Comments in Response to the Bureau of Ocean Energy Management Notice of Intent to Prepare an Environmental Impact Statement for Empire Offshore Wind, LLC's Proposed Wind Energy Facilities Offshore New York, 86 Fed. Reg. 33351 (June 24, 2021)

Submitted by National Wildlife Federation, Natural Resources Defense Council, National Audubon Society, Wildlife Conservation Society, Ocean Conservation Research, All Our Energy, Audubon New York, Connecticut Audubon, Mass Audubon, Nassau Hiking & Outdoor Club, New Jersey Audubon, New York City Audubon Society, South Shore Audubon Society, Surfrider Foundation, and Whale and Dolphin Conservation

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I. Introduction

On behalf of National Wildlife Federation, Natural Resources Defense Council, National Audubon Society, Wildlife Conservation Society, Ocean Conservation Research, All Our Energy, Audubon New York, Connecticut Audubon, Mass Audubon, Nassau Hiking & Outdoor Club, New Jersey Audubon, New York City Audubon Society, South Shore Audubon Society, Surfrider Foundation, Whale and Dolphin Conservation, and our millions of members and supporters, we submit these scoping comments to inform the preparation of an Environmental Impact Statement (EIS or Draft EIS) by the Bureau of Ocean Energy Management (BOEM) for Empire Offshore Wind LLC's Empire Offshore Wind Energy Facilities Offshore New York (the Project or Empire Wind).[1]

The Biden Administration has set forth an ambitious and necessary goal for the nation to have net-zero global greenhouse gas emissions by mid-century or before[2] and committed the U.S. to reducing net greenhouse gas emissions by 50-52% below 2005 levels in 2030.[3] As the Administration has recognized, offshore wind energy is one of the most abundant sources of zero emissions energy and it must play a significant role if the nation is going to meet these goals. Our organizations are united in support of responsibly developed offshore wind. We have long advocated for policies and actions needed to bring it to scale in an environmentally protective manner. Offshore wind provides a tremendous opportunity to fight climate change, reduce local and regional air pollution, and grow a new industry that will support thousands of well-paying jobs in both coastal and inland communities.

Responsible leasing and permitting of offshore wind energy: (i) avoids, minimizes, mitigates, and monitors adverse impacts on marine and coastal habitats and the wildlife that rely on them, (ii) reduces negative impacts on other ocean uses, (iii) includes robust consultation with Native American tribes and communities, (iv) meaningfully engages state and local governments and stakeholders from the outset, (v) includes comprehensive efforts to avoid impacts to environmental justice communities, and (vi) uses the best available scientific and technological data to ensure science-based and stakeholder-informed decision making. These comments seek to provide BOEM with recommendations for what legal, justice, and environmental factors must be considered to ensure a responsibly developed project as the agency drafts an EIS.

With BOEM's Record of Decision for Vineyard Wind 1 signaling a critical milestone in the launch of this industry, this is a pivotal moment in America's nascent offshore wind story and the fight to reduce greenhouse gas emissions and mitigate the impacts of climate change. The Biden Administration's new offshore wind goals plan to deploy 30 gigawatts (GW) of offshore wind by 2030, creating more than 44,000 good-paying union jobs and triggering over $12 billion per year in capital investment in offshore wind projects on both coasts.[4] Meeting this objective unlocks a larger, long-term goal of expanding offshore wind to 110 GW by 2050, generating more economic opportunity, and conveying the benefits of clean energy and renewable power to future generations.[5] The Empire Wind Draft EIS is another crucial opportunity for this Administration to conduct an analysis of a major offshore wind project from

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[1] 86 Fed. Reg. 33,351 (June 24, 2021).

[2] Proclamation No. 14008, 86 Fed. Reg. 7619 (EO 14008).

[3] https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/United%20States%20of%20America%20First/United%20States%20NDC%20April%2021%202021%20Final.pdf

[4] FACT SHEET: Biden Administration Jumpstarts Offshore Wind Energy Projects to Create Jobs, 2021 White House Statements and Releases (Mar. 29, 2021).

