which the National Marine Fisheries Service (NMFS) says the whale's behavior will no longer be disturbed. This could essentially block the NARW from using this historic migration corridor.

- Together with with other planned projects father out to sea, the entire 60-mile wide historic range of the whales migration could be affected, and obstruct and potentially block the whales migration, as shown in this report.

- The final EIS alludes to- with some calculation by Save LBI -the higher noise source levels involved, but does no quantitative analysis of the noise field from the wind complex, the distance required for the noise to decrease to criteria levels, and its impact on marine mammals.

- The failure to do such an analysis here is inconsistent with the NMFS practice for vessel survey authorizations where the distance required (and number of animals affected) for the noise to drop from source levels to the impulsive noise criterion of 160 dB is far less than that here to reach the lower 120 dB criteria for continuous noise.

- The failure of the final EIS and the Construction and Operations Plan to provide a quantitative analysis of the impact of operational turbine noise on the migration of a critically endangered whale, and other marine mammals, is a fatal flaw in both documents. This is information that is essential to know in order to determine the impact of turbine operation from the full project on migrating endangered and other marine mammals. Both documents must be revised to produce an analysis. Any decision to approve this project without such critical information can only be taken, at best, as uninformed.

The extent of operational turbine noise above the disturbance level criterion of 120 decibels(dB) from the wind complexes planned off the New Jersey and New York coasts is analyzed and presented in this report.

- Prior measurement studies of the trends in turbine noise source level versus turbine power allow for a reliable prediction of a noise source level between 181 to 192 dB from the turbines and foundations expected.

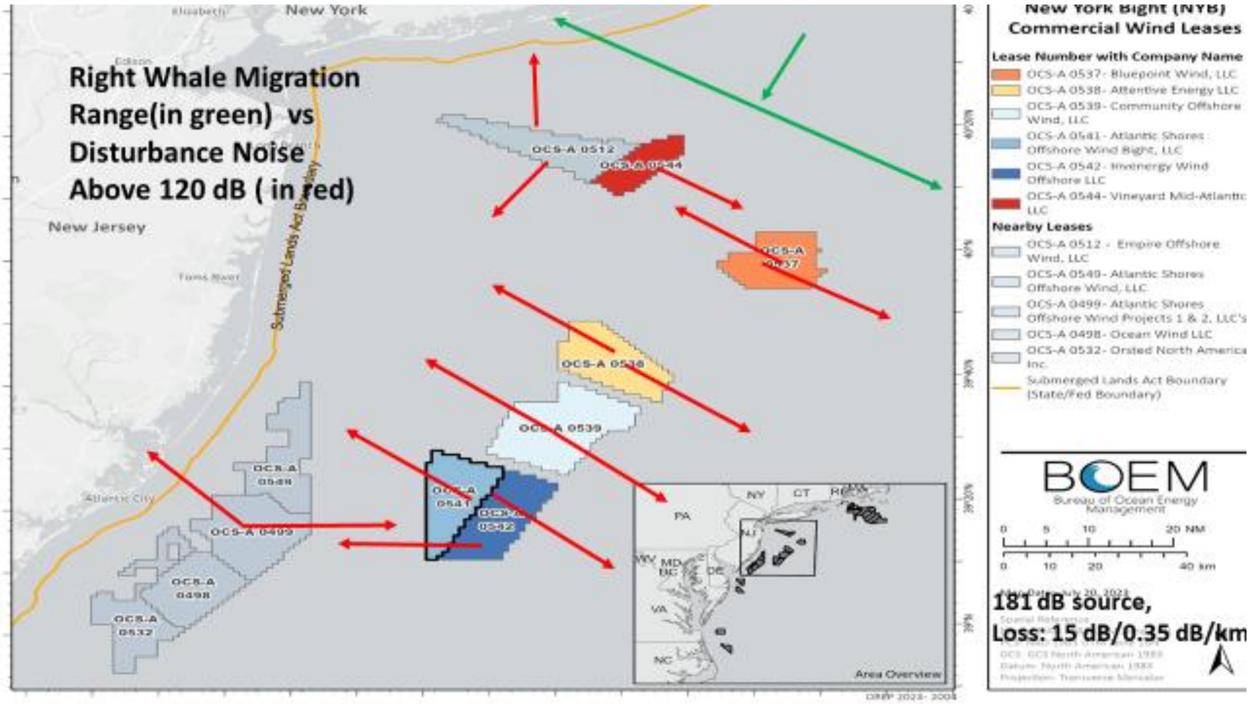
- Past agency practice and measurements of noise transmission loss, including one study on the New Jersey Continental Shelf, provide reliable noise transmission loss factors of 15 dB for noise spreading loss and 0.35 dB per kilometer for seabed attenuation.

- With the lower source level of 181 dB and those noise loss parameters, it **requires 12 miles from the perimeter of the wind complex for the noise to dissipate to 120 dB.**

- The results are shown in the map below. The green line represents the North Atlantic right whale's (NARW) historic migration range, which is within 60 miles from shore.

- The red lines represent the distance from the wind complexes where the noise level will exceed the 120 dB level that will according to National Marine Fisheries Service (NMFS) criteria disturb the whale's behavior.

Figure ES-1 , Extent of Operational Noise Levels Exceeding the Disturbance Criterion



- There is general scientific consensus that the whale will try to avoid or stand-off from continuous noise above 120 dB.

- In addition to the behavior disturbance, straightforward calculations in the Report for a whale passing by a pile-driver show that the 183 dB noise energy threshold for **permanent hearing loss** is exceeded at distances **less than 2¼ miles** from the project perimeter.

- A whale attempting to go into the wind complex in between two rows of turbines spaced 0.6 nautical miles apart would encounter a sound pressure level of 181-15 $\log_{10}$ 531 or 140 dB (seabed attenuation not a factor at these distances). Adding to that the 47.6 dB from the time of exposure results in a total cumulative energy received **of 187.6 dB which clearly exceeds the level for permanent hearing loss**.

- The cumulative sound exposure level of **168.6 dB** at 12 miles from the perimeter or across the entire 12-mile-wide migration corridor would exceed the NMFS SEL criteria of **168 dB for temporary threshold shift hearing impairment**.

- So, in addition to the risk of suffering permanent hearing loss traveling within 2.25 miles of the project perimeter, the **whale can suffer temporary hearing loss and have its behavior disturbed throughout its entire migration corridor creating major obstacles, perhaps insurmountable ones, to its ability to migrate**.

- Given all this , there is no route the whale could take within its historic migration range and avoid disturbance and temporary hearing loss, thus jeopardizing its migration and continuing existence.

- There are no practical, observational mitigation measures that can be applied in an operational turbine setting.

- To leave the whale a migration corridor, wind energy projects in either the closer to shore New Jersey lease areas or the farther out New York Bight areas must cease. Given the other adverse impacts of the close-in lease areas on shore communities the choice should be obvious to any responsible decision maker.

Foundation for this report: comments provided on the record

The foundation for this report was laid in: (1) the 209 pages of comments provided by Save LBI on June 29,2023 on the draft environmental impact statement for the Atlantic Shores South project, specifically on pages 5 and 33 to 57 of those comments, and (2) in Save LBI's comments of October 31, 2023 on the National Marine Fisheries Service proposed rule with respect to the Taking of Marine Mammals Incidental (ITA rule) to the Atlantic Shores South Project with respect to the Marine Mammal Protection Act (MMPA), specifically the cover letter and Enclosure I of those comments.

The points made in this report are virtually identical to those made in those comments. A few of the numbers have been updated.

About the Author:

Bob Stern is currently the President of the Save Long Beach Island Organization and representing the concerns of its 8,000 supporters.

He holds a dual Doctorate Degree in Applied Mathematics from the Courant Institute of Mathematics of New York University and in Aeronautical Engineering from the Engineering School. In previous employment, he managed the Office of Environmental Compliance within the U.S. Department of Energy responsible for providing Department and contractor-wide guidance on environmental compliance with many statutes, and for the review and recommendation to the Secretary of Energy of approval of the Department's environmental impact statements.

With that background, he is well qualified to prepare professional and expert level environmental impact analysis on many subjects, particularly those with a mathematical component, which is present here with respect to noise propagation. His personal preparation of 123 pages of technical and scientific commentary on the ITA proposed rule making is ample evidence of a dedicated work effort and a sincere commitment to protecting marine mammals and problem solving.

Introduction

The final environmental impact statement (EIS), section 3.5.6, for the proposed Atlantic Shores Offshore Wind project provides voluminous background information about whales but does not analyze or make any prediction of the impact of operational turbine noise on the migration of the critically endangered North Atlantic right whale (NARW).

To demonstrate the significance of this issue, Save LBI conducted its own assessment, described below, which as mentioned above was provided in comments on the draft EIS and the proposed ITA rule. That assessment includes defining:

1. **A Noise Source Level:** An estimate of the noise source level from the Vesta-236 turbine based on two published studies of measured noise level trends from smaller and moderate size turbines.

2. **Reliable Transmission Loss factors and the Affected Range:** the range from a project complex for the noise to reduce to 120 decibels(dB) so as not to disturb whale behavior,

3. **The NARW Migration corridor**: An exhaustive review of where the North Atlantic right whale has historically migrated off the NJ coast,

4. **The likelihood the NARW Migration will be Blocked**: An assessment of the NARW's reaction to that continuous noise above 120 dB and the likelihood that it will block or seriously reduce its migration, and spell its extinction as a species, and

5. **The Conclusion**: that wind energy development in either the Atlantic Shores lease area or the other lease areas in the NY Bight area must cease if the whale is to have a migration corridor and survive.

Given the severity of these impacts, the analysis of operational noise is perhaps the most important one to be undertaken and should have been or be presented in the final EIS, the Biological Assessment and the Biological Opinion.

The EIS Attempts to Downplay and Dismiss perhaps the Worst Impact of the Project.

The project proposes turbine placement 9 to 20 miles offshore. The North Atlantic right whale has a major migration corridor there that extends from about 20 miles to 32 miles offshore. That critically endangered whale must migrate through that corridor south/north each year between its calving and feeding grounds to survive. Its numbers are already low and recently are declining rapidly (Exhibit A). The noise emanating from the larger turbines to be used will extend across its entire corridor at levels that will disturb its behavior, potentially blocking its migration and threatening its existence.

Treatment of Operational Noise in the final EIS.

The final EIS does not quantify the underwater noise levels from the operation of the turbines to be used. This is information that is essential to know in order to determine the impact of turbine operation from the full project on migrating endangered whales.

The attempt by the agency to dismiss turbine operational noise as a critical issue on page E-5 of the final EIS is biased, misleading, deceptive and technically indefensible .

The two studies referred to are not “modeling scenarios”. Both studies simply tabulated actual measurements of turbine source level noise versus turbine power level and other parameters. Both studies showed a clear decibel-scale linear increasing noise level trend with turbine power, which reflects a very high level of increasing noise energy or intensity.

No basis is provided by the agency to characterize these particular studies with “a high degree of uncertainty”. In fact, Save LBI quantified that uncertainty in its noise source prediction in its comments on the MMPA proposed ITA rule, and it was found to be quite acceptable statically.

The claim that the noise level “for the Project” could start at 109 to 128 dB is false and technically indefensible. First, those numbers are for much smaller turbines. The Lindeboom study measured noise from 3 megawatt (mw) turbines. The Pangerc study measured the noise from 3.6 mw turbines. The 2009 Tougaard study measured noise from 2, 0.5 and 0.45 mw turbines. The turbines to be used here are 15 mw turbines. There is no technical basis laid to say that the noise from a larger turbine will be the same as that from a small turbine. In fact, the two studies the Agency refers to just after show the complete opposite. In addition, those three studies took noise measurements at various distances away from the turbine, so they are not true noise source levels.

Notwithstanding the EIS and BiOP insistence on citing lower noise levels for smaller turbines, the final EIS essentially confirms this higher level. On page 3.5.6–44, it states that: “Larger turbines do produce higher levels of operational noise, and the least squares fit of that dataset would predict that an SPL measured 328 feet (100 meters) from a hypothetical 15 MW turbine in operation in 22 mile per hour (10 meter per second) wind would be 125 dB re 1 μPa (Tougaard et al. 2020).” Backing that 125 dB number up from 100 meters to the source at 1 meter using the Tougaard transmission loss numbers results in a source level for a single turbine of 172.4 dB, getting closer to the plaintiff’s 181 dB number. The Tougaard “dataset” was for all foundation types, had that least squares fit been done just for the monopile foundations to be used here, it would likely have duplicated the plaintiff’s source level number.

Secondly, the project does not consist of one turbine. It consist of 200 turbines which significantly increases the noise level from the project. Therefore the statement about “the project” noise level is misleading and simply wrong.

The following statements on page E-5 about the Stober and Thompson and Tougaard studies are equally misleading.

The Stober and Thompson numbers of 170 to 177 decibels (dB) are for a 10 mw turbine. We are not dealing here with a 10 MW turbine but rather a much more powerful one. Extrapolating the Stober and Thompson trend line to a 15 mw turbine assumed to operate at 13.6 mw yields noise source levels for a single turbine of 180 to 195 dB. That also does not include the effect of the 200 turbines.

The numbers provided referencing the Tougaard study are for an 11.5 mw turbine. We do not have an 11.5 mw turbine. We have a 15 mw turbine. Assuming conservatively that it was operating at 13.6 mw, the noise source level from the formula derived in the Tougaard study for a single turbine would be 177.4 dB. The effect of the 200 turbines is approximated by a commonly used formula and equal to 10 times the logarithm of 200 or 23 dB, for a total effective source level from the wind project of 200.4 dB. Even assuming a conservative noise loss rate of 20 dB that requires 10,459 meters or 6.5 miles to reach 120 dB, not several hundred meters as presented in the final EIS.

Ultimately, however, the agency attempts to obfuscate this issue catch up to it, and it steps on its own toes. On page 3.5.6–44, it states the following:

“Larger turbines do produce higher levels of operational noise, and the least squares fit of that dataset would predict that an SPL measured 328 feet (100 meters) from a hypothetical 15 mw turbine in operation in 22 mile per hour (10 meter per second) wind would be 125 dB re 1 μPa (Tougaard et al. 2020). However, all of the turbines in the dataset, apart from those at the Block Island Wind Farm (BIWF), were operated with gear boxes of various designs that did not use newer direct-drive technology that is expected to lower noise levels significantly.”

The latter point about direct drive turbines is not relevant here because the Vesta- 236 turbines are of the gearbox drive type. In addition, the 15 mw turbine is not hypothetical, it’s real, the Vesta-236.

Regarding the noise source level, after crying about the uncertainty and the impossibility of predicting a noise source level, it actually does the least squares fit that is required and proves the plaintiff’s point about the importance of this problem. It estimates a 125 dB level 100 meters away from the source assuming a modest wind speed. Backing that up to the source at 1 meter using the Tougaard numbers results in a noise source level for a single turbine of 172.4 dB. Adding the effect of the entire wind farm with the 23 dB gives an effective noise source of 195.4 dB for the full project. Again using the conservative 20 dB loss factor, that would require 5,888 meters or 3.65 miles for the noise to drop below the 120 dB level. That distance would be greater for higher wind speeds.

So in fact, the final EIS proves the point that operational noise levels above the disturbance criterion from the project can extend miles from the turbines. This can obstruct and potentially block the migration of the North Atlantic right whale. **But then having established that the operational noise is substantial the Agency just stops in its tracks.**

The failure to do such an analysis here is inconsistent with the NMFS practice for vessel survey authorizations where the distance required (and number of animals affected) for the noise to drop from source levels to the impulsive noise criterion of 160 dB is far less than that here to reach the lower 120 dB criteria for continuous noise.

Therefore, a full analysis of this problem that calculates the elevated noise range from each turbine and adds them, and that considers the noise fields from the other planned projects across the whale's migratory corridor is required in a revision to the final EIS. This is exactly the kind of analysis that the plaintiff and its expert acoustic consultant company XI-Engineering do in this Report.

This is essential information required for any reasoned decision. No reasonable decision maker would approve a project in, adjacent to and near a historic migration corridor of a critically endangered whale without knowing the turbine operation noise source level and elevated noise range from the wind complex. If the agency is unwilling to do this study then-to protect the whale- this lease area should be terminated.

The final EIS also does not clearly show the precarious status of the right whale. The number of critically endangered North Atlantic right whales (NARW) is already low at 366 animals and in steep decline. There are less than 94 females of reproductive age left. In addition, the proximity of the right whale's primary migration corridor to the project area that was presented in the project application itself, Figure 13 here, was not disclosed.

Historical Perspective of Site Selection. Under this operational impact the selection of a wind energy area adjacent to a key right whale migration corridor makes little sense. The final EIS does not explain how the NJ wind energy area came into being, and whether it took into account the impacts to marine mammals being reviewed now. This provides perspective on why, in order for this project to proceed, the BOEM and NMFS at this late stage now have to reach the rather arbitrary conclusion that hundreds of large, noisy, wind turbines in or adjacent to the migration path of a critically endangered whale will only have a negligible impact on it, as required by the MMPA.

This is likely the worst impact of this proposal. It potentially could violate both the ESA and MMPA, and make the project not viable. But rather than confront the issue, the EIS presents no analysis of the problem at all and tries to obfuscate and dismiss it. It falls back to an extensive discussion of smaller turbine noise levels which are not relevant to this proposal. It makes passing reference to the two studies and dismisses their use in a full impact analysis without justification.

Compounding this omission, as required By CEQ NEPA Rule Section 1502.9(b), an EIS should discuss all major points of view on the environmental impacts and alternatives including the proposed action. This EIS presents nothing regarding the strength of these two studies either by the authors or by Save LBI Inc. in its detailed calculations and comments on the notice of intent [BG4, PRC1] and in subsequent communications [W20].

Because this problem can bring into question the projects inappropriate location and legal compliance issues with the ESA and MMPA, we believe that the presentation of the operational noise issue, or rather the lack of it in the EIS is a deliberate attempt to avoid it, mislead the reader, and is an abuse by the BOEM of its authority. We can think of no reason for an agency to devote pages on the noise levels from smaller turbines which have no relevance to this proposal and then devote a few lines to a passing mention of the studies that it could use to actually illuminate the issue.

The EIS fails to produce any relevant evidence to dismiss the issue. The obstruction of the migration of the critical Endangered North Atlantic right whale is likely the most significant impact of this project yet the BOEM EIS or the COP do not present any impact analysis of it. The truly significant consequences of the operational turbine noise from the project are presented in detail below.

Technical Background, Underwater Noise, Marine Mammals, and the "Decibel".

The EIS does not present any of this as discussed below, so we provide it below, first by way of explanation, some technical back ground regarding underwater noise.

Underwater noise can adversely affect marine mammals, i.e., by causing physiological damage, hearing loss, and changes in behavior, which in turn can affect their ability to communicate, navigate, migrate, detect prey and predator, and reproduce.

The underwater noise energy reaching a marine mammal is measured in decibels(dB), often by the formula 10 times the logarithm of that energy. That means that a 10 dB increase in decibels, say from 130 to 140 dB does not represent an eight percent increase in the noise energy received, but rather a tenfold increase.

Events where noise levels exceed criteria i.e., "takes" are generally calculated as the product of the area around the noise source where criteria levels are exceeded, multiplied by the density of the mammals in that area, multiplied by the time the noise source is present. The area where noise levels are exceeded is called the ensonified area, and is often estimated by another logarithmic formula.

That formula often expresses the reduction in noise level from the noise source to the mammal in terms of a "transmission loss" factor times the logarithm of the distance required for the noise to decrease to the criteria level. So, suppose that loss factor is 15 dB. Then, here again, an increase in the noise source level of 15 dB, from say 160 to 175 dB, doesn't change the distance required by nine percent but rather tenfold, i.e., it could require going from 100 to 1000 meters or from 1,000 to 10,000 meters.