[5] *Id.*

Draft EIS to a Record of Decision that sets a high standard for how to develop a responsible project that protects wildlife and their habitats. Setting the right standard here will help future projects come online more quickly with strong protections, supporting the Administration's goals.

In addition to these robust federal goals, many east coast states, including and especially New York, are rapidly mobilizing to tap into the booming offshore wind global industry and harness the abundant, clean energy available off their shores. The State of New York has a goal of producing 9 GW of offshore wind energy by 2035.[6] This nearly 2,100 megawatt (MW) project will be critical to New York meeting this target.

Empire Wind—which is actually two projects, Empire Wind 1, a 816 MW project, and Empire Wind 2, a 1,260 MW project—if responsibly developed to avoid, minimize, mitigate, and monitor potential environmental, cultural, and economic impacts, will provide substantial benefits to society and the environment. The Project is part of the urgent transition away from dirty, climate-altering fossil fuels to the clean energy economy envisioned by the Biden Administration that is necessary to avoid catastrophic warming.

This rapid transition to a clean energy economy is paramount to preserving wildlife and the environment. Absent a substantial shift from carbon intensive sources of energy to solutions like offshore wind, we face ever worsening impacts from climate change that will further drive countless species to extinction in both marine and terrestrial environments, threatening entire ecosystems. These complicated biological support systems enable the United States' continued success across commercial and social sectors. Protecting these complicated webs of biodiversity for future generations is vital to preserving the economic, social, and environmental well-being that our society relies on for our health and survival.[7]

As recognized by the United Nations Environment Program Convention on the Conservation of Migratory Species of Wild Animals, migratory species, such as migratory marine species, are particularly vulnerable to climate change impacts.[8] Similarly, a report by National Audubon Society found that bird species, already facing threats from habitat loss and other stressors, face significant impacts from climate change that can be ameliorated if we prevent warming from reaching higher levels.[9]

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[6] https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/Focus-Areas/NY-Offshore-Wind-Projects

[7] World Institute for Development Economics Research, The Economics of Transnational Commons 97-102, Clarendon Press, (1997).

[8] UNEP/CMS Secretariat, Bonn, Germany, Migratory Species and Climate Change: Impacts of a Changing Environment on Wild Animals (2006) at 40-41 (available at http://www.cms.int/publications/pdf/CMS_CimateChange.pdf). "As a group, migratory wildlife appears to be particularly vulnerable to the impacts of Climate Change because it uses multiple habitats and sites and a wide range of resources at different points of their migratory cycle. They are also subject to a wide range of physical conditions and often rely on predictable weather patterns, such as winds and ocean currents, which might change under the influence of Climate Change. Finally, they face a wide range of biological influences, such as predators, competitors and diseases that could be affected by Climate Change. While some of this is also true for more sedentary species, migrants have the potential to be affected by Climate Change not only on their breeding and non-breeding grounds but also while on migration."

[9] Wilsey, C, B Bateman, L Taylor, JX Wu, G LeBaron, R Shepherd, C Koseff, S Friedman, R Stone. Survival by Degrees: 389 Bird Species on the Brink. National Audubon Society: New York (2019), https://www.audubon.org/sites/default/files/climatereport-2019-english-lowres.pdf.

Against this backdrop of unprecedented climate change risks threatening species extinction and shifts in distribution, it is imperative that all offshore wind development activities move forward with strong protections in place for coastal and marine habitats and wildlife, using science-based measures to avoid, minimize, mitigate, and monitor impacts on valuable and vulnerable wildlife and ecosystems. BOEM must consider sufficient measures to protect our most vulnerable threatened and endangered species and require a robust plan for pre-, during, and post-construction monitoring that can enable effective adaptive management strategies.

Several decades of offshore wind development in Europe have shown that offshore wind power can be developed responsibly with regards to wildlife, provided that all siting and permitting decisions are based on sound science and informed by key experts and stakeholders. The European experience shows us that avoiding sensitive habitat areas, requiring strong measures to protect wildlife throughout each stage of the development process, and comprehensive monitoring of wildlife and habitat before, during, and after construction are essential for the responsible development of offshore wind energy.[10]

Despite offshore wind's rapid growth in Europe, United States offshore wind remains a new industry, with the nation's first commercial project – the Block Island Wind Farm (30 MW) – only coming online in December 2016. BOEM has recently issued a Record of Decision approving a major project to the north of Empire Wind, Vineyard Wind 1, and is considering multiple projects including three (South Fork, Ocean Wind, and Revolution Wind) where extensive comments have already been gathered. Comments on these projects should provide guidance for BOEM's preparation of an EIS for Empire Wind.

BOEM needs to rigorously review the potential impacts of offshore wind development on wildlife and their habitats, including potential impacts related to future projects at the scale envisioned by the President's offshore wind goals, to ensure appropriate mitigation and monitoring measures are developed and adopted. Various potential impacts associated with offshore wind construction and operations could directly, indirectly, and cumulatively impact species and habitats in the coastal zone and offshore environment along the coast. In addition to a thorough examination of direct and indirect impacts, as well as mitigation measures, assessing cumulative impacts is essential to understanding the impact of offshore wind on species and ecosystems along the coast.

We submit the following comments to guide BOEM in meeting its obligations under the National Environmental Policy Act in preparing a Draft EIS for the Project.

II. BOEM'S Obligations Pursuant to the National Environmental Policy Act

The National Environmental Policy Act (NEPA)[11] is the fundamental tool for ensuring a proper vetting of the impacts of major federal actions on wildlife, natural resources, and communities; for ensuring reasonable alternatives are considered and identifying the most environmentally preferable alternative; and for giving the public a say in federal actions that can have a profound impact on their lives and livelihoods.[12] NEPA requires "efforts which will prevent or eliminate damage to the environment and

[10] O'Brien, Sue. "Lessons learned from the European experience." Presentation at the *State of the Science Workshop on Wildlife and Offshore Wind Energy Development*. Nov. 13-14, 2018.

[11] 42 U.S.C. § 4321 *et seq.*

[12] It is important to note that in July 2020, the Council of Environmental Quality (CEQ) published a final rule revising long-standing NEPA regulations. These regulations went into effect on September 14, 2020 (85 FR 43304). Pursuant to President Biden's Executive Order 13990, these rules are being reviewed for possible repeal

biosphere and stimulate the health and welfare of man"[13] and mandates that "to the fullest extent possible" the "policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with [NEPA]."[14] To comply with NEPA, an EIS must, *inter alia*, include a "full and fair discussion" of environmental impacts,[15] including positive as well as negative impacts, and assess possible conflicts with other federal, regional, state, tribal, and local authorities.[16]

Consistent with the Department of the Interior Secretary Haaland's Secretarial Order, in drafting the EIS, BOEM should ignore the Trump Administration's repeal of 40 C.F.R. § 1508.7, which required the consideration of cumulative impacts. Rather, BOEM should include an analysis of cumulative impacts, as defined under the former 40 C.F.R. § 1508.7:

> *Cumulative impact* is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

BOEM must include a robust cumulative impacts analysis in the Draft EIS, which is required by longstanding case law interpreting NEPA and in no way prohibited by the current regulations.[17]

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or replacement. To begin this process, the Administration has issued an interim rule extending the deadline by two years for Federal agencies to develop or revise proposed procedures for implementing the procedural provisions of NEPA (86 FR 34154). This interim rule is expected to be followed by a second rulemaking phase that will seek to address the many deficiencies of the 2020 rule (*See* White House Press Release, CEQ Extends Deadline for Agencies to Propose Updates to National Environmental Policy Act Procedures). Additionally, Department of the Interior Secretary Haaland issued a Secretarial Order stating that the 2020 rule will not be applied "in a manner that would change the application level of NEPA that would have been applied to a proposed action before the 2020 Rule went into effect on September 14, 2020" (Secretarial Order No. 3399, § 5 (a)).

[13] *Id.* § 4321.

[14] *Id.* § 4332

[15] 40 C.F.R. § 1502.1.

[16] *Id.* § 1502.16(a)(5).