Therefore, the area affected and the impact on marine mammals, or "takes", are extremely sensitive to those noise source levels and transmission loss factors, hence a focus on them in these comments.

1. Noise Source Level.

As shown below, the noise source level for the Vesta-236 turbine with a monopile foundation is estimated to be between 181-192 dB with high statistical confidence, by using the Tougaard Study and the Stober Study of trends in measured noise source versus turbine power.

These two excellent, consistent studies of *measured* noise levels from smaller and moderate sized turbines, showing a clear straight-line trend increase in turbine source noise decibel level with turbine power were provided to the BOEM during the NOI comment period [NOI1] that can readily be used to estimate the noise source level of the proposed turbines and analyze and determine the extent of that noise permeation into the corridor.

There are no measurements currently available from the larger turbines so the use of the best scientific data available requires that we rely on the trends shown by measurements from smaller and moderate-sized turbines.

Such an analysis is also required By CEQ NEPA rule §1502,21. which states that when essential information to a reasoned decision is not directly available, the agency must provide:

"a summary of existing credible scientific evidence that is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment; **and the agency's evaluation of such impacts** based upon theoretical approaches or research methods generally accepted in the scientific community".

The extrapolation of results from clear trends is a generally accepted method in the scientific community.

Two such studies [W2, W17] exist that do that and show a clear linear trend of increasing noise source level in decibels with increasing turbine power. That trend can be extrapolated out further to get an estimate of the noise level emanating from a larger turbine. Using those trends based on actual measurements correctly, the noise source level for the larger turbines can be estimated as shown below, and is critical to analyzing the problem of the impact to the whales.

The EIS does not even disclose the power size and drive type of the turbines expected to be used and its relation to the expected noise source levels. The Atlantic Shores Construction and Operations Plan (COP) does not specify the power, manufacturer, or drive type of the turbine proposed to be used or the foundation type. But the New Jersey Board of Public utilities (BPU) approval of 1510 megawatts (mw) for Project 1 was based on the use of Vesta-236 13.6 mw turbines and monopile foundations [(BG1)]. We assume that Atlantic Shores is adhering to the conditions of the State's approval so our comments here are based on the use of those turbines and foundations. The COP also says that turbines up to 20 mw in power may be used making the illustrative noise impacts shown below far worse, and their omission in the EIS even more egregious.

The BOEM finally acknowledges on pages 3.5.6-44 and 45 of the final EIS the existence of these two studies (by Stober and Tougaard). On page 3.5.6–44 the final EIS uses the Tougaard study to predicts a noise level at 100 meters from the source for a "hypothetical" 15 megawatt(mw) turbine of 125 dB. That number is underestimated because it uses the trend line for all foundation types as opposed to the trend for the monopile foundations that are to be used for this project. It then tries to discredit the number by saying that direct drive turbine noise would be lower than gearbox turbines (which were used for the trend line), but that has not been proven, and in any case the Vesta-236 turbines to be used here are gearbox drive.

But as explained above, even using the 125 dB number propagated back to the turbine itself, and accounting for the additive noise from the 200-turbine complex, would create significant affected distances of elevated noise and marine mammal impact, yet the final EIS carries it no further.

On page 3.5.6–45 the BOEM uses the Stober and Thompson study to estimate a noise source level of 170 to 177 dB for a 10 mw turbine. That too is underestimated because 15-mw turbines will be used for the project, assumed here to be operating at 13.6 mw or less than full power. Nevertheless, even using those numbers and accounting for the increased noise from the full complex, would result in significant affected distance and marine mammal impact, but here too the analysis stops.

On page 3.5.6-45 the final EIS then tries to dismiss this critical impact by attempting to discredit both studies by saying that the models were based on a small sample size which adds uncertainty to the modeling results. But the Tougaard study had an ample sample size of 46, and Tougaard states in his study that it has "good explanatory power" and a coefficient of determination of 0.67, indicating that a good part of the uncertainty (which is inherent in any set of measurements) is explained by the trend line results. In addition, the Stober study has an ample sample size of at least 24 measurements. The EIS again brings up direct drive to diminish the power of the studies but that is not relevant here for the Vesta -236 gearbox turbines.

In addition, the final EIS doesn't explain what the BOEM "uncertainty" is, nor does it describe any attempt on BOEM's part to investigate it. Rather it just uses a phrase to capriciously ignore an existential threat to a critically endangered whale.

The actual uncertainty in the predicted value of the 181 dB source level is estimated below, and it is shown that even with that uncertainty, the operational noise problem persists.

The BOEM makes additional misleading statements and cites references on page 3.5.6–45 in more attempt to downplay the importance of operational noise problem. It cites a study by Tougaard et al. pointing to no change in the acoustic behavior of the animals observed, but fails to mention that the received noise levels received there were less than the 120 dB level that NMFS has established for behavioral response. So, it is no surprise that changes in acoustic behavior were not observed, and any such changes in acoustic behavior would be just one of many behavioral responses that could occur.

It goes on to cite studies by Lucke at al. concluding that masking of communication would occur only within 20 meters of an operating turbine. But those turbines were less than 5 mw in size with much lower noise source levels than the 15 mw turbines adopted for this project. Also, as shown below, the received noise levels from the smaller turbines in that study are less than the typical vocalizations of the right whale, which is the prime concern here. So, loss of communication space would not be expected and these arguments are irrelevant.

The EIS continues to downplay impact by presenting impact of smaller turbines with much lower noise source intensity then what will be constructed here. It continues to dismiss all the evidence of increasing noise source level with megawatt size. These arguments are not relevant to the larger gearbox turbines here, and border on the technically absurd.

The proper use of those credible and reliable studies, and others, to predict the noise source level for the Vesta-236 gearbox turbines assumed operating at 13.6 mw on the monopile foundations to be used for the Atlantic Shores project are shown below.

<u>The Stober Study</u>

Using the Stober referenced study, ***broadband* noise source levels for those 13.6 mw gearbox turbines are predicted at 180 dB [W2]** using the root mean square trend line of Figure 1 of the study below, extrapolated out to 13.6 mw turbines, which is about 40 dB higher and 10,000 times* more intense than the noise from the smaller turbines.

Figure 1. Noise Source Level vs. Turbine Power-Stober

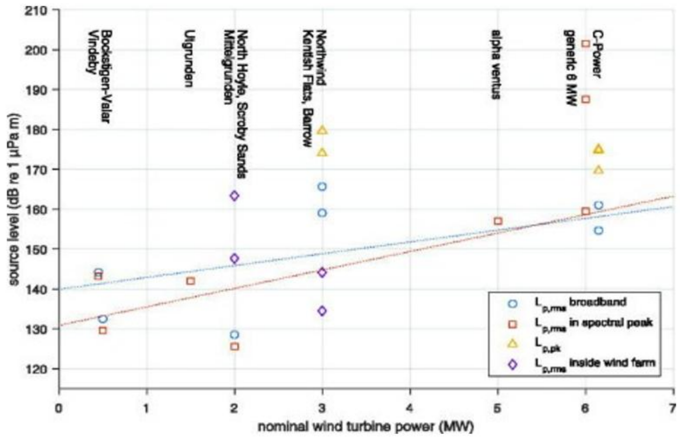


FIG. 1. (Color online) Source SPLs versus nominal wind turbine power as listed in Table I. The names of wind farms or the dat a source are indicated at the top of the figure. Regression lines for broadband levels (blue) and sound levels at spectral peaks (red) show the increasing trend.

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DOI: 10.1121/10.0003760

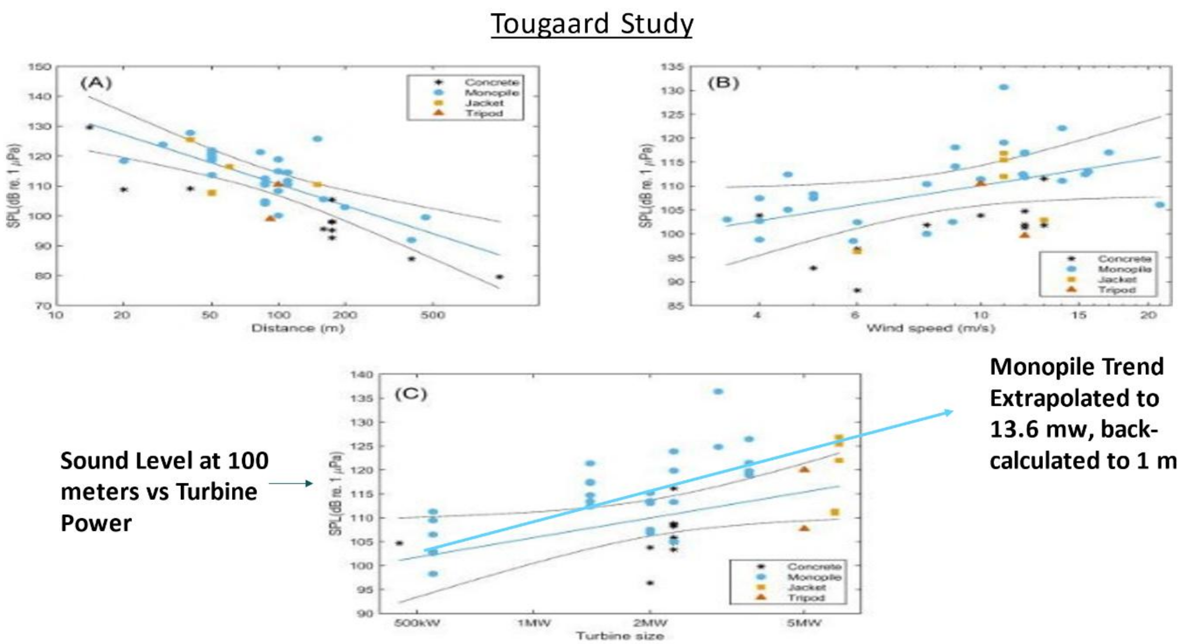
Also, following author Stober’s suggestion, the spectral root means square line is actually a better indicator of the increase in noise level as turbine power increases, because it is more indicative of frequency range that the whale hears. Extrapolating that trend line in his Figure 1 out to 13.6 mw-for the Vesta-236 turbines to be used **results in a mean turbine noise source level of 192.2 dB**. We used the more conservative estimate of 180 dB from the broadband trend line in our comments on the NOI[(BG4)] because it was sufficient to demonstrate our main point that the 120 dB marine mammal behavior disruption level would be exceeded many miles from shore potentially blocking all of the historical right whale’s migration corridors off the NJ coast, as shown below.

<u>The Tougaard Study</u>

The 180 dB source noise level is confirmed by the second Tougaard study [W17]. By means of the general linear regression model in the study, it was possible to separate the influence of the three factors, distance, wind speed, and turbine power on the received noise level. All three factors turned out to be significant, and the effects are plotted separately in Fig. 3 of the Study below.

Figure 3(C) below from the study shows the trend in received noise level at 100 meters from the source versus turbine power for the monopile foundation data. Drawing a regression trend line through the **monopile foundation data** and extrapolating it out to 13.6 megawatts results in a mean noise level of 132.5 dB. Back calculating that from 100 meters to the turbine source at 1 meter using the noise loss factors in the Study adds 47.4 dB (page 21) to the 132.5 dB resulting in a mean or most expected **noise source level of 179.9 dB for one turbine, very consistent with the Stober study broadband result.**

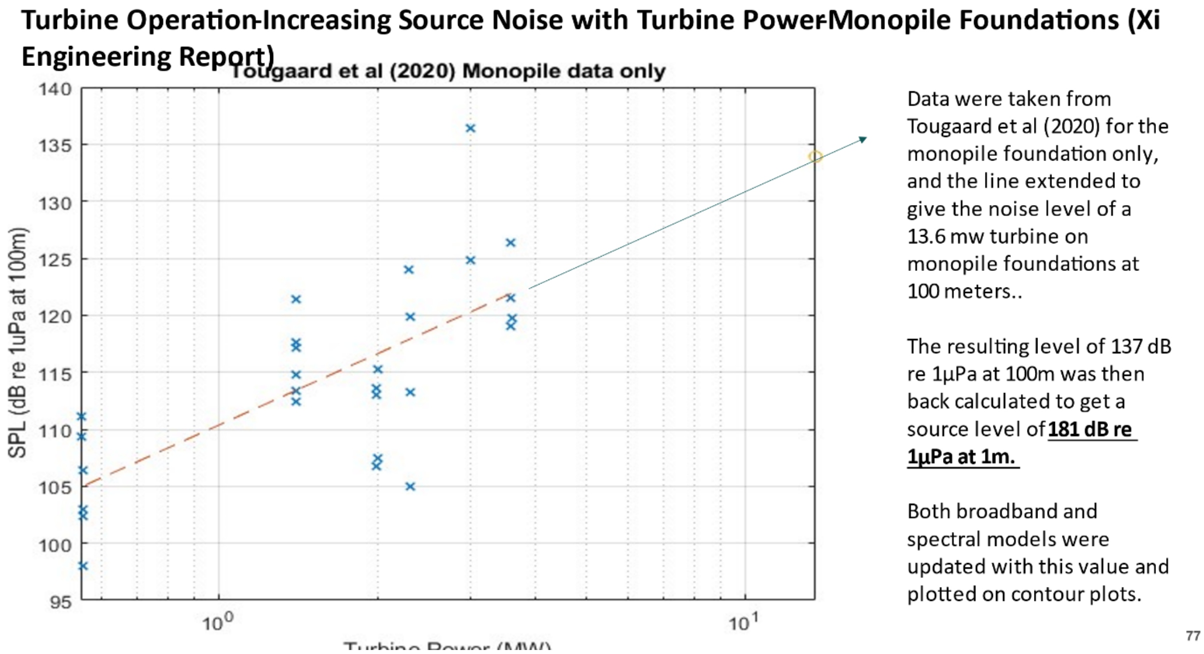
Figure 2. Noise Source Level vs. Turbine Power-Tougaard



The XI-Engineering Study

To confirm our mean estimate of 179.9 dB for the noise source level of a 13.6 mw gearbox 13.6 mw turbine, Save LBI engaged a well-known acoustic engineering company, XI-Engineering to do its own analysis **of the monopile foundation data**. Their trend analysis, shown below, **predicts a noise source level of 181 dB**, very close to the 179.9 dB number.

Figure 3. Noise Source Level vs. Turbine Power –Monopile Foundations-XI-Engineering



[77]

Navy Algorithm

In addition, it should be noted that the Department of the Navy [W22] often uses a simple algorithm to compare and equate noise sources in air versus noise sources in water. It effectively adds 62 dB to the noise level in the air to achieve a comparable effect in water. In this case the Vesta- 236 air noise source level is 118 dB(A) per the manufacturer specifications, A-weighted. Adding 62 dB to that would result in a comparable underwater noise level of 180 dB which is very close to the noise source level derived in all three studies cited above. This algorithm is a generalization and can change depending on frequency considerations. but it does add additional support for the 181 dB turbine noise source level used below to estimate affected ranges and marine mammal impact.

The Stober, Tougaard, and XI-Engineering studies, as well as the Navy Algorithm are all consistent, credible and reliable, and show that we are actually looking at a turbine source **operational noise levels between 180 and 192.2 dB**. These source levels should have, but were not, used in the DEIS to assess the operational noise impact on the whales.

Uncertainty

Regarding uncertainty in the trend lines in the Tougaard Study, which is present in any statistical estimation, the author states that:

"The model had overall good explanatory power (**R^2 = 0.67, N= 46**). The effect of the recording distance was -23.7 dB/decade [standard error (SE) = 3.1 dB, t = -7.55, p < 0.001]. The effect of the wind speed was 18.5 dB/decade (SE = 5.8 dB, t

= 3.20, p = 0.003), and **the effect of the turbine size was 13.6 dB/decade (SE = 3.8 dB, t =3.62, p < 0.001**)”.

The R squared(R^2) value is a measure of the variation in the estimate of the turbine source noise level that is explained by the linear regression model used divided by the total variation in the sample. In this case more than two-thirds of the variation is explained by the regression model used. The very low p value and higher t value go hand-in-hand in describing a trend of noise level with turbine tower that is statistically significant and makes it very unlikely that the trend results are just due to chance.

Of greatest use to quantify the uncertainty in the estimated noise level of 180 dB from the Tougaard data for a 13.6 mw operation of the turbine is Figure 3C above provided by the Study. That Figure shows the standard error (SE) for various turbine powers. At the 13.6 mw point it shows a standard error of 10 dB. From that a **Confidence Interval** can be calculated that will show the range around the 180 dB mean estimate where the result will lie with 95 percent confidence. That confidence interval is calculated with the equation below:

Confidence Interval = the mean estimate (here 180 dB) plus or minus Z times the standard error.

Assuming the variations in the mean estimate here are normally distributed which is often the case, Z equals 1.96. So, the confidence interval here is 180 dB plus or minus 1.96×10, or between 160 and 200 dB. This means that there is 95 percent confidence that the noise source level for the turbine will be between 160 and 200 dB, with the most expected or probable level still being 180 dB.

The odds that source levels at or below 160 dB would actually occur are less than 2.5 percent. However, even that lower level added to 23 dB ($10 \log_{10}(200)$) to account for the full wind complex of 200 turbines results in an effective noise source level of 183 dB. Using the formula for transmission loss below with a 15.2 dB noise spreading loss factor and a 0.9 dB/km seabed attenuation factor it would require 4 miles for that level to decrease to the 120 dB criteria below which the whale’s behavior will not be disturbed.

Conclusions Regarding Operating Turbine Noise Source Levels

The Stober, Tougaard, and XI-Engineering studies, as well as the Navy Algorithm are all consistent, credible and reliable, and show that we are actually looking at a turbine source **operational noise levels between 180 and 192.2 dB**. These source levels should have, but were not, used in the DEIS to assess the operational noise impact on the whales.

It is clear from the nature of the EIS discussion of turbine source noise levels that the BOEM wishes to dispense with the issue of operational turbine noise. However, the numbers presented above and their staggering consequences to the right whale are pesky things that do not allow this issue to be dismissed so easily.

We must remind the BOEM of its responsibilities under **NEPA Rule §1502.21** regarding incomplete or unavailable information presented below.

2. Noise Transmission Loss Factors and the Affected Range above the Noise Disturbance Criterion of 120 dB,

The criteria used to determine the the affected is the 120 dB National Marine and Fisheries Service (NMFS) level B criterion for disrupting marine mammal behavior from continuous noise [W4] [W5] [W6].