[17] Courts recognized the requirement to examine the cumulative impacts of a project well before regulations requiring a cumulative impacts analysis were promulgated in 1978. For instance, in 1972, the U.S. Court of Appeals for the Second Circuit found that when making a determination regarding whether or not an action is subject to NEPA, agencies should consider, *inter alia*, "the absolute quantitative adverse environmental effects of the action itself, including the cumulative harm that results from its contribution to existing adverse conditions or uses in the affected area." *Hanly v. Kleindienst*, 471 F.2d 823, 830-31 (2d Cir. 1972). The Court went on to highlight that, "it must be recognized that even a slight increase in adverse conditions that form an existing environmental milieu may sometimes threaten harm that is significant. One more factory polluting air and water in an area zoned for industrial use may represent the straw that breaks the back of the environmental camel. Hence the absolute, as well as comparative, effects of a major federal action must be considered." *Hanly v. Kleindienst*, 471 F.2d at 831. Likewise, in 1975, the U.S. Court of Appeals for the Seventh Circuit stated that, "NEPA is clearly intended to focus concern on the 'big picture' relative to environmental problems. It recognizes that each 'limited' federal project is part of a large mosaic of thousands of similar projects and that cumulative effects can and must be considered on an ongoing basis." *Swain v. Brinegar,* 517 F.2d 766 (7th Cir. 1975) (recognizing that an EIS should consider comprehensive, cumulative impacts, but resolving the case on the grounds that the federal agency had impermissibly delegated the EIS to Illinois state authorities.) Similarly, in

Additionally, under NEPA, BOEM must make every attempt to obtain and disclose data necessary to its analysis in order to provide a "full and fair discussion of significant environmental impacts."[18] Under previous regulations, the simple assertion that no information or inadequate information exists will not suffice. Unless, under the 1978 regulations, the costs of obtaining the information are exorbitant, NEPA requires that it be obtained.[19] Under the 1978 regulations, agencies were further required to identify their methodologies, indicate when necessary information is incomplete or unavailable, acknowledge scientific disagreement and data gaps, and evaluate indeterminate adverse impacts based upon approaches or methods "generally accepted in the scientific community."[20] Such requirements become acutely important in cases where, as here, so much about an activity's impacts depend on newly emerging science. Finally, NEPA does not permit agencies to "ignore available information that undermines their environmental impact conclusions."[21]

A. Analysis of Cumulative Impacts

1. Scope of Reasonably Foreseeable Offshore Wind Development

Critical to a proper cumulative impacts analysis is its scope. In Vineyard Wind 1's June 2020 Supplemental EIS, BOEM greatly expanded the "scope for future offshore wind development . . . from what was considered in the Draft EIS [for Vineyard Wind], which only considered in detail projects that had submitted construction plans (approximately 130 MW) in federal waters at that time)."[22] BOEM kept this scope for the Vineyard Wind 1 Final EIS, issued on March 12, 2021.[23] Likewise, the January

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1976, the U.S. Supreme Court acknowledged the importance of examining cumulative effects under NEPA, concluding that, "Cumulative environmental impacts are, indeed, what require a comprehensive impact statement." *Kleppe v. Sierra* Club, 427 U.S. 390, 413 (1976). Although 40 C.F.R. §1508.7 currently remains repealed, in a January 20, 2021 executive order, President Biden ordered the "immediate review of agency actions taken between January 20, 2017, and January 20, 2021" that are inconsistent with his Administration's policies of "promot[ing] and protect[ing] our public health and the environment"; conserving, "restor[ing] and expanding our national treasures and monuments"; "listen[ing] to the science"; and "reduc[ing] greenhouse gas emissions." Exec. Order No. 13,990, 86 Fed. Reg. 7037 (Jan. 20, 2021). President Biden directed the heads of agencies to immediately review all regulations and other agency actions promulgated, issued, or adopted between January 20, 2017, and January 20, 2021, that are inconsistent with these Administration policies, and for any such actions identified, "the heads of agencies shall, as appropriate and consistent with applicable law, consider suspending, revising, or rescinding the agency actions." *Id.* It is possible that the Biden Administration's review of Trump Administration regulatory actions will result in a reinstatement of 40 C.F.R. §1508.7.