The transmission loss (TL) and distance needed for the noise source levels to drop to the 120 dB level was estimated using the equation below from the recent BOEM Nationwide Recommendations for Impact Pile Driving, Sound Exposure Modeling and Sound Field Measurement for offshore wind construction and Operation Plans of August, 2023.

$$TL = F \times \log10(R) + a \times R/1000 \quad (1)$$

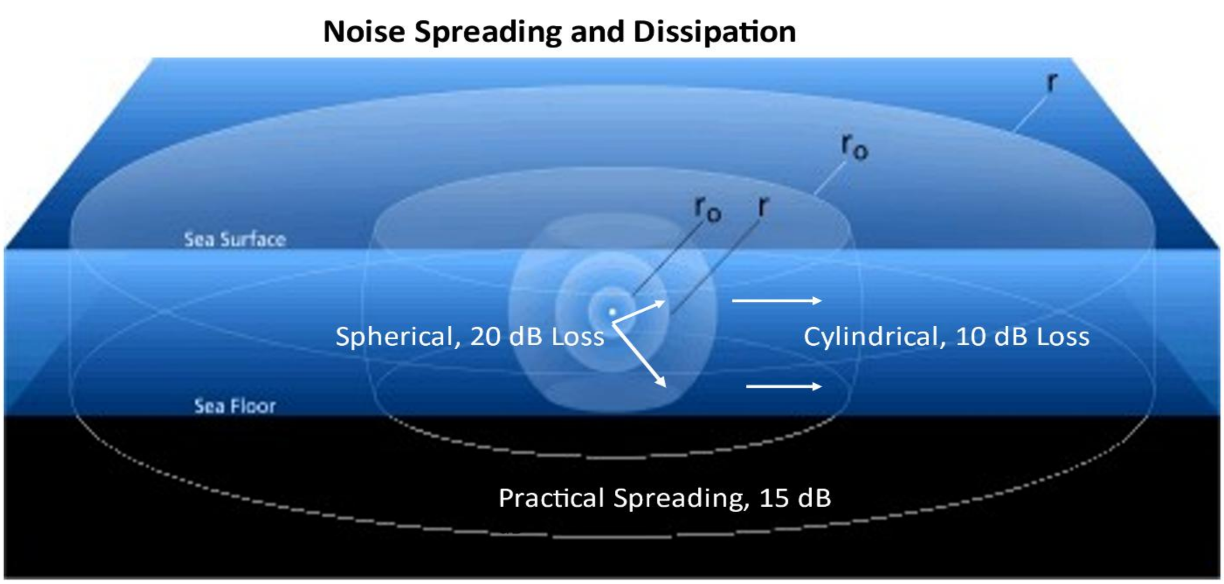
Where F is the noise spreading loss factor in dB,

a is the attenuation loss factor in dB per kilometer, and
R is the distance from the source in meters
x means multiplied by

The Spreading Loss Factor F:

Regarding the noise spreading loss, a diagram is provided below to show the dynamics at work.

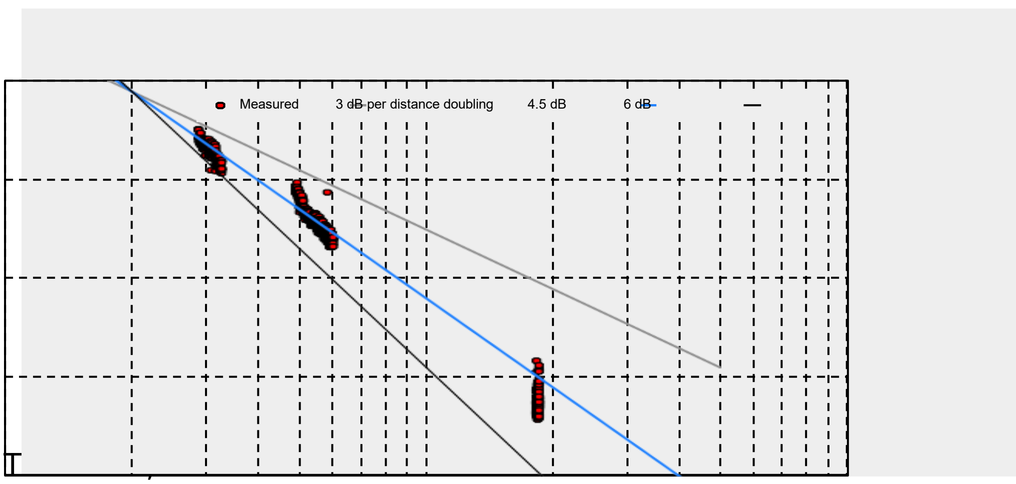
Figure 4. Noise Spreading - Conceptual



Essentially the sound waves from the source will spread out in a semi-spherical manner (at a loss rate of 20 dB for a 10-fold increase in distance) until the wave hits the seabed or surface, at which point it will reflect back into the water column and move horizontally, now spreading out in a cylindrical shape with a loss rate of 10 dB per decade distance increase. **A “practical spreading” formula of 15 dB times the logarithm of the distance from the source has been used for many ITA’s and IHA’s by the NMFS and by many researchers to marry the effect of both regimes as shown in Addendum A.** Therefore, noise spreading loss factors distinctly above 15 dB at distances greater than the water depth would be suspect.

Measured noise levels versus distance in Figure 6 of the report titled “Underwater noise emissions from offshore wind turbines”, 2005, Klaus Betke also show a match with a 15 dB loss rate, as shown below.

Figure 5 , Noise Loss vs Distance -Betke



T ***ise spreading loss*** and the calculations below.

Noise Propagation Loss due to Attenuation

The attenuation comes from two places, the seawater itself and the seabed.

Seawater attenuation.

As explained in the report by Frank Thomsen of July 06, 2006, titled: Effects of offshore wind farm noise on marine mammals and fish, one factor that has to be considered is absorption of energy by the medium. Absorption of sound by seawater increases with increasing frequency with energy loss being proportional to the square of frequency. Therefore, the absorption coefficient is frequency-dependent and can be calculated by:

$\alpha = 0.036 f^{1.5}$ (dB/km)

with f = frequency in kilohertz (kHz). For frequencies less than 1 kHz, which is the dominant part of the source spectrum here, absorption is less than 0.1 dB/km and therefore not significant. However, at higher frequencies, absorption can cause significant loss at long ranges.

Another factor affecting transmission loss is scattering due to reflections at boundaries (surface, bottom and shore) and other obstacles. The attenuation due to reflections and scattering at the water, seafloor interface is highly site-specific, and uncertain, dependent upon the acoustic properties of the sediment. Accurate computation of the reflected sound requires knowledge of the sediment properties over at least a few wave lengths in depth, which for the low frequency noise here can extend to tens of meters (Adrian Farcas, Underwater Noise Modeling for Environmental Impact Assessment, September 21, 2015, Section 4.2).

The amount of energy lost due to scattering varies with the roughness of the bottom and the frequency of the incident sound. Soft bottoms (e.g. mud) are associated with high bottom loss, whereas hard bottoms such as smooth rock or sand produce lower losses.

Thiele (2002) developed a formula that is applicable for coastal North Sea and Baltic waters with water depths up to 100 meters, a sandy bottom and wind-speeds less than 20 knots:

$TL = (16.07 + 0.185\ FL)\ (\log (r/1.000\ m) + 3) + (0.174 + 0.046\ FL + 0.005\ FL^2)\ r$

(FL = 10 log (f / 1 kHz; 1 m - 80 km, frequencies f in kHz from 100 Hz - > 10 kHz))

Figure 13 of the Jasco March 2023 exposure modeling report shows that the dominant energy from the pile driving occurs at frequencies less than one KHz. For a frequency of 1000 Hertz or 1KHZ of interest for the low cetacean numbers, the FL term is zero, and the formula (where r is in km) produces an attenuation factor of 0.174 dB/km or a modest attenuation from 1 to 10 km of 1.57 dB.

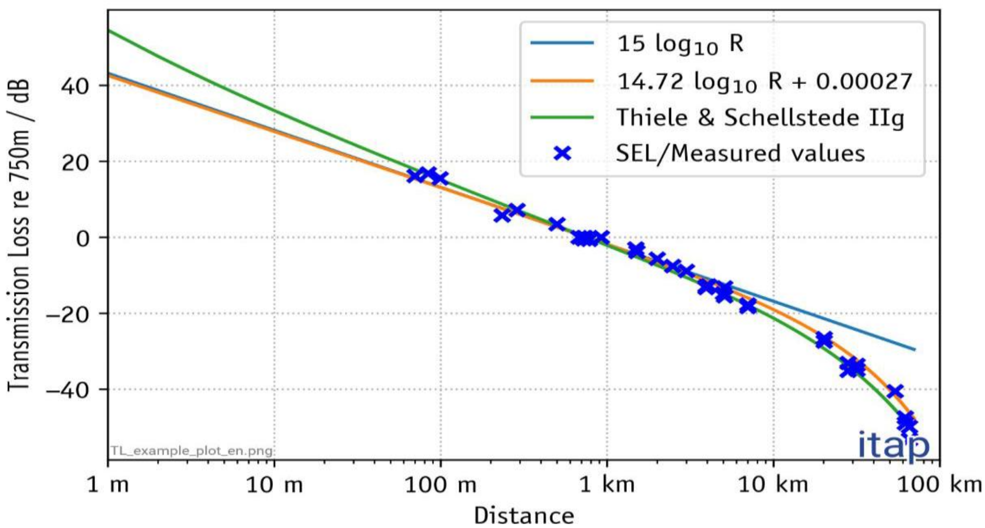
The affected noise area between 1 and 10 km is of interest because, if circular, its area is 100 times greater than the area within 1 km. Assuming that there is a uniform animal density in the general area would indicate that many more marine mammals would be present there and potentially impacted.

Measurements by DEWI (2004) and Betke (pers. comm.) of pile-driving noise at different distances proved that the formula by Thiele (2002) is the best approximation of transmission loss. DEWI (2004) measured a transmission loss of 4.5 dB per distance doubling (= 15 log (r)) for broadband pile-driving signals in the Mecklenburg Bight (Baltic Sea).

The chart below from the technical report titled Underwater Noise During Percussive Pile Driving, Michael Bellman, May 2020, showing measurements of sound levels from pile driving also supports the use of a 15 dB geometric spreading factor out to

10 km, with attenuation having a modest effect up to that point, from 1 to 10 km roughly 1.75 dB, close to the Thiele estimate.

Figure 6 Noise Measurements, Level vs Distance



Save LBI commission to study to. analyze the effects of spreading loss and seawater attenuation alone. The results are presented in Addendum B.

Seabed Attenuation.

The noise attenuation by the seabed is potentially higher than that from the sea water, but is uncertain and requires measurements to determine. As stated in the report titled; Underwater noise modeling for environmental impact assessment by Adrian Farkas, Environmental impact assessment review. 57 (2016) 114-122, "Even if the propagation through sediments is neglected, and only the reflection back into the water at the seabed interface is considered, accurate computation of the reflected sound field still requires knowledge of the sediment properties over at least a few wavelengths in depth (Katsnelson et al., 2012), which in the case of low-frequency sound waves can be tens of metres".

The seabed attenuation factor is critical to the estimation of transmission loss and affected range. No information has been made publicly available by the project sponsors regarding those sediment properties for the Atlantic Shores project, or the method as to how those sediment properties are translated into a water column attenuation factor. The factor being used in the Jasco Applied Sciences modeling reports for pile driving has not been disclosed but appears to be unusually high [W37]. The attenuation factors are highly dependent on local seabed characteristics, but factors above 1.5 dB/km would be unusual, and at a minimum such factors should be called out and explained as to what unique characteristics of the site are causing them.

Fortunately, a detailed study [W38] of noise transmission measurements on the New Jersey Continental shelf was performed from which a seabed attenuation factor can be derived. That study shows in its Figure 15 (also shown below) a measured transmission loss of 68 decibels over 15,000 meters or 15 km.

Figure 7. Measured Transmission Loss , NJ Outer Continental Shelf

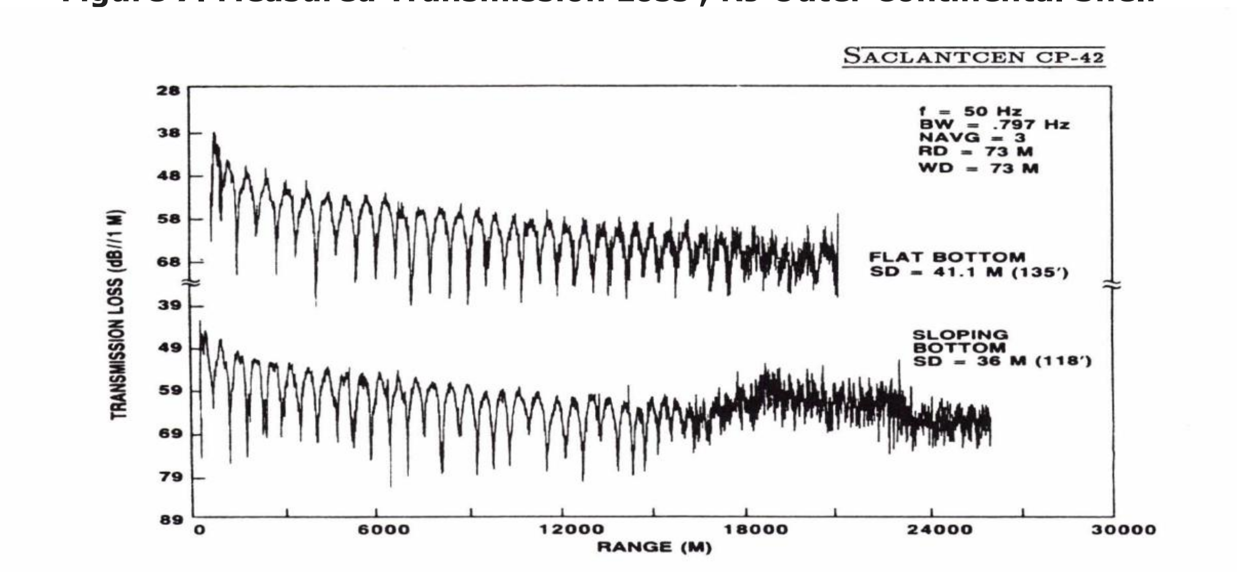


Figure 15. The transmission loss measured for the flat (TL3-1) and sloping bottom (TL3-3) runs shows the effect of the slope and a change in modal structure.

But the noise spreading loss at 15 km using the 15 dB factor accounts for 62.64 of those decibels, leaving 5.36 decibels attributable to seabed attenuation, conservatively assuming no sea water attenuation. That results in a seabed attenuation factor of 5.36 dB/15 km or **0.35 dB/km**. In addition, Figure 6 above shows a departure of measured values from the 15 dB spreading loss line at ten km of about 3.5 dB. Attributing that to seabed attenuation also supports the use of a 0.35 factor (3.5 dB/10 km).

Therefore, **the 0.35 dB/km factor for seabed attenuation is used below** to determine the ranges or distances from the wind complexes here that will exceed 120 decibels, **and is considered the most reliable estimate because it is based on NJ specific and other noise measurements.**

Data on seabed attenuation factors elsewhere is sparse. The BOEM presents attenuation factors of 0.94 to 1.41 dB/km for specific sites in Table 3-1 of its Report titled: Parametric Analysis and Sensitivity Study of the Acoustic Propagation for Renewable Energy. A higher value of 1.47 dB/km was used by Dominion Energy for its site in its report of November 28th 2020 titled Coastal Virginia Offshore Wind Noise Monitoring during Mono-pile Installation. The Marine Mammal Commission cites a factor of 0.9 dB/km in its letter to miss Jolie Harrison of March. 1st 2021 regarding the South Fork wind farm. The ranges from the wind complexes above 120 dB were also determined using factors of 0.9 and 1.5 dB/km to bound these factors provided, but they are not specific to the seabed sediment here.

The transmission loss and affected range was estimated below for three cases:

1. **The lower source level of 181 dB and the seabed attenuation of 0.35 dB/km from NJ Coast Measurements**
2. **The higher source level of 192 dB and a seabed attenuation of 0.9 dB/km, and**
3. **the lower source level of 181 dB and the highest seabed attenuation of 1.5 dB/km**

1 Source Level of 181 dB and seabed attenuation of 0.35 decibels per kilometer (dB/km) derived from local measurements.

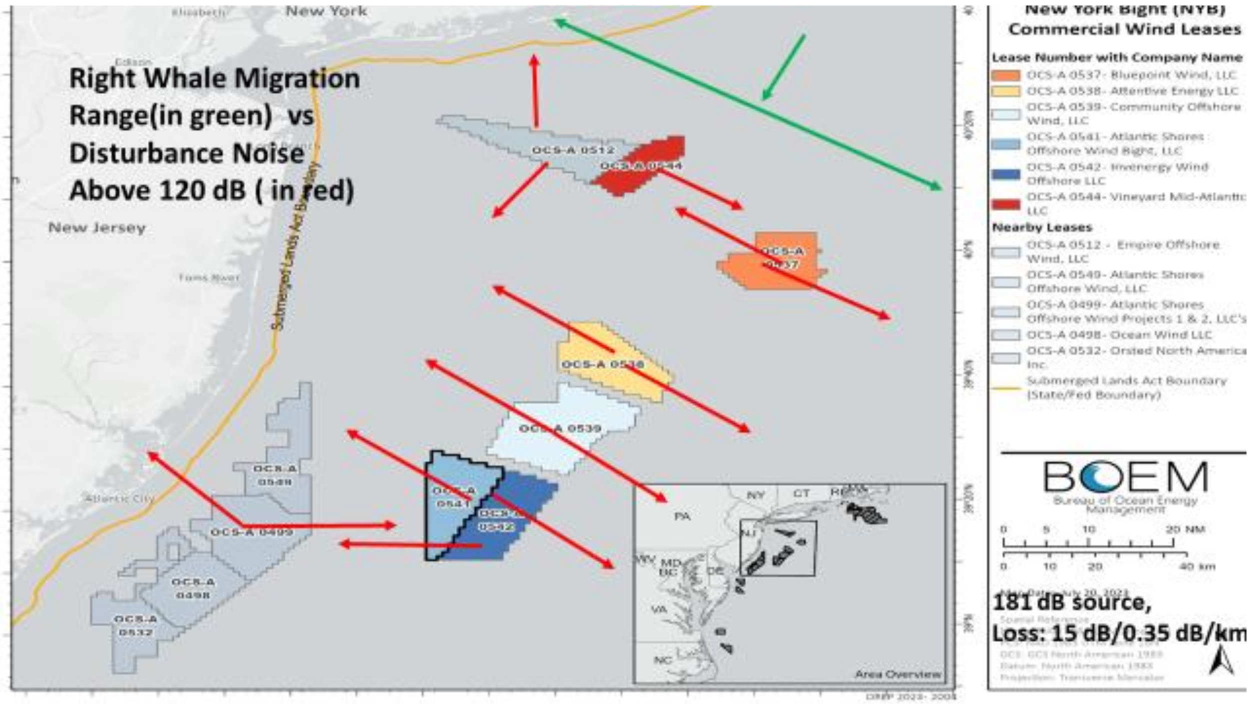
The case with the conservative source level of 181 dB and the seabed attenuation of 0.35 db per kilomter derived from ctual local measurements was analyzed below.

Using equation (1) above with a 15.2 dB (the 0.2 accounts for sea water attenuation) spreading loss factor, and the 0.35 seabed attenation factor it would require 7 kilometers for the noise from one turbine to decrease to 120 decibels. But neighboring turbines also contribute to the noise level received at that point. The increase in noise level at the 7 km point from the closest 26 turbines in the first three rows assuming they are spaced a mile apart was 12 decibels. That is essentially equivalent to **having an effective point source level of 193 dB centered in the second row.** That requires 18.4 km or **12 miles** from the perimeter to reach 120 dB. The same distance was assumed for all the wind complexes in the NY Bight area, assuming they would use comparable turbine power and spacing.

The results are shown in the map below. The green line represents the range of the right whale's primary historic migration. The red lines represent the distance from the wind complexes where the noise level will exceed 120 decibels, which will disturb the whales behavior and which it will likely try to avoid. It can be seen that there is essentially no route the whale could take to stay within its historic migration range and avoid the 120 and greater decibel noise levels, and **this is the most realistic case because it is based on actual noise measurements off the NJ coast.**

Using the 181 dB source level for the Vesta 236, 15 MW turbines Atlantic Shores proposes, in concert with a 15 dB noise spreading loss consistent past agency practice, and a seabed attenuation factors consistent with prior measurements of 0.35 dB /km, the 120+ dB zone extends 12 miles from the perimeters of the turbine projects in the NY/NJ Bight as shown below.

Figure 8 : Best Estimate of the Range of Noise above 120 Decibels from the Planned Wind Complexes based on NJ Continental Shelf Measurements



2. Higher Source level and Seabed attenuation of 0.9 decibels per kilometer (dB/km).

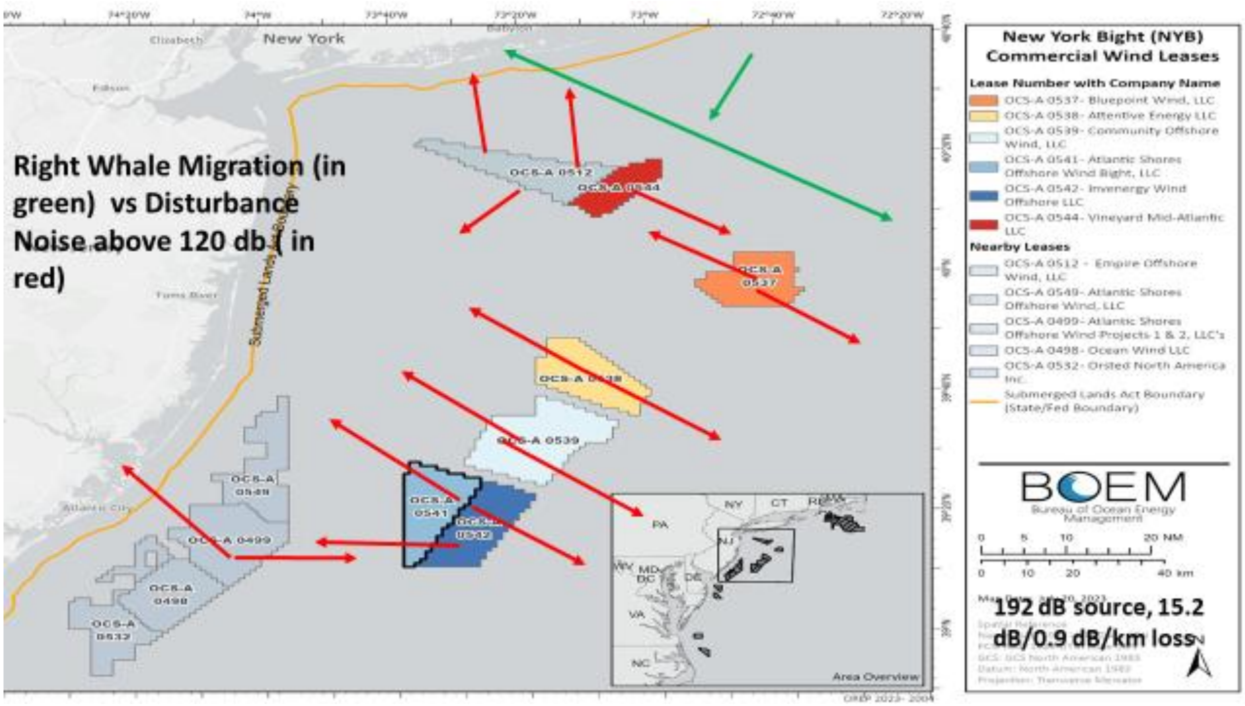
The case using the Stober estimate of 192.2 decibels for the source level, and the 0.9 decibels per kilometer for seabed attenuation, was also analyzed below.

Using equation (1) above with a 15.2 dB (the 0.2 accounts for sea water attenuation) spreading loss factor, would require 11.6 kilometers for the noise from one turbine to decrease to 120 decibels. But neighboring turbines also contribute to the noise level received at that point. The increase in noise level from the closest 34 turbines in the first three rows assuming they are spaced a mile apart was 12.1 decibels. That is essentially equivalent to having a single point source with an effective source level of 192.2 plus 12.1 equals 204.3 dB centered in the second row.

That requires 19.4 km or 12 miles from the complex perimeter for the noise to decrease to 120 dB. The same distance was assumed for all the wind complexes in the NY Bight area assuming they will use comparable size trubines and spacing.

The results are shown below. The green Line represents the range of the right whale’s primary historic migration. The red lines represent the distance from the wind complexes where the noise level will exceed 120 decibels. which will disturb the whales behavior and which it will likely try to avoid. It can be seen that there is barely any route the whale could take to stay within its historic migration range and avoid the 120 and greater decibel noise levels.

Figure 9; Estimates of Affected Range Based on Higher Stober Source Level and Lower BOEM Seabed Attenuation Number



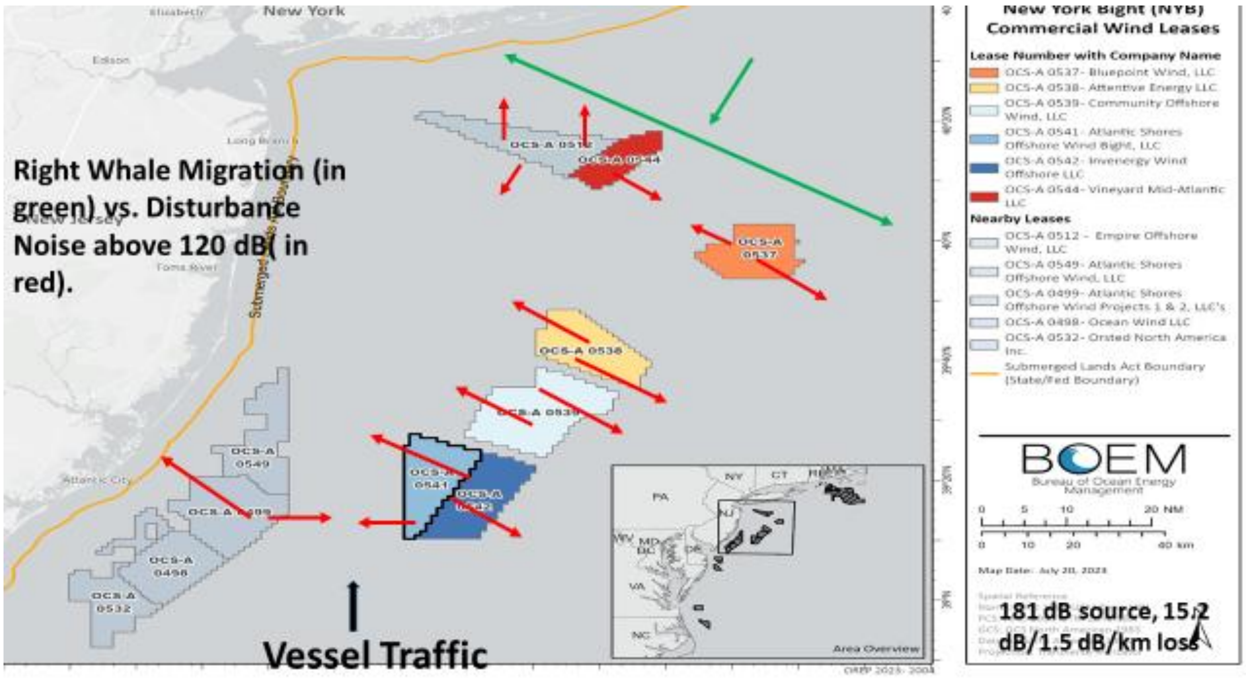
3. Lower Source level of 181 dB and High Seabed attenuation of 1.5 dB/km.

A third affected range, optimistic case with the more conservative Tougaard study predicted source level of 181 decibels and the higher seabed attenuation rate of 1.5 decibels per kilometer was also assessed as explained below.

In this case, again using equation (1) with a 15.2 dB spreading loss factor, it would require four kilometers for the noise from a single operating turbine to decrease to 120 decibels. The contribution from the closest 26 turbines in the first three rows was 8.3 dB. That is equivalent to an effective source level in the second row of 181+ 8.3 or 189.3 decibels, ***which requires a distance of 5.4 kilometers (3.4 miles) from the perimeter of the wind complex to decrease to 120 dB.***

That distance of 5.4 km is applied to all the projects in the New York Bight area, assuming that the turbines there will be similar to the Vesta-236 and spaced approximately a mile apart. The results are shown in the map below.

Figure 10; Estimates of Affected Range Based on Lower Tougaard Source Level and Higher BOEM Seabed Attenuation Number.



For this optimistic case, the affected range above 120 dB from the wind complexes is less, but there are still barely any routes the whale could take and avoid 120 dB level and higher noise.

The noise from the Atlantic shores project above 120 decibels extends to within six miles of shore within which the whale has rarely migrated.

Going in-between the Atlantic Shores projects and the Hudson South projects it must pass through a narrow 12-mile wide corridor. But that corridor will also be used by large commercial and military vessels that will likely not be allowed in the wind complexes, significantly increasing the risk of vessel strike. Use of that corridor will also expose the whales to cumulative noise exposure resulting in hearing loss as discussed further below.

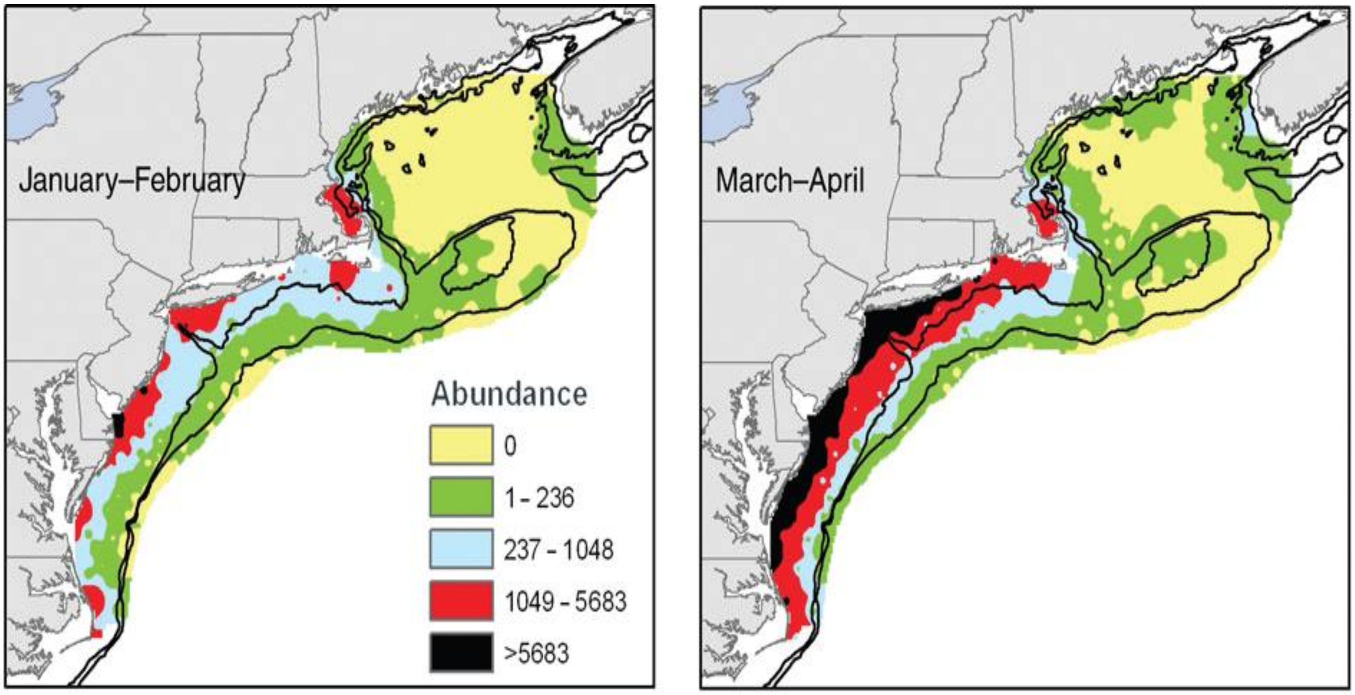
Going further out, it would have to travel beyond its historic migration range from shore.

3. The NARW Migration Route

The presence of endangered whales in and near the project area and the use of larger gearbox turbines poses a significant operational noise problem. The whale's historic migration routes intersect with the elevated noise from the planned wind projects.

As shown in the figures above the dominant migration corridor was within 60 miles of shore. That is probably due to the location of its primary food source, copepods, which is also within 60 miles of shore during the migration period, January through April, as shown in Figure 11 below [W39].

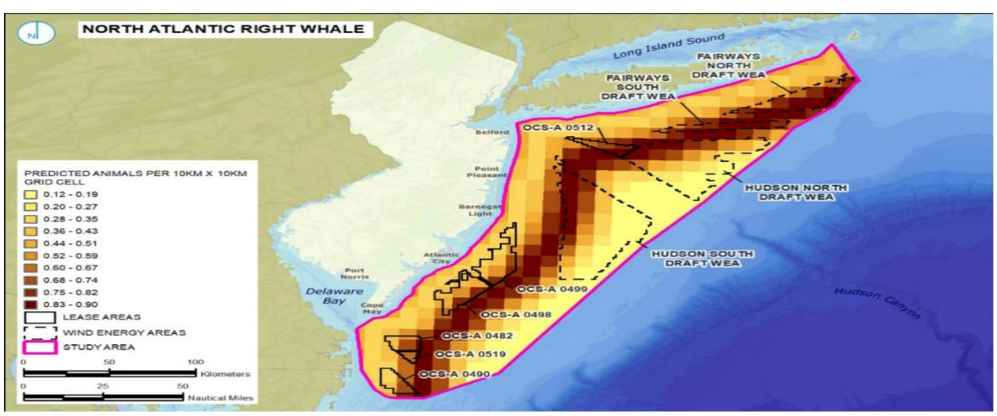
Figure 11. Copepod Distribution During the NARW Migration Period



That 60 mile limitation is confirmed by numerous observational studies as discussed below.

The proposed action would place turbines 9 to 20 miles offshore. Other development is planned about 32 to 57 miles out. One major right whale 12-mile-wide migration corridor, between 20 and 32 miles out was depicted in the New Jersey Strategic Plan of July, 2020. It showed the concentrated path below (in dark red) off New Jersey intersecting with and adjacent to this wind project area (see map below) [W1, W24]

Figure 12: Right Whale Primary Historical Migration Corridor-in purple



Source, NJ Offshore Wind Strategic Plan, Natural Resource Technical Appendix, Figure 21. Section 2.6.

The Atlantic Shores Offshore Wind project recently confirmed that intersection of the NARW migration with the project area in its recent 2022 Construction Take Application to the NMFS [W25], as shown below from Figure 9 in their Application.

The density maps there, shown below, for winter shows that the migration corridor intersects the project area and extends about 12 miles southeast of it. The density map for spring shows an even narrower migration corridor adjacent to the project area of about 5 miles.

Figure 13, Right Whale Migration Routes, Atlantic Shores ITA Application

Right Whale Migration- from Atlantic Shores Incidental Take Application for Construction

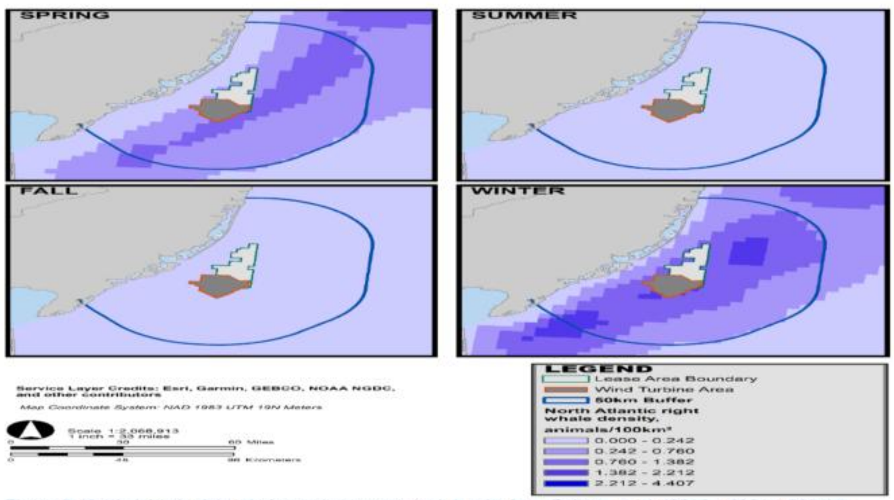


Figure 9. North Atlantic right whale maximum seasonal density from Roberts et al. (2016a, 2021a, 2021b).

That whale migration corridor uniquely goes between two wind energy development areas-the Atlantic Shores project and the Hudson South projects.

In particular, the critically endangered North Atlantic right whale migrates just off the lease area and that migration, and its continued existence is threatened by these turbines. Despite our prior comments on the NOI, and Robert's density data [W19] that is available to show it, the DEIS *did not disclose* the presence of the right whale's migration corridor intersecting with and adjacent to the lease area.

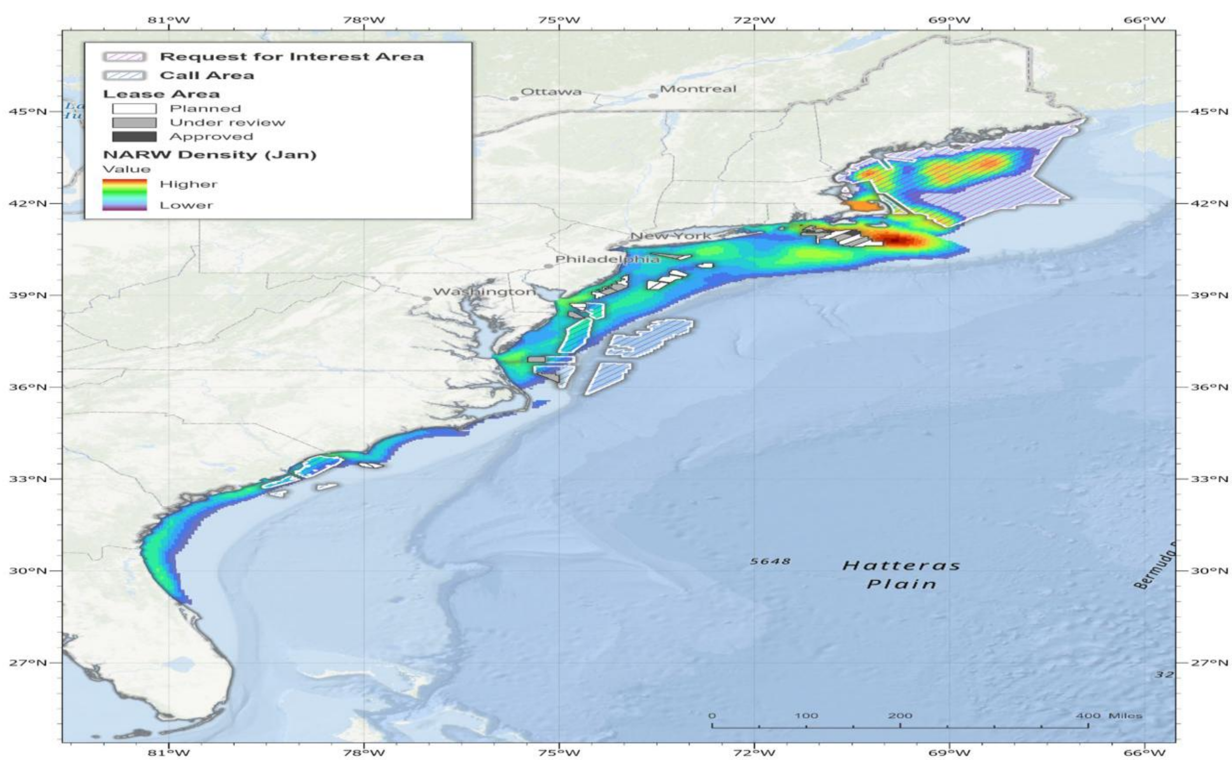
As far back as 2013 [W24] the authors there recommended that a critical habitat for the whale be designated out to 50 km (31.25 miles), not just based on migration but also on the right whale's presence at other times and apparent need to feed (see Fig 2 of that report showing presence in winter and spring). Their recommendation matches well with the outer edge of the 20 to 32-mile primary migration corridor that Save LBI has been using in our comments to the Bureau of Ocean Energy Management (BOEM) and the National Marine Fisheries Service (NMFS). Also, that Figure 2 shows right whale presence closer than 20 miles or 32 km (within, not just adjacent to the 9-20-mile-wide wind project area).

Those results are confirmed by 11 years of recordings (2004 -2014) from passive acoustic monitors along the U.S. east coast [W26]. Figures 3 and 4 of that study show a distinct presence during the winter migration period extending to about 25 miles offshore.

More recent right whale density data [W27] compiled by Duke University indicates that whales have been migrating closer to shore than the corridors shown above, a range of higher density from **6 to 13 miles.**

Other Duke University data [W28] shows migration further out, from about 40 to 86 miles, over the January through April period, **with the dominant part of it occurring within about 60 miles of shore.** That data is shown below for January in the Figure below.

Figure 14. Right Whale Migration- Intersection with Wind Energy Areas - January



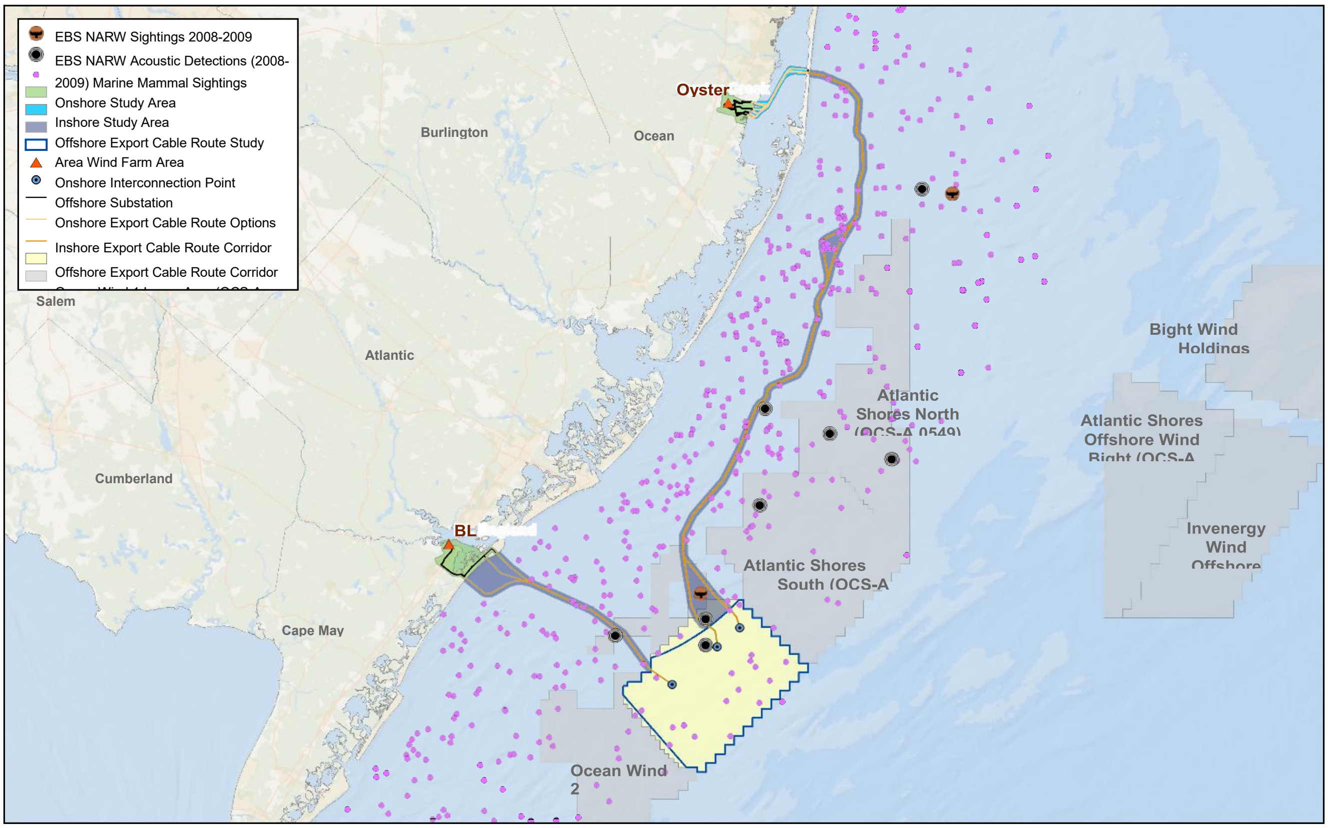
Source: BOEM/NMFS Right Whale Strategy Draft Document-January Density Map

Similar intersections of the whale's migration paths occur for other proposed wind energy projects along the east coast [W29, W30, W31, W32] as shown above in the Figure just above which was taken from the BOEM/NMFS Right Whale Strategy Draft

Document. That map also shows the predominant migration being with 60 miles of shore.

The map just below **currently** presented on the web by the BOEM for the Ocean Wind 1 Project, just south of this project, also shows significant NARW (and other marine mammal presence) in and near this lease area.

Figure 15. Right Whale Presence , Ocean Wind Project , BOEM



Based on a thorough review of available right whale density information [W1, W24, W25, W27, W28, W33, W34], migration has been observed between 6 to 86 miles, but there has been no significant right whale migration beyond 86 miles, and that distance appeared only in one source for one month, March [W27]. The predominant migration has occurred within 51 miles of shore.

The data below, extracted from those studies, supports that conclusion.

Table 1: NARW Presence, Ranges and Studies

Off the New Jersey Coast/from Barrier Islands (miles)

Time Period	Inner Zone	Outer Zone	Source /Comments
Annual	20-32		(4) NJ Strategic Plan, based on Duke University data, see Exhibit 9.
Jan Feb Mar April	6-14 6-23	29-38 34-46 34-46, 68-74 34-51, 57-68	(1a) Roberts, Duke University
Jan Feb Mar April	7-31 7-31 7-47 16-47	32-47 32-47 48-62 48-62	(1b) Duke University
Jan -Mar Apr- Jun	6-33 10-33		(5) Atlantic Shores Project Take Application
Jan Feb Mar April	9-31 9-31 9-31 9-31		(6) Whitt
Nov-Feb Mar-April	12-25 12-21		(2) Davis, Baumgartner
Nov-March	?-33		(7) Firestone
Jan -April 2022 Jan -April 2021	8-39 11-26	50-56	(11) whale map
Composite	**6-33**	**34-62**	

References

(1a) North Atlantic right whale v12 model overview (Version 12 considered preliminary by Duke) Duke University Marine Geospatial Ecology Lab, Durham, NC. Habitat-based Marine Mammal Density Models for the U.S. Atlantic: Latest Versions, 2015-2022, A Collaboration Led By Marine Geospatial Ecology Laboratory / Duke University, jason.roberts@duke.edu, tina.yack@duke.edu, phalpin@duke.edu. Updated June 20 2022. Version 12 - 2022-02-14 **Roberts et al. (2016a)**. Citation: Roberts JJ, Best BD, Mannocci L, Fujioka E, Halpin PN, Palka DL, Garrison LP, Mullin KD, Cole TVN, Khan CB, McLellan WM, Pabst DA, Lockhart GG (2016) Habitat-based cetacean density models for the U.S. Atlantic and Gulf of Mexico. Scientific Reports 6: 22615. doi: 10.1038/srep22615,**Roberts et al. (2016b)**, Citation: Roberts JJ, Mannocci L, Halpin PN (2016) Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2015-2016 (Base Year). Document version 1.0. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC, **Roberts et al.**

(2020) Citation: Roberts JJ, Schick RS, Halpin PN (2020) Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2018-2020 (Option Year 3). Document version 1.4. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC. **Roberts et al. (2021)**. Citation: Roberts JJ, Schick RS, Halpin PN (2021) Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2020 (Option Year 4). Document version 2.2. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC. **Roberts and Halpin (2022)**. Citation: Roberts JJ, Halpin PN (2021)

(1b) Duke University, Density of NARWs in U.S. waters, 2010-2019, Roberts et al, 2016, Roberts and Halpin 2022, from NMFS, BOEM draft NARW Strategy Document, October, 2022.

(2) Long-term passive acoustic recordings track the changing distribution of North Atlantic right whales (*Eubalaena glacialis*) from 2004 to 2014, Genevieve E. Davis, Mark F. Baumgartner, et al.

(3) https://www.researchgate.net/profile/Christopher-Clark-Charles Muirhead 10/publication/322898296_Seasonal_acoustic_occurrence_of_blue_fin_and_North_Atlantic_right_whales_in_the_New_York_Bight/links/5cdeb89ea6fdccc9ddb76764/Seasonal-acoustic-occurrence-of-blue-fin-and-North-Atlantic-right-whales-in-the-New-York-Bight.pdf

(4) Source, NJ Offshore Wind Strategic Plan, Natural Resource Technical Appendix, Figure 21. Section 2.6.3, Cetaceans Subgroup Inputs Cetacean subgroup figures display cetacean abundance data from the MDAT mammal abundance technical report from Duke University in: MARINE-LIFE DATA AND ANALYSIS TEAM (MDAT) TECHNICAL REPORT ON THE METHODS AND DEVELOPMENT OF MARINE-LIFE DATA TO SUPPORT REGIONAL OCEAN PLANNING AND MANAGEMENT Authors: Corrie Curtice, Date published: 24 June 2019 Project manager and point of contact: Jesse Cleary, Marine Geospatial Ecology Lab, Duke University, Durham, NC 27708 em: jesse.cleary@duke.edu ph: 919-684-3660 w: mgel.env.duke.edu Accessible from: http://seamap.env.duke.edu/models/MDAT/MDAT-TechnicalReport.pdf The individual species maps represent the results of distance sampling modeling methodology applied to over 20 years of aerial and shipboard cetacean surveys, linked with remote sensing and ocean model environmental covariates. Cetacean models were created for the entire US East Coast and southeast Canada. The data was provided by the MDAT as a grid consisting of 10 km x 10 km cells.

(5) Atlantic Shores Offshore Wind Application for Marine Mammal Protection Act (MMPA) Rulemaking and Letter of Authorization Prepared by: JASCO Applied Sciences (USA) Inc. September 2022 Submitted to: Permits and Conservation Division, Office of Protected Resources, NOAA Fisheries, Figure 9. North Atlantic right whale maximum seasonal density from Roberts et al. (2016a, 2021a, 2021b).

(6) North Atlantic right whale distribution and seasonal occurrence in nearshore waters off New Jersey, USA, and implications for management Amy D. Whitt*, Kathleen Dudzinski, Jennifer R. Laliberté Geo-Marine, Inc., 2201 K Avenue, Suite A2, Plano, Texas 75074, US

(7) Statistical modeling of North Atlantic right whale migration along the mid-Atlantic region of the eastern seaboard of the United States, Jeremy Firestone et al. Biological Conservation, Volume 141, Issue 1, January 2008, Pages 221-232.

(8) Right whale occurrence in the coastal waters of Virginia, U.S.A.: Endangered species presence in a rapidly developing energy market DANIEL P. SALISBURY, CHRISTOPHER W. CLARK, and AARON N. RICE, 1 Bioacoustics Research Program, Cornell Lab of Ornithology, Cornell University, Ithaca, New York 14850, U.S.A. Ab

(9) Annual Report 2015: Passive Acoustic Monitoring for North Atlantic Right Whales at Cape Hatteras, North Carolina, Using Marine Autonomous Recording Units, October 2014 – March 2015, Duke University Marine Lab, submitted to NAVFAC, February 1, 2016.

(10) North Atlantic right whale occurrence near wind energy areas along the mid-Atlantic US coast: implications for management Kristin B. Hodge1, Charles A. Muirhead1, Janelle L. Morano1,

(11) Whalemap.org, confirmed sightings and acoustic detections. *Johnson H, Morrison D, Taggart C (2021). Whale Map: a tool to collate and display whale survey results in near real-time. Journal of Open Source Software, 6(62), 3094, https://joss.theoj.org/papers/10.21105/joss.03094*

(12). Bureau of Ocean Energy Management (BOEM) Report # 5586, Investigations of the potential effects of underwater noise from petroleum industry activities on migrating gray whale behavior, phase 2 January 1984 migration, Nyack et al.

(13) Letter to President Biden from Save LBI, February 15th,2023

This is essential information necessary to reach a reasoned conclusion on the severity of the impacts of this project, and the EIS should have presented the Robert's density data for the right whale in the area for each month in map form which is already readily available. The EIS also does not clearly show that endangered fin and humpback whales frequent the inner part of the project area, distances out to 11.5 miles (Exhibit C).

The Recent NARW Presence Changes Presented.

The proposed rulemaking for authorizing construction of the Atlantic Shores South project dramatically lowers local area densities for the NARW compared to what was presented in the Atlantic Shores application of September 9th 2022. In fact, for the primary migration months, the NARW densities in the rulemaking update are only 10 percent of what was reported in the Atlantic Shores LOA just a year ago as shown below. Yet, despite this dramatic change, the proposed rulemaking neither explains why the densities are lower nor provides any scientific evidence in support of the much lower density figures.

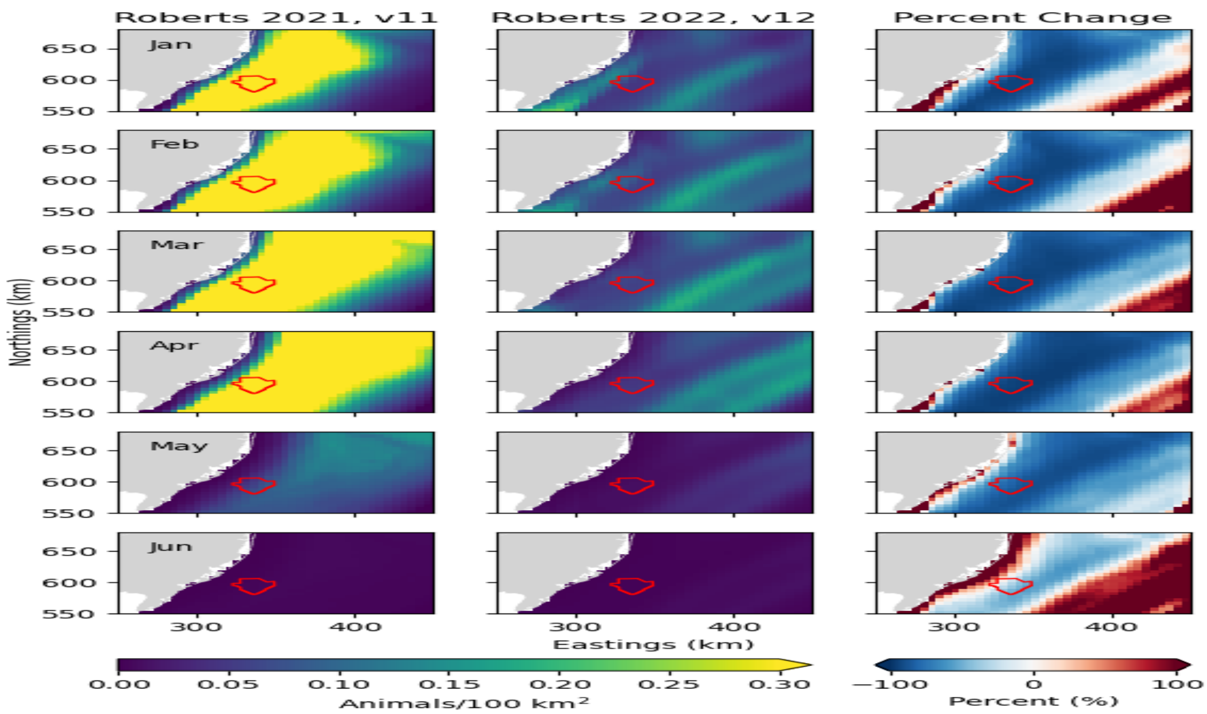
Table 2: Right whale Densities in the Project Area, Animals/100 km^2

	Dec	Jan	Feb	Mar	Apr	May

Atlantic Shores, LOA Application, 09/2022	0.275	0.562	0.628	0.686	0.607	0.059
Update for Rulemaking, June 2023	0.042	0.069	0.074	0.062	0.046	0.010

The most recent density changes are presented in graphical form in Section 7 of the Jasco Atlantic Shores Offshore Wind Updates to the Application for MMPA Rulemaking and letter of Authorization dated June 21, 2023, as shown below.

Figure 16, Recent NARW Presence Changes, Proposed Rule.



The new densities now show the whale avoiding the project area. These dramatic ten-fold density decreases raise serious doubts as to the scientific credibility of the rule making for estimating NARW densities. The credibility of this change is in question because **the new densities are too low and area constricted to depict the whale's migration.**

In the graph above, for the primary NARW migration months of January through April, the new density model, Version 12, replaces a wide, closer to shore corridor of high density, the yellow area above, previously about 0.3 animals per square kilometer (km^2), with narrower green areas of lesser density, about 0.15 animals per km^2. The width of the green areas is about half the width of the yellow area. This suggests that the overall number of whales migrating is now one-fourth of what it was, one-half due to density reduction and one-half due to corridor width reduction. The third column's percent density increases farther offshore do not offset this because they are measured from very low densities. The new densities therefore suggest a 75 percent reduction in the number of NARW migrating. No such reduction has been put forth in the rule-or by anyone else as far as we know.

The new densities of New Jersey do not represent the number of whales migrating. From the density maps off of New England and Canada from January through April, it appears that about two-thirds of the population remains there, while one-third of the population migrates, about 116 animals. The green areas in the new density maps in the second column above account for about two whales in those areas at a given time. With documented [W35] median swimming speeds of 1.2 kilometers per hour and travel periods of 16 hours per day, the new green area densities **would account for about 50 whales passing through** those areas in January and February, which we assume comprises the bulk of the southern migration. **This is far less than the expected number of about 116.**

The failure of the new NARW density data to reasonably represent the actual NARW migration disqualifies their use here.

On the other hand, the "old" yellow density areas in the first column above show a whale presence of about 24 whales at a given time. *Again, with reasonable swimming speeds and travel periods those densities would account for about 103 whales migrating which is much more representative of the expected 116 number.*

Duke University Recommendations. The recent underestimates the NARW presence in December by using an unsupported and unexplained low "density" number of 0.042 animals per 100 square kilometers**.** The new NARW density numbers shown above in Table 2 are now inexplicably one-tenth of what they were just a year ago in the project's application for Marine Mammal Protection Act (MMPA) approval.

That **contradicts** the density maps for 2010 to 2019 recommended for use by Duke University in its new Version 12 Density Modeling Report, shown below in Figure 17.

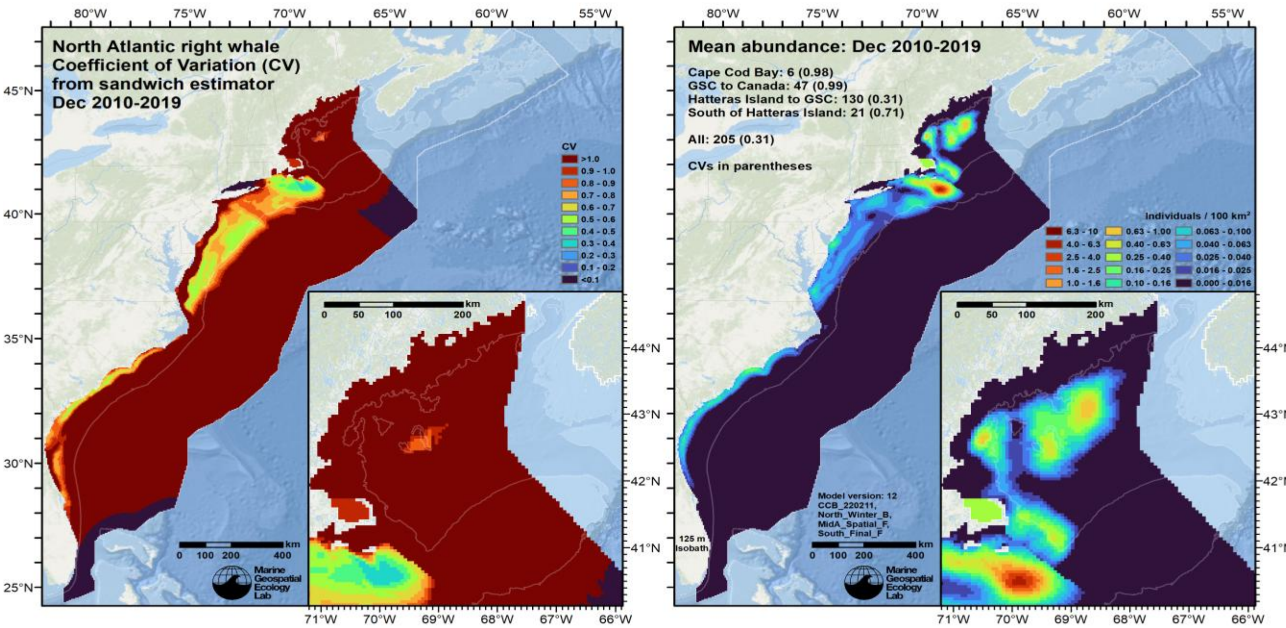
The Duke University Report [W40], in Section 6.4 titled Management Applications, states that:

"most management applications, such as agency rule-making, and permitting are based on an assumed future distribution of right whales. Given that explicit forecasts of future density are not yet available , Managers usually opt to rely on the recent past as a proxy for the near future .accordingly **we recommend our density maps for the 2010 to 2019** era (spanning October 2010 through September 2020) be used for this purpose".

The map for December shown again below shows the whales migrating right through the project area. The densities there in the project area from the Duke University map for December range from 0.16 to 0.26 animals per 100 square kilometers, **4 to 6 times what the BO assumed.**

In addition, the coefficient of variation map to the left for December shows significant uncertainty in the estimate. Taken together, a proper conservative December density number would be closer to the 0.275 estimate in the Atlantic Shores application, **which is 6½ times what the BA and BO have used.**

Figure 17. Duke University Recommended right whale Density Map for December.



4. The Impact on the Whales from the Operational Turbine Noise

As shown above the operational turbine noise levels above the whale disturbance criterion of 120 dB from the Atlantic Shores project and the other planned projects farther offshore will span the entire width of the right whale's historic migration routes, making it extremely difficult if not impossible for the whale to migrate through. The reaction of the whale to that noise is discussed in more detail below.

Paths to Harm and Fatality from Disturbance.

The potential for direct hearing loss. should the whale attempt to navigate in between the Atlantic shores project and the neighboring ones in the Hudson South area is discussed below. But injury and fatality to marine mammals from noise can come from other ways besides hearing loss.

In the rulemaking for the Atlantic Shores project under the Marine Mammal protection Act the NMFS does not account for the potential for such harm and fatality from the results of Level B exposures, and therefore does not present a full and complete Level A take number. Rather, it estimates and separates Level A injury from Level B disturbance. But in both the regulatory and the real whale world that distinction is not present, and level B disturbance exposures can indirectly lead to worse injury and fatality outcomes.

Under the MMPA, a Level A incident or "take" includes any annoyance that has the "potential to injure" a marine mammal. That linkage is also presented in the December 21, 2016, NMFS interim guidance, defining the term "harass," under the Endangered Species Act (ESA), as to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering".

Therefore, any assessment of harm and fatality should include the linkage from reactions to level B exposures to create the "potential to injure" or the "likelihood of injury" with a level of analyses comparable to that given to direct Level A injury take from hearing loss.

With the use of realistic noise source and noise transmission loss numbers, as shown above turbine operational noise above the continuous noise disturbance level will extend across all of the right whale's approximately primary 60- mile-wide migration corridor. Under the setting here of a critically endangered whale attempting to complete a migration that is essential to its survival through a No. migration corridor that could now be blocked, that "potential to injure" or to "create the likelihood of injury" certainly exists from a number of possible results of a level B exposure including:

A. Migration Blockage

The most obvious serious impact to the right whale would be the blockage of its migration. Although there is debate within the scientific community as to what reactions disturbance level noise will cause, there is general consensus that most baleen whales encountering an elevated noise level will seek to avoid or standoff from it [W23, W36].

As shown above, such elevated levels will exist continuously from turbine operation across most, if not all, of the right whale's traditional migration corridor. Unless there is a new farther out route that the whale can and will take, wind project development in both the Atlantic Shores project area and the New York Bight areas will likely block its migration and spell its extinction.

B. The Masking of Whale Communications that Could Lead to Serious Injury or Death.

One path to such injury involves separation of calves from mothers as a result of masking of their communication from elevated noise levels. Such communications can employ low-amplitude signals susceptible to masking as discussed in the report, Acoustic crypsis in communication by North Atlantic right whale mother–calf pairs on the calving grounds, Susan E. Parks, Dana A. Cusano[†], Sofie M. Van Parijs and Douglas P. Nowacek, Published 09 October 2019.

The right whale's vocalizations are normally at the 125 dB root mean square level for low background noise, but can rise to 150 dB in the presence of high background noise (Parks et.al., The Royal Society, Individual right whales call louder in environmental noise, July 7, 2010).

The potential for loss of mother/calf communication was presented in, Acoustic propagation modeling indicates vocal compensation in noise improves communication range for North Atlantic right whales, Jennifer B. Tennessen, Susan E. Parks, June 15, 2016.

Even with the conservative turbine noise source level of 181 dB the noise level anywhere within the turbine complex (in just a 4 –turbine array spaced a mile apart) will be greater than 141 dB. Therefore, much of the whale's vocalizations in the 125 to 150 dB range will be masked there. In addition, as shown above. levels above 120 decibels will exist considerable distances from the. wind complex, masking communications there as well.

Masking of its communications risks the separation of females from calves during migration [W13, W14] resulting in a calf fatality.

C. The Masking of Sounds Potentially Used by the Whale to Navigate.

The right whale's echolocation capability is unclear. But baleen whales probably do navigate by sound. Low frequency and infrasound are given off by potential obstacles, geologic formations and breaking waves. There may be several of these sounds at a given point so the whale can triangulate its position. If those signals are masked by those from offshore wind projects the whale will lose its ability to find and follow its traditional migration paths [W16]. That could impair or prevent its migration, and spell its extinction.

It also appears that their migration is aided by their capability to communicate with each other along the way. The the masking of those communications will further impair its migration.

D. Increased Risk of Vessel Strike.

A level B exposure can cause whales to ascend, and swim just below the surface where they are more susceptible to vessels strike, not just from construction-related vessels, but from other vessels as well. This behavior has been demonstrated experimentally by Nowacek et al in the paper titled, North Atlantic right whales ignore ships but respond to alerting stimuli, The Royal Society, May 20, 2003 [W5].

The proposed use by the Coast Guard (BG2) of the right whale's migration corridor in between the Atlantic Shores project and the projects in the Hudson South area as a new deep draft vessel lane , and the channeling of ship traffic into it would significantly increase the risk of vessel strike once it ascends.

E. Stranding.

As stated above the whales navigation ability may be impaired [W16], while trying to find a noise open route to continue its migration. Whales seeking to avoid the noise by going closer to shore risk stranding because, as shown in the maps above, the elevated noise levels above 120 dB from the close-in Atlantic Shores project will follow them all the way to shore, or at least to within 6 miles of shore where it has not previously migrated- see Table above.

F. Feeding Loss.

The right whale must have a reason for traditionally not migrating farther out than 60 miles. If that involves feeding opportunity, then that opportunity will be lost if it attempts to migrate farther out. The whale may therefore be disrupted from foraging and lose the energy it needs to complete its migration

G. Stress

Reactions to above Level B noise exposures could involve stress and distress [W12]. 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.

Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity, have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

Neuroendocrine stress responses have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance. During a stress reaction, if an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other normal functions, leading to distress situation. This state of distress will last until the animal replenishes its energetic reserves sufficient to restore normal function. Studies in the Bay of Fundy found that noise reduction from reduced ship traffic was associated with decreased stress in North Atlantic right whales leading to a reasonable expectation that some of its normal functions, including its migration, could be impaired from higher level exposures.

Hearing Loss

In addition to the above impacts a whale would suffer permanent and temporary hearing loss migrating in between the Atlantic Shores project area and the farther out lease areas.

Consider a whale approaching the 12-mile wide migratory corridor between the project area and the lease area OCS A-0541 in the Hudson South area. In an effort to continue its migration, it might tolerate the noise disturbance and continue its 13-mile, 16-hour journey (@1.3 km/hr.) past the full Atlantic Shores project complex.

For case 1 above, with an effective source level from neighboring turbines to the one closest to the whale at a given time of 193 decibels centered 1.6 kilometers back from the perimeter, the noise level at a distance X from the project perimeter would be.

Noise Level = 193 dB – 15 $\log_{10}$(1,600+ X in meters) -0.35 x (1.6 +X in km).

But it would incur additional noise exposure during the passage of the wind complex of 10 $\log_{10}$(16 hrs x 3600 sec /hr) = 47.6 dB.

The cumulative noise energy experienced by the whale as a function of distance from the perimeter is shown in Table 3 below.

Table 3. Cumulative Sound Energy vs. Distance from Perimeter

Distance (X) from the perimeter in miles	SEL at Distance X (dB)	Contribution from Time of passage(dB)	Total Sound Exposure Level (dB)
1	139.4	47.6	187
2	136.1	47.6	183.7
2.25	135.5	47.6	**183.1**
4	131.7	47.6	179.3
6	128.38	47.6	176
12	121	47.6	**168.6**

From the Table, it can be seen that the 183 dB noise energy threshold for **permanent hearing loss** is exceeded at distances **less than 2¼ miles** from the perimeter.

A whale attempting to go into the wind complex in between two rows of turbines spaced 0.6 nautical miles apart would encounter a sound pressure level of 181-15 $\log_{10}$ 531 or 140 dB (seabed attenuation not a factor at these distances). Adding to that the 47.6 dB from the time of exposure results in a total cumulative energy received **of 187.6 dB which clearly exceeds the level for permanent hearing loss**.

The cumulative sound exposure level of **168.6 dB** at 12 miles from the perimeter or across the entire 12-mile-wide migration corridor would exceed the NMFS SEL criteria of **168 dB for temporary threshold shift hearing impairment [W11]**. Since the right whale is believed to navigate by reception of noise signals, this would greatly impair its ability to continue its migration.

As shown in the first column of Table 3 above, for Case 1 the SPL is above 120 dB **within 12 miles** of the project perimeter. On the seaward side this covers the entire width of its historic migration corridor.

So, in addition to the risk of suffering permanent hearing loss traveling within 2.25 miles of the project perimeter, the **whale can suffer temporary hearing loss and have its behavior disturbed throughout its migration corridor creating major obstacles, perhaps insurmountable ones, to its ability to migrate**.

The Right Whale's Precarious Status

The numbers of NARW are already very low at 366 animals and in steep decline- Exhibit A. There are less than 94 females of reproductive age left. The NMFS 2020 stock assessment report for the NARW shows an average per female productivity rate of 0.06 for the years 2013 to 2017. It also shows (in its Figure 2a) an average female population of 180, leading to 11 average births per year. Table 2 shows estimated human caused fatalities at an average of 18.6 per year for that period.

According to the International Fund for Animal Welfare [W10], over the past five years from 2016 through 2020, 17 whales died on average per year from human actions. During that same period 7 whales were born on average per year.

Clearly, with a human caused death rate (not including natural mortality) about twice the birth rate and a net loss of 8 to 10 whales per year, current mitigating and recovery measures are not sufficient to protect the whale, and any additional serious injury or fatality would "jeopardize" it under the meaning of that word which is to put (someone or something) into a situation in which there is the possibility of suffering loss, harm, injury or failure.

Therefore, the only sensible and scientifically credible criterion for the NMFS to adopt for the right whale is one of zero tolerance for any fatality or serious injury during its migration from operational turbine noise. Given the noise levels and. Multiple opportunities for harm and fatality described above that criteria cannot be met with wind energy development in both the Atlantic Shores project area and the farther out New York Bight project areas.

5. Conclusions Regarding NARW Migration, Harm and Fatality from Turbine Operational Noise.

The noise levels described and shown above as the red lines in the first map for a 0.35 dB/km attenuation loss represents the most reliable estimate. It creates a “wall” of noise across the turbine complexes and the whale’s migration corridor, likely blocking it.

It will be extremely difficult for the whales to avoid that expanse of elevated noise and continue their migration. Attempting to do so could expose them to high cumulative sound exposures and hearing loss, loss of communication between and separation of females from calves, stranding, and loss of their navigational abilities.

The noise spreading loss and seabed attenuation factors are critical to the analysis. The factors being employed by the. federal agencies in their noise exposure modeling must be disclosed and justified.

Wind projects in both the close-in Atlantic Shores lease area and the Hudson South area leave no path for the right whale to migrate off New Jersey, the federal agency must chose one, it cannot have both.

Mitigating measures involving detection and turbine shut down are not viable for the large noise influence zones and electric producing operation here, leading to the need to re-consider this lease area as unsuitable for large turbine placement.

There will be a similar impact on the right whale from other projects up and down the East Coast, wherever their migration route intersects an elevated noise area, and the cumulative impact on their migration also needs to be addressed .

The Impact of Operational Turbine Noise on Fin and Humpback Whales.

The DEIS mentions that fin and humpback whales frequent the area of the project, but does not present an analysis of the impact of operational turbine noise on them. That noise could force fin and Humpback whales dangerously close to shore, as summarized below, and must be addressed.

The inner side of the project area is frequented by endangered fin and humpback whales out to distances of 11.5 miles (Exhibit C). Project area sited turbines would generate elevated noise levels above 120 dB all the way to the shore, and would force these whales towards shore to try to avoid it, potentially causing beach stranding.

Given all the above and noting that detection and shut down procedures are unreliable for the noise reduction distances and the electricity need for turbine operation here[W8], there is no place in this lease area for turbine placement that is compatible with protecting the right whale’s migration, or preventing fin and humpback whales from being driven to shore**.**

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Addendum A: Use of the 15 dB Spreading Loss Factor

The use of the 15 dB noise transmission spreading loss factor would be consistent with the NMFS approach used and described fully as "common practice" for coastal waters in the NMFS's ITA rulemaking of December 15, 2021 titled, Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to U.S. Navy Construction at Naval Station Newport in Newport, Rhode Island. In that rulemaking document, NMFS stated that,

"SOUND PROPAGATION. Transmission loss (TL) is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. The general formula for underwater TL is

$$TL = B * \log_{10} (R_1 / R_2),$$

Where
B = transmission loss coefficient (assumed to be 15)
R_1 = the distance of the modeled SPL from the driven pile, and
R_2 = the distance from the driven pile of the initial measurement.

This formula neglects loss due to scattering and absorption, which is assumed to be zero here. The degree to which underwater sound propagates away from a sound source is dependent on a variety of factors, most notably the water bathymetry and presence or absence of reflective or absorptive conditions, including in-water structures and sediments. Spherical spreading occurs in a perfectly unobstructed (free-field) environment not limited by depth or water surface, resulting in a 6 dB reduction in sound level for each doubling of distance from the source (20*log(range)).

Cylindrical spreading occurs in an environment in which sound propagation is bounded by the water surface and sea bottom, resulting in a reduction of 3 dB in sound level for each doubling of distance from the source (10*log(range)).

As is common practice in coastal waters, here we assume practical spreading (4.5 dB reduction in sound level for each doubling of distance). Practical spreading is a compromise that is often used under conditions where water depth increases as the receiver moves away from the shoreline, resulting in an expected propagation environment that would lie between spherical and cylindrical spreading loss conditions. Practical spreading was used to determine sound propagation for this project".

Bold emphasis added. Note also that a 4.5 dB doubling distance is equivalent to using a 15 dB loss factor, "B", and in the equation above and R_1 is one meter (m)**.**

Applying a higher dB loss factor would not be consistent with the 15 dB loss factor presented above that was used by NMFS in approving a request from its parent agency, the National Oceanic and Atmospheric Administration (NOAA), for authorization to take marine mammals incidental to the NOAA port facility project in Ketchikan, Alaska as recently as December 1, 2021.

Regarding the Navy construction at Newport, Rhode Island and the NOAA construction in Ketchikan, Alaska, the NMFS says in its response to our comments on the Ocean Wind and Atlantic Shores surveys that these activities are not relevant to the noise surveys at hand because they occur in less than 10 meter depths. The depths at hand are often about twice that but that is not enough to significantly affect the decibel acoustics.

The NMFS also states that the pile driving activity associated with those projects produces sound with higher frequency and shorter wavelengths than the noise sources being employed here-making them more amenable to the 15 dB factor. While pile driving activities do produce some noise energy at higher frequencies about 75 percent of the noise spectrum is still below the two-thousand Hz frequency level which is of interest here. That is shown in a report done by Jasco Applied Sciences of July 21, 2017 titled Acoustic Modeling Study of Underwater Sound Levels from marine pile driving in southeast Alaska, which contains results specifically for the Ketchikan facility (See Figures 1 through 5 on page 12 and Figure 10 on page 17). Therefore, that approval is relevant to the noise surveys here.

The 30-inch diameter piles modeled in that study (Table 1) are also similar to those used in the Naval construction action in Newport, Rhode Island (See Table 2 of the

Federal Register notice of October 13, 2021 titled Take of Marine Mammals Incidental to Specified Activities; taking marine mammals incidental to U.S. Navy construction at Naval Station Newport in Newport Rhode Island). Therefore, that approval is relevant to the noise surveys here.

In its response to comments on the Ocean Wind and Atlantic Shores surveys (FR Notice, Vol. 87, No. 93, May 13, 2022) the NMFS states that the wave length of the sound emitted relative to the water depth should be considered in determining these transitions. It states that for sounds in the thousands of hertz (cycle per second) range, the wave length is short and spherical spreading could extend further. That is correct if the relevant wave length (sound speed /frequency) is much smaller than the water depth.

But here with respect to the right whale, we are interested in frequencies less than 1000 hertz (Hz) which are thought to be its primary hearing range (See Parks, SE, Clark CW. 2007. Acoustic communication: Social sounds and the potential impacts of noise. In: Kraus SD, Rolland R, editors. The Urban Whale: North Atlantic Right Whales at the Crossroads. Cambridge, Massachusetts: Harvard University Press. p. 310-332).

Further, based on analysis of vocalizations the right whale's estimated band of maximum hearing sensitivity is 100 to 400 Hz (See Short- and long-term changes in right whale calling behavior: The potential effects of noise on acoustic communication. The Journal of the Acoustical Society of America 122, 3725 (2007), Susan E. Parks and C. W. Clark.

For the highest frequency in that range (shortest wave length) the wave length would be about 1700 meters per second (sound speed in water) divided by 400 cycles per second or 4.25 meters, which is not small relative to water depths less than 15 meters. Therefore, wavelength is not a major factor here as regards the right whale and the use of the appropriate 15 dB noise loss factor.

The use of a different spreading loss factor here would not be consistent with the 15 dB factor NMFS used very recently on February 8, 2022 to justify the "Taking of Marine Mammals Incidental to Kitty Hawk Wind Marine Site Characterization Surveys, North Carolina and Virginia" which used similar sound survey devices. The use of a 40-43 dB factor here is not consistent with the Bureau of Ocean Energy Management's (BOEM's) cited factor of 15 dB for use in the Practical Spreading Loss Model for pile driving in its report titled, A Parametric Analysis and Sensitivity Study of the Acoustic Propagation for Renewable Energy, OCS study, BOEM 2020-011,

It would not be consistent with NMFS's own previous recommendation in 2012 cited in that Report on page 30 for use of a 15 dB loss factor. In fact, that same report shows that the use of the 10 Log r formula, i.e., even less transmission loss than the 15 dB factor, compared better with real or simulated measurements (See Figure 3.2 on page 31). So even the practical spreading loss formula may overestimate transmission loss.

The use of a different dB spreading loss factor here is not consistent with the method used by Tetra Tech Inc. for the Dominion Wind Energy Project as discussed in the report titled, Underwater Acoustic Modeling Report Virginia Offshore Wind Technology Advancement project, December 2013. In that report, Tetra Tech only uses the 20 dB factor out to the water depth distance. Tetra Tech then uses the lesser 15 dB factor from there to eight times the water depth, and beyond that uses a 10 dB factor.

The use of a higher dB spreading loss factor here would be very far from the more conservative "worst case" formulas used by an Atlantic Shores noise specialist consultant, Pangea Subsea (Report 04563-1) in the Atlantic Shores application for incidental harassment authorization of December 15, 2021. Formulas 7 and 8 of that report only use a 20 dB loss factor from 1 m to 3.5 m, and a 10 dB coefficient beyond that.

A significantly higher dB noise spreading loss factor is far from the effective transmission loss factor of 16 dB that reflects the distance to criteria results in the BOEM's own Atlantic Geological and Geophysical Activities Programmatic Environmental Impact (EIS) statement of March 2014. Using the above formula for transmission loss, that "effective" 16 dB value can be calculated from the radial distances (about 1750 meters) required to reach 160 dB in Table D-23 of the EIS for the four shallow depth scenarios 20, 26,30 and 34, and the representative source noise level of 212 dB for boomers (modeled as similar to sparkers) and sparkers, in Tables D-6 and D -13 respectively.

The use of a dB noise spreading loss factor here is not consistent with field measurements. A comparison of modeled transmission loss with actual measurements by Thompson et al. in the report titled, Effects of Offshore Wind Farm Noise on Marine Mammals and Fish, dated July 6, 2006, found that for pile driving events with frequencies less than 1000 hertz, the 15 dB loss factor was the best approximation of transmission loss for shallow North Sea and Baltic waters, and other settings comparable to this survey area, pages 15-16.

The use of the 15 dB noise spreading loss factor has also been recommended by the Marine Mammal Commission and its letter to NMFS of September 21, 2015 on impact pile driving at the Kodiak Ferry Terminal project in Alaska, and in its letter of January 23, 2020 regarding impact pile driving during the construction of a new petroleum and cement terminal in Anchorage, Alaska.

Measured noise levels versus distance in Figure 6 of the report titled "Underwater noise emissions from offshore wind turbines", 2005, Klaus Betke also show a match with a 15 dB spreading loss rate. The BOEM report titled "Effects of Noise on Fish, Fisheries, and Invertebrates in the U.S. Atlantic and Arctic from Energy Industry Sound-Generating Activities" recommends a default factor of 15 dB on page B-50, and shows a match of root mean squared(rms) measured noise results on page B-51 with a factor of 16 dB, close to the 15 dB factor
.

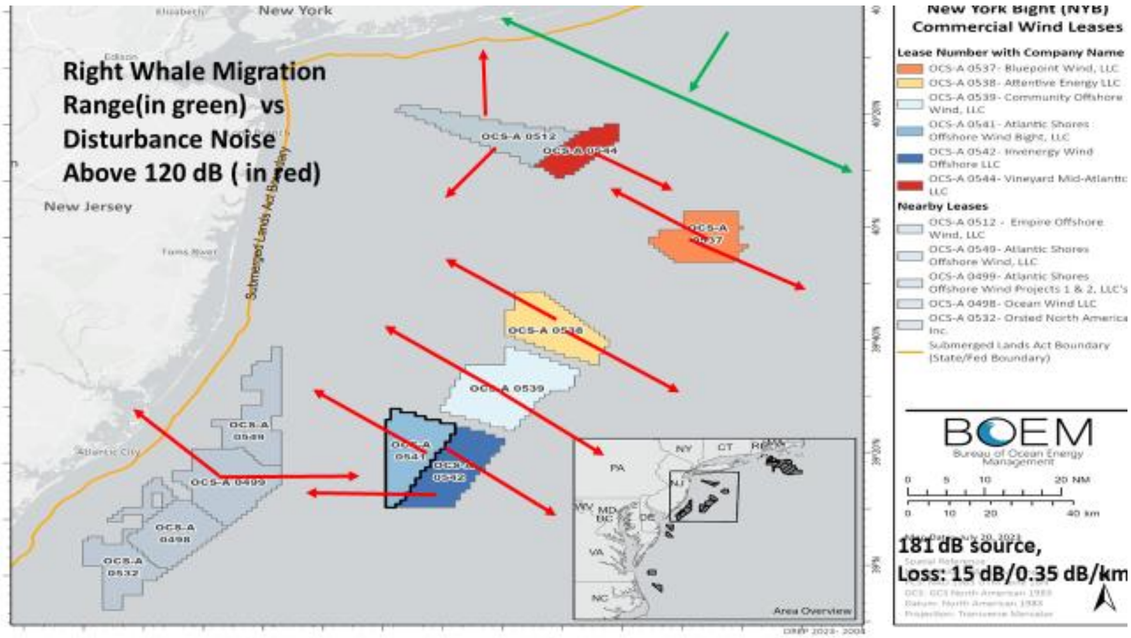
A number of other studies use the 15 dB spreading loss factor such as the recent analysis by Stober et al. estimating larger turbine noise source levels titled, How Could Operational Underwater Sound from Future Offshore Wind Turbines Affect Marine Life, March 15, 2021, and the recent study on passive acoustic monitoring (PAM) detection probabilities titled, Pam Guard Quality Assurance Module for Marine Mammal Detection using Passive Acoustic Monitoring, CSA Ocean sciences Inc., August, 2020.

Without a cogent physical and scientific explanation (not just an overview of model names and general descriptions), it is very difficult to see how noise spreading and dissipation well beyond even spherical spreading is being achieved. The parabolic equation method stated briefly in Section E.4 of the Application appears to have been originally designed for very large distances, 50 to 60 km, and the deeper ocean, 4 to 5 km deep, (Fred D. Tappert, The Parabolic Approximation Method, 1977, the Courant Institute of Mathematical Sciences. In the absence of such an explanation, the NMFS's and the BOEM's own previously stated preference for the 15 dB noise spreading loss factor in coastal waters should be employed.

Operational Noise

Notwithstanding the EIS and BiOP insistence on citing lower noise levels for smaller turbines, the final EIS essentially confirms this higher level. On page 3.5.6–44, it states that: "Larger turbines do produce higher levels of operational noise, and the least squares fit of that dataset would predict that an SPL measured 328 feet (100 meters) from a hypothetical 15 MW turbine in operation in 22 mile per hour (10 meter per second) wind would be 125 dB re 1 µPa (Tougaard et al. 2020)." Backing that 125 dB number up from 100 meters to the source at 1 meter using the Tougaard transmission loss numbers results in a source level for a single turbine of 172.4 dB, getting closer to the plaintiff's 181 dB number. The Tougaard "dataset" was for all foundation types, had that least squares fit been done just for the monopile foundations to be used here, it would likely have duplicated the plaintiff's source level number.

Using the 181 dB source level for the Vesta 236, 15 MW turbines Atlantic Shores proposes, in concert with a 15 dB noise spreading loss consistent past agency practice, and a seabed attenuation factors consistent with prior measurements of 0.35 dB /km, the 120+ dB zone extends 12 miles from the perimeters of the turbine projects in the NY/NJ Bight.



The red lines overlayed on the BOEM wind lease areas below denote the 12-mile distances from the center perimeters of the turbine projects, i.e., the region ensonified by disturbance level noise (120+ dB). The green line represents the NARW's historic migration range from shore. As such, the NARW's migration will be obstructed and potentially blocked by this noise.

This is noise which is likely to obviate the NARW from migrating effectively through the NY/NJ Bight. It will be extremely difficult for the whales to avoid that expanse of elevated noise and continue their migration. Attempting to do so could expose them to high cumulative sound exposures and hearing loss, loss of communication between them, separation of females from calves, strandings, and loss of their navigational abilities.

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ENCLOSURE 3

Systemic Underestimation of Level A and B Take Numbers

February 18, 2025

To the Secretaries of Interior and Commerce:

Douglas Burgum, Secretary
Department of the Interior
1849 C Street, NW, MS-4106
Washington D.C. 20240

Howard Lutnick, Secretary
Commerce Department
1401 Constitution Ave, NW
Washington D.C. 20230

*Regarding**: Calculations of Level A and B Takes & Request for Reinitiation of ESA Section 7(a) Consultation.***

Dear Secretaries Burgum and Lutnick,

My name is Bob Stern. I'm currently leading the Save Long Beach Island, Inc. organization. We have had major concerns with the Atlantic Shores South wind project proposed here due to its exceptional proximity to shore, placement in the primary migration corridor of the North Atlantic right Whale and other negatives.

We have over the past several years diligently reviewed and commented upon the prior documentation put forward by your agencies, particularly with regard to the impact on marine mammals, and more specifically how level A and level B takes have been calculated.

I have a Doctorate degree in Applied Mathematics and Aeronautical Engineering, and have been supported by two professional acoustic consultants, XI-Engineering, and Rand Associates. I previously managed the Office of Environmental Compliance within the Department of Energy, so am familiar with methods for predicting environmental impacts.

Underestimated Take Numbers.

The Jasco Applied Sciences reports upon which the agencies have primarily relied upon are difficult to decipher because they do not provide the basic equations, assumptions and inputs that go into their computer models, which turn out the Take numbers. To see if those numbers are reasonable, I have researched the relevant material on noise source levels, transmission loss rates and acceptable received levels, and have done my own calculations.

We have come to the conclusion that the numerical calculation of the Takes has been systematically underestimated through the use of unsupported, very optimistic technical and scientific assumptions at virtually all steps in the process.
The compounding effect of these assumptions, particularly in the logarithmic decibel scale, in the full calculation results in unrealistically low estimates of the range of elevated noise and the number of instances of Level A (severe harm or fatality) and Level B (behavior disturbance) Takes.

The key factors in that regard are summarized in Enclosure 1, where numerical estimates of that underestimation are presented, which are manifold and significant.

Reinitiation of ESA Section 7(a) Consultation

Section 50CFR§402.16 (Reinitiation of Consultation) requires federal agencies to reinitiate formal ESA Section 7(a) consultation "if new information reveals effects of the action that were not previously considered".

We suggest that the numerical discrepancies in the Enclosure provide very significant new information that requires a reinitiation of the Section 7(a) consultation for the Atlantic Shores South project.

For pile driving, that information shows that at least four North Atlantic right whales would perish from the pile driving of the project, in contrast to the small fraction in the biological opinion (BiOP), and many more disturbed, potentially warranting a different BiOP conclusion.

For turbine operation, Enclosure 1 and our full Report on Operational Noise Impact in Enclosure 2 show that the elevated noise above the whale's disturbance level would extend miles from the project perimeter, impairing and potentially blocking the whales migration leading indirectly to instances of harm and fatality and reducing essential reproduction. It also shows that a whale attempting to migrate through or past the complex within 2.5 miles of its perimeter would suffer permanent hearing loss. In stark contrast, no numerical calculations of level A and B takes were done for turbine operational noise at all.

Another Possible Approach

Regarding this project and others along the East Coast, under CFR 50§402.16 reinitiation of consultation is also "required and shall be requested by the Federal agency, if a new species is listed or critical habitat designated that may be affected by the identified action". We have researched and could reasonably define the primary historical migratory corridor for the NARW along the East Coast and ask that it be designated as critical habitat.

Our report on operational noise in Enclosure 2 shows that the placement of a modern wind complex within that migratory corridor would degrade it to the point where it would, at a minimum, seriously impair the migration, especially of the seventy or so female whales capable of reproduction, thereby jeopardizing the species existence. Therefore such wind complexes should not in our view be placed within it.

If you believe such an effort would further the Administration's goals, please have your staff contact me. We would be glad to discuss that approach further.

Calculation Method Review

Coincident with any new consultation, we suggest you consider assembling a team of mathematicians, and acoustic and marine mammal experts to develop methods of calculation for all future reviews that would be binding on applicants. We thought that the recent BOEM document providing such guidance for pile driving noise modeling was a good effort in that regard. Unfortunately, it was not followed in the noise modeling reports for this project.

Conclusions and Recommendations

The underestimates in the Take Numbers described here raise serious questions over the Take Numbers that have been relied upon in issuing prior Harassment and Take Authorizations and Letters of Authorization, not just for the Atlantic Shores South project, but for many projects along the East Coast, since the procedures and calculation methods used are virtually identical everywhere.

It is recommended that you authorize a reinitiation of the ESA Section 7(a) consultation for the Atlantic Shores South project, as well as a concurrent review of how the Take calculations have been done.

We would also suggest that you consider authorizing a pause in all onshore and offshore construction and preparatory activities for all the projects to provide the opportunity to reassess the Take numbers that were used there.

It should be noted that a pause in construction is critical because should the Take numbers turn out to be flawed as we suggest there may be no effective remedy. The placement of these new large turbines and their foundations into the seabed may be irreversible. The current OCS regulations allow for them to be left in place. No documents have been put forward demonstrating the technical feasibility of removing the towers, blades and a section of the foundation, and processing such onshore. No onshore industrial processing capability has been identified that could do such processing. No contractual arrangements or other firm commitments have been made by the companies to do the removal and processing. No cost estimates of removal and processing have been put foward. No financial assurance is now being provided to fund such an effort. Given that, there may be no recourse but to leave constructed turbines in place in a non-operational state. This would pose very long-term risks to vessel navigation and sea life, provide no electric power whatsoever, and serve as an epic governmental embarrassment for generations.

Thank you very much for considering.

Bob Stern

____

Bob Stern, Ph.D., President
Save Long Beach Island Inc.
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917.952.5016

cc: Dr. Neil Jacobs , NOAA Administrator Nominee
Lee Zeldin, EPA Administrator
Vice Admiral Nancy Hann, Acting NOAA Administrator
Emily Menashes, Acting Assistant Administrator, NMFS
Congressman Jeff Van Drew

Enclosure 1

Systemic Underestimation of Level A and B Take Numbers for Offshore Wind Projects

Background on Noise

The impact on marine mammals from a noise source logically depends on the intensity of that source, the distance or range required for that source noise to decrease to desired levels, the presence of marine mammals in the elevated noise area, and how they react to it. Such calculations involve noise levels expressed in the decibel (dB) scale. The decibel scale is an exponential one whereby an increase of 10 dB, e.g., from 200 to 210 dB means that the noise intensity or energy has increased 10 times from what it was before, not by 5 percent. So relatively small changes in decibels on our human counting scale can have major impact on a whale.

Relatively small changes in any of those dB numbers can mean very large changes in the elevated noise range and the number of animals affected. For example, for vessel surveys, with a source level minus desired level of 51 dB the change in transmission loss rate from 20 dB to 15 dB, results in an increased range of elevated noise **seven times** what it was before. For pile driving, a reduction in source level of 10 dB means that the elevated noise range is now only one-third of what it was, and since in this case, the area affected is roughly circular, that area and the number of animals affected are now just one ninth of what it was without that 10 dB reduction. Therefore, these factors, their disclosure and their scientific justification are critical to the analysis.

The calculation of level A (instances of harm or fatality) and level B Takes (instances of disturbance- potentially leading to worse outcomes) occurs through a combination of the elevated noise area (the "ensonified" area derived from the exposure range) and the animal density in that area, and in the case of level A Takes times the added effects of time spent in the area and auditory weighting upon the whale's hearing. Therefore, underestimates at each stage get compounded in the calculation. For level B Takes from vessel surveys, a 16-fold decrease in ensonified area and a tenfold decrease in animal density for the NARW combine for a 160- fold underestimate. For level B Takes from pile driving, a 5-fold decrease due to the failure to use realistic disturbance threshold criteria and the tenfold decrease in NARW density for a combined 50-fold underestimate. For level A Takes from pile driving it appears that there is an 81-fold underestimate in ensonified area and an additional 1.8-fold underestimate due to the use of the unsupported auditory weighting functions for a combined 144- fold underestimate.

Therefore, the level A and level B Take estimates up upon which the Biological Opinion (BiOp) conclusions are based are severely underestimated, not based on the best science available, nor in any way conservative which the Endangered Species Act calls for.

Recent calculations of Level A and Level B Takes have also been highly dependent on the assumption of a new much reduced presence of the right whale in the project area -by a factor of 10- based on a new Duke University model that is not recommended at this time by its developers;

For vessel surveys, a low noise source level and a high and unexplained sound pressure level transmission loss rate:

For pile driving a 10 dB source reduction from bubble curtains and similar systems not proven for the large foundations here, a very high and unexplained noise transmission loss rate, the down-weighting of the hearing sensitivity of baleen whales, like the NARW, to the low frequency noise omitted by the pile driving, and to the failure to use a realistic probabilistic approach for estimating level B disturbance levels for impulsive noise criteria, that was included in the Jasco Applied Science noise exposure modeling but not in the BiOP. In addition, as discussed below, operational turbine noise was not adequately addressed at all.

Vessel Surveys

Source Level. For marine site characterization surveys, the BiOp uses technically unsupported low noise source levels for the sparker units, taken from a smaller "surrogate" device as opposed to actual measurements of the sparker devices Which are controlling in terms of the affected distance.

It uses a low noise source level of 203 dB from a smaller device rather than the actual measured 211 dB from the more powerful sparker device being used, as shown in the Table below. The 211 dB or a higher number for the same device is cited in numerous places in the technical literature. The area affected outward from the vessel is a logarithmic function of the noise source level, the transmission loss and the criteria level to avoid whale harm and disturbance. A difference of 8 dB means a lot in terms of the area and number of animals affected.

Vessel Noise Device –Source Level

Table 10. Applied Acoustics Dura-Spark Acoustic Characteristics

Source Settings		Source Level (dB re 1μPa@1m)				Pulse Width (ms)	Bandwidth 3 dB (kHz)
Energy (Joules)	Tips	Pk-Pk	Pk	RMS	SEL		
100	80	213	207	200	173	2.2	2.6
200 (high)	80	216	212	203	177	2.2	2.8
400 (low)	80	222	218	207	182	2.8	1.9
500 (high)	240	223	219	209	181	1.4	4.4
1,000 (high)	240	228	223	213	186	2.1	3.2
1,250 (high)	240	229	225	214	187	2.3	2.8
500 (high)	400	216	211	203	174	1.1	4.6
2,000 (high)	400	229	224	214	188	2.4	2.8
2,400 (high)	400	229	225	214	188	2.2	2.9
2,400 (high)*	400	226	221	212	185	2.3	2.7
* Source moved closer to side wall							

Transmission Loss. Similarly, the BiOp and its supporting reports provides no basis for the very high 20 dB transmission noise loss factor being used in the calculations of exposure range and takes for vessel surveys. The BiOp incorrectly uses a high 20 dB noise transmission loss rate for vessel survey/marine site characterization everywhere, even though the spherical noise spreading it represents only exists from the vessel out to seabed depth distances.

Use of the proper device noise source level and the 15 dB transmission loss rate which the NMFS has used previously, extends the elevated ranges from 0.1 to 1.6 miles, and the number of animals affected significantly. That rate of 15 dB represents the transition from geometric spherical noise spreading to cylindrical noise spreading in between the seabed and surface appropriate for typical vessel survey elevated noise distances which are not large enough to involve significant seabed attenuation.

The 15 dB loss factor has been confirmed by sound field verification (SFV) measurements at the Vineyard Wind 1 project. In the final SFV report dated April 21, 2024 by Jasco Applied Sciences. measurements taken at various distances from the pile driving of twelve monopile foundations were displayed. At the near-field distances relevant to vessel survey noise out to approximately 2000 meters, nine of those measurements showed a 15 dB loss factor, one showed a 14 dB loss factor and two showed a 17 dB loss factor (Figures A-12, 24, 35, 48, 58, 70, 94, 106, 116, 128, 140, and 152). The 15 dB factor is distinctly different from higher loss rates appropriate to pile driving noise that can occur at farther distances, from both noise spreading and another mechanism - seabed attenuation.

Pile Driving.

The BiOP provides no reliable support for use of a noise source attenuation from bubble curtain or similar systems of 10 dB for the large 15-meter diameter foundations and low frequency noise here, for use of a small 0.72 kilometer range for the NARW incurring permanent threshold hearing loss, for the use of much lower NARW densities in and near the project area, for the use of auditory weighting functions purporting to show that lower frequency cetaceans do not hear that well at low frequencies, and for not using a probability of response approach for Level B disturbance estimates.

Underestimate of NARW Deaths.

The Level A Take exposure range for the NARW and the number of Level A takes in the BiOp are inconsistent with the calculation method described and are significantly underestimated. The discussion in the BiOp of how the exposure range for a Level A permanent threshold hearing loss was calculated does not lead to the number of 0.72 kilometers in Table 7.1.8. The BiOp states on page 192 that the exposure range was calculated assuming an animal stayed there for the full pile driving duration to reach the accumulated energy criteria of 183 dB. It states on page 167 that the pile driving duration is 7 to 9 hours so the time spent contribution to the accumulated energy would be 10 times the log of 9×3600 or 45 dB.

That would mean that the one second sound energy level at the 0.72 km point would have to be 183 minus 45 dB or 138 dB. However, Tables F.6 through F.12 in the August 10th Jasco Applied Sciences modeling reports, even assuming the 10 dB source reduction and auditory weighting, show that it would require a distance of about 9 km to decrease to 138 dB. This 81+ fold increase in ensonified area (assumed circular) would increase the <u>**Level A Take number** in Table 7.1.13 **for the NARW from 0.14 to 11**</u>, well above the biologic removal rate.

These higher Level A Take numbers are consistent with the Save LBI transparent and scientifically supportable calculations shown in Table 3 of its Report on Pile Driving Impact. Using the sound energy level versus distance numbers in the August 10 Jasco Noise Expose Modeling Report and observed swim speeds for the NARW from a published study, and even assuming the 10 dB source attenuation and the auditory weighting, it was found that a whale passing within 3.7 miles of miles of a pile driving operation will accumulate enough sound energy to suffer permit hearing loss. Considering its migration in December when pile driving is allowed and needed to maintain schedules 4 to 7 NARW will suffer Level A takes from pile driving, depending on the extent of night time construction, leading to permanent hearing loss.

The Save LBI estimate is fully consistent with the estimate of 11 level A Takes above considering that the BiOp assumed that the whale was in the vicinity of the pile driver for 7 to 9 hours where the assumption here was that the whale was passing by the pile driver over a period of about 4 hours. Therefore, the estimate here of 4-7 Takes is about half of the 11 Level A Take estimate. Both estimates are contrary to the agencies' conclusion of no Level A takes and permanent hearing loss. Even the death of 4-7 NARW would far exceed the biological removal rate of 0.8.

This significant underestimate of NARW deaths results from a series of unsupported optimistic assumptions, which, when multiplied together do not reflect the reality of the impact to the whale. Similarly, level B takes are systematically and significantly underestimated. The elements contributing to this are summarized below.

NARW Presence. The NARW densities are far too low, a tenth of what they were just a year ago in the project application and underrepresent the presence of NARW in the NY/NJ Bight offshore waters. The new very low NARW densities used in the BiOp are counter to those in the company's own recent application for the MMPA ITA rulemaking and to the recommendations of the Duke University laboratory that compiles these density numbers, not to use them, but to use the higher numbers in its previous reports for "management purposes". This significantly underestimates both Level A and B takes by up to a factor of 10.

Transmission Loss. The revised higher estimates for NARW Level A takes above are based on the distances to reach the 138 dB level found in the Jasco Noise Exposure Modeling Reports relied on by the BiOp. However, even those distances are underestimated because they rely on an unusually high and unexplained 30 dB sound energy level (SEL) and 35 dB sound pressure level (SPL) noise transmission loss factors.

The recent BOEM Nationwide Recommendations for Impact Pile Driving, Sound Exposure Modeling and Sound Field Measurement for offshore wind construction and Operation Plans of August, 2023, presents the noise transmission loss (TL) with distance by the equation.

$$TL = F \cdot \log10(R) + a \cdot R/1000,$$

Where F is the noise spreading loss factor in dB, a is the attenuation loss factor in dB per kilometer, and R is the distance from the source in meters.

The Jasco noise exposure modeling reports supporting the BiOp have not disclosed the factors being used, but presumably have accounted for both spreading loss and attenuation. For a hammer operating at 4,000 kilojoules, Table F-11 in Appendix B of the Jasco August 10, 2022 Report shows a transmission loss in SEL from 1 to 10 km of about 30 dB. Similar losses occur for other energies. That is unusually high compared to actual measurements as shown below from the Report by Rand Acoustics, Inc. titled Pile Driving Noise Survey, Technical Report of March 28, 2024.

The Rand Report SEL measurements show a transmission loss of at most 17.4 dB going from 1 to 10 kilometers, much less than the 30 dB in the noise modeling reports relied on by the BiOp. Subtracting a conservative 15 dB from that for noise spreading at greater distances, the measurements already account for an attenuation factor of 0.27 dB per kilometer (2.4 dB divided by 9 km). The only possible explanation for such a high 30 dB loss factor would involve additional seabed attenuation of 1.40 dB per kilometer (the extra 12.6 dB divided by 9 kilometers) for a total attenuation factor of **1.67 dB per kilometer**.

Such a high attenuation level does not appear in the scientific literature. If such a high attenuation factor has been used ,the BiOp should have disclosed what factor it is using, and the physical and/or measurement basis for it.

As shown in the Save LBI Technical report on the Impact of Operational Turbine Noise on the Essential Migration of the NARW, based on actual measurements of sound loss off the New Jersey Continental Shelf reported in the study: Shallow Water Sound Transmission Measurements Taken on the New Jersey Continental Shelf, William M Carey et.al, Advanced Research Projects Agency, Arlington, VA, a **seabed attenuation factor of 0.35 dB per kilometer** factor can be derived, which may be the **most reliable estimate** because it is based on NJ specific measurements.

SPL measurements taken at twelve pile driving locations at the Vineyard Wind 1 project out to distances of 10 kilometers were presented in the report titled Underwater Sound Field Verification Vineyard Wind 1 Final Report, April 21, 2024, by Jasco Applied Sciences. The results were fitted to the formula in footnote 14 to derive the noise spreading loss and attenuation factors. In nine of those cases where the spreading loss was plausibly above 10 dB for cylindrical spreading, the attenuation factors ranged from a low of 0.02 **to a high of 0.89**. Other data on the seabed attenuation is sparse.

The BOEM presents without support attenuation factors **of 0.94 to 1.41 dB** per kilometer for specific sites in Table 3-1 of its Report titled: Parametric Analysis and Sensitivity Study of the Acoustic Propagation for Renewable Energy. A higher value of 1.47 dB per kilometer was used by Dominion Energy for its site in its report of November 28, 2020 titled Coastal Virginia Offshore Wind Noise Monitoring during Mono-pile Installation without explanation. The Marine Mammal Commission cites a factor of 0.9 dB per kilometer in its letter to miss Jolie Harrison of March 2021 regarding the South Fork wind farm.

Even higher unexplained attenuation factors arise from the sound pressure level (SPL) data derived and relied on in the Jasco reports. Tables F-51 and F-52 of the Jasco August 10th 2022 Report show a 35 dB decrease going from 1 to 10 kilometers. But the measured SPL result in the Rand Pile Driving Report, Figure 22 , shows a loss of only 17.5 dB. The attenuation factor needed here to account for the difference from noise spreading would have to be 20 dB/9 km **or 2.2 dB per kilometer.**

Such high attenuation factors do not appear in the scientific literature. If such high attenuation factors have been used the BiOp should have disclosed what factors it is using, and the physical characteristics of the seabed and/or the measurements that justify its use. Absent that, the noise exposure modeling should be revisited using a lower attenuation factor more consistent with measurements, which would increase the ensonified ranges, area and Level A Takes above even more.

Threshold Level. The BiOp does not use the more reasonable probabilistic, impulsive “Wood et al.” noise criteria for level B harassment disturbance, which would significantly increase the number of Level B takes for pile driving, even though those were included in the Jasco Applied Sciences noise exposure modeling report.

The assumption that 160 dB is the threshold over which the NARW's behavioral reaction to impulsive noise will occur neglects to use the reasoned probability of response approach from Wood et.al. based on whale observation that was included in the Jasco noise exposure modeling reports, but was excluded from the BiOp without explanation. The probability approach would exponentially increase the region of auditory weighted 140+ dB noise, such that even adjusting upward to a 150 dB threshold for the uncertain and unverified weighting functions in the JASCO Reports, and assuming a uniform animal density, the number of Level B takes would increase by 5 times using the Wood probability criteria.

Source Reduction. The agencies presume the use of a mitigation technique, "bubble curtains" will substantially reduce the noise impact to NARW. However, bubble curtains will not block noise less than 200 Hertz ("Hz") in frequency, which constitutes the predominant pile driving noise. This is important because the NARW, a low frequency cetacean, hears in a large portion of the frequency not attenuated by bubble curtains.

In the BiOp, NMFS used an unsupported 10 dB pile driving noise source loss attenuation from bubble curtains or similar system. This assumption is not valid for the large diameter foundation here and the low frequency noise generated by the pile driving of it. Among other reasons, the pile driving of the larger turbines generates more energy at lower frequencies, and much of the lower frequency noise energy is transmitted down the foundation into the seabed where it then travels, bypassing the bubble curtains, and emerges back into the water column downstream. Therefore, these systems are inherently limited for the low frequency noise dominating the pile driving noise. The low frequency noise requires larger bubbles to contain it, which are inherently difficult to sustain in the ocean environment.

BOEM staff have stated in briefing material that these systems are ineffective for frequencies less than 200 Hertz. The "Bellman" report itself, which the BiOp often references, recommends that for these larger foundation diameters and higher energy pile driving operations, noise reduction should be focused on reducing the pile driving energy itself and not rely on secondary bubble curtain or similar systems. The low take estimates in the BiOp, in particular the Level A Take estimate for the NARW less than 1, rely on this scientifically unsupported 10 decibel source attenuation assumption, and are therefore not valid.

Weighting Functions. The BiOp uses an unproven unverified auditory weighting function for low frequency cetaceans, like the right whale, which asks us to believe that these whales, previously said to be "low frequency specialists," no longer hear well at the low frequency noise prominent from pile-driving and turbine operation, even though the whale has vocalized at those frequencies for centuries and presumably received responses to its calls. For Level A takes, the Jasco reports used two unverified and scientifically unsupported auditory weighting functions allegedly to represent the whale's hearing sensitivity at various frequencies in its calculation. Based on a comparison of the exposure ranges for the unweighted and auditory weighted calculations in the JASCO Tables F.6 through F.12 of its August 10th Report, eliminating the use of the auditory weighting function would increase the range to get to 138 dB from 9 to 12 km, increasing a circular ensonified area 144-fold compared to the

BiOp range and **increasing the Level A takes to 20 (144 X 0.14)**. The use of these weighting functions has the effect of concluding that the NARW no longer hears well at low frequencies. This is a conclusion that is antithetical to the available evidence.

<u>Operational Noise</u>

As shown in more detail in Enclosure 2, the Biological Assessment, BiOp, LOAs, and the final EIS fail to analyze the critical problem arising from the continuous noise generated by the operation of the turbines in the wind complex. They fail to use the best available science contained in two studies of noise measurements showing a clear increasing linear decibel versus noise power trend for low to moderate power turbines from which a noise source level for the larger Vesta-236 turbine to be used here was reliably predicted to be 181 dB. They failed to add to that single turbine source level the effect of the 200 turbines, which adds 23 dB to provide an approximate effective source level for the full wind complex of 204 dB.

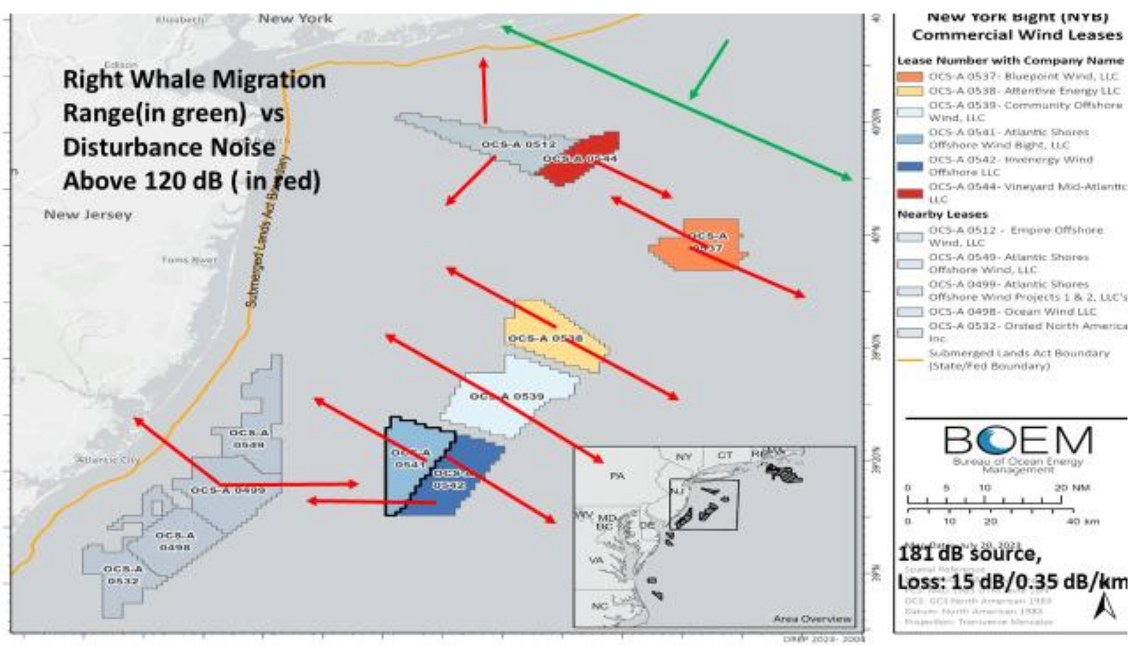
Because the desired level for continuous noise is 120 dB or 40 dB less than that for impulsive noise, the difference between the wind complex source level and the desired level for operational noise, and thus the elevated noise range will be greater than that for pile driving and vessel surveys for which numerical analyses was done, but inexplicably no numerical analysis was done for operational noise. Our calculations show that the cumulative project operational noise in the NJ/NY Bight areas will obstruct and potentially block the migration of the NARW and jeopardize its continuing existence making the failure to analyze this issue a major if not, the most egregious omission in the noise exposure modeling supporting the project approvals.

The BiOp incorrectly determined that the trend lines of noise source level versus turbine power shown in the work of Stober and Thomsen (2021) and Tougaard (2020) are not considered the best available scientific information on underwater noise likely to result from operation of 10 megawatt (MW) or larger turbines.

Using the trend lines from the “Tougaard” study, the plaintiffs noise consultant, XI-Engineering, predicted a noise source level for a single 15-MW Vesta-236 turbine of 181 dB for monopile foundations.

Notwithstanding the EIS and BiOP insistence on citing lower noise levels for smaller turbines, the final EIS essentially confirms this higher level. On page 3.5.6–44, it states that: “Larger turbines do produce higher levels of operational noise, and the least squares fit of that dataset would predict that an SPL measured 328 feet (100 meters) from a hypothetical 15 MW turbine in operation in 22 mile per hour (10 meter per second) wind would be 125 dB re 1 µPa (Tougaard et al. 2020).” Backing that 125 dB number up from 100 meters to the source at 1 meter using the Tougaard transmission loss numbers results in a source level for a single turbine of 172.4 dB, getting closer to the plaintiff’s 181 dB number. The Tougaard “dataset” was for all foundation types, had that least squares fit been done just for the monopile foundations to be used here, it would likely have duplicated the plaintiff’s source level number.

Using the 181 dB source level for the Vesta 236, 15 MW turbines Atlantic Shores proposes, in concert with a 15 dB noise spreading loss consistent past agency practice, a seabed attenuation factor consistent with prior measurements of 0.35 dB /km, and considering the contributions of the turbines in the first 3 rows nearest the receptor. the 120+ dB zone extends 12 miles from the perimeters of the turbine projects in the NY/NJ Bight. The red lines overlayed on the lease areas in the Figure below denote the 12-mile distances from the perimeters of the turbine projects, i.e.,



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region ensonified by disturbance level noise (120+ dB). The green line represents the NARW's historic migration range from shore. As such, the NARW's migration will be obstructed and potentially blocked by this noise.

This is noise which is likely to obviate the NARW from migrating effectively through the NY/NJ Bight. It will be extremely difficult for the whales to avoid that expanse of elevated noise and continue their migration. Attempting to do so could expose them to high cumulative sound exposures and hearing loss, loss of communication between them, separation of females from calves, strandings, and loss of their navigational abilities.

Hearing Loss

In addition to behavior disturbance a whale could suffer permanent and temporary hearing loss migrating in between the Atlantic Shores project area and the farther out lease areas.

Consider a whale approaching the 12-mile (19 km)wide migratory corridor between the project area and the lease area OCS A-0541 in the Hudson South area. In an effort to continue its migration, it might tolerate the noise disturbance and continue its 13-mile, 16-hour journey (@1.3 km/hr.) past the full Atlantic Shores project complex.

For the noise source and transmission loss case above , with an effective source level of 193 decibels centered 1.6 kilometers back from the perimeter (from neighboring turbines), the noise level at a distance X from the project perimeter would be.

Noise Level = 193 dB – 15 $\log_{10}$ (1,600+ X in meters) -0.35 x (1.6 +X in km).

But it would incur additional noise exposure during the passage of the wind complex of 10 $\log_{10}$(16 hrs x 3600 sec /hr) = 47.6 dB.

The cumulative noise energy experienced by the whale as a function of distance from the perimeter is shown in the Table below.

Cumulative Sound Energy vs Perimeter Distance

Distance from perimeter(X) in miles	SPL at Distance X (dB)	Contribution from Time of passage(dB)	Total Sound Exposure Level (dB)
1	139.4	47.6	187
2	136.1	47.6	183.7
2.25	135.5	47.6	**183.1**
4	131.7	47.6	179.3
6	128.38	47.6	176
12	121	47.6	**168.6**

From the table, it can be seen that the 183 dB noise energy threshold for **permanent hearing loss** is exceeded at distances **less than 2¼ miles** from the perimeter.

A whale attempting to go into the wind complex in between two rows of turbines spaced 0.6 nautical miles apart would encounter a sound pressure level of 181-15 $\log_{10}$ 531 or 140 dB (seabed attenuation not a factor at these distances). Adding to that the 47.6 dB from the time of exposure results in a total cumulative energy received **of 187.6 dB which clearly exceeds the level for permanent hearing loss**.

The cumulative sound exposure level would be **168.6 dB** at 12 miles from the perimeter or across the entire 12-mile-wide migration corridor. This exceeds the NMFS SEL criteria of **168 dB for temporary threshold shift hearing impairment**. Since the right whale is believed to navigate by reception of noise signals, this would greatly impair its ability to continue its migration.