[18] 40 C.F.R. § 1502.1.

[19] 40 C.F.R. § 1502.22 (repealed 2020); *see also* 42 U.S.C. §4332(G)(agencies shall "make available to states, counties, municipalities, institutions, and individuals, advice and information useful in restoring, maintaining, and enhancing the quality of the environment"). The current regulations require that such information be obtained if "the overall costs of obtaining it are not unreasonable." 40 C.F.R. § 1502.21(b).

[20] 40 C.F.R. §§ 1502.22(b)(2), (b)(4), 1502.24 (repealed 2020). Current regulations at 40 C.F.R. §§ 1502.21(c), 1502.23 have similar provisions that are not inconsistent with the application of the more robust previous regulations.

[21] *Hoosier Environmental Council v. U.S. Department of Transportation*, 2007 WL 4302642 *13 (S.D. Ind. Dec. 10, 2007).

[22] Vineyard Wind 1 Offshore Wind Energy Project, Supplement to the Draft Environmental Impact Statement (June 2020), at ES-2. (VW1 SEIS)

[23] Vineyard Wind 1 Offshore Wind Energy Project, Final Environmental Impact Statement (Mar. 2021), at 1-5. (VW1 FEIS).

2021 South Fork Draft EIS also used this broader scope for its cumulative impact analysis.[24] This scope is described as the state capacity planned commitment for existing Atlantic leases (21.8 GW, or approximately 22 GW). While this was a reasonably foreseeable scope for offshore wind development at the time, now that the first U.S. offshore wind facility has been permitted with Vineyard Wind 1, life has been injected into the industry. Paired with an ever-greater urgency to address increasing climate change impacts, the offshore wind industry is materializing quickly. As such, state capacity planned commitment should be re-evaluated to consider a larger role for pledged commitments in cumulative impacts assessment. We urge BOEM to expand the Empire Wind Draft EIS to include the Administration's goal of building 30 GW of offshore wind within the next nine years, future development in the newly identified Wind Energy Areas (WEAs) in the New York Bight, and North Carolina's new commitment for 8 GW of offshore wind by 2040. Moreover, turbine technology and spacing needs are rapidly evolving and technical resource potential should be reexamined to ensure that the cumulative impacts evaluation is keeping pace with technology and political needs.

2. BOEM Should Account for Technological Changes in Future Evaluations

As acknowledged in previous environmental reviews of offshore wind projects,[25] in assessing how future wind sites may be constructed, operated, and sited, it is reasonable to assume that future projects will employ higher output turbines that can generate more power by using fewer physical turbines of larger size. This could change impacts related to hub height, rotor diameter, and total height of turbines for future projects, as well as, *inter alia*, the number of turbines and the length of inter-array cables.[26]

Projects, particularly projects further on the time horizon, may have increasingly larger turbines that could impact the design and layout of the operation. As BOEM has already noted, for future projects, BOEM should assume that "the largest turbine that is presently commercially available" be used to evaluate potential impacts.[27] Changes in turbine size could have beneficial impacts (such as fewer turbines spaced further apart) as well as potentially negative impacts (larger rotation zones that could impact certain species like higher flying birds). The Vineyard Wind 1 project is one example of successfully incorporating evolving technological changes. In Empire Wind's Draft EIS, we urge BOEM to ensure that future cumulative impact models continue to keep pace with technology.

3. BOEM Must Ensure Robust Data Collection and Monitoring at the Project and Regional Level to Properly Assess Cumulative Impacts

BOEM must consider strong and intentional action in the preparation of the EIS to advance robust monitoring, which will assess impacts and enable adaptive management. As previously noted, offshore wind remains a new technology in the United States and, as such, BOEM must closely monitor the impact of offshore wind construction and operations on marine wildlife and the ocean ecosystem to guide its adaptive management and future development.

It is necessary to understand baseline environmental conditions prior to large-scale offshore wind development in the United States, so offshore wind impacts can be clearly understood with relation to

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[24] South Fork Wind Farm and South Fork Export Cable Project, Draft Environmental Impact Statement (Jan. 4, 2021), at 1-6. (SFWF DEIS).
[25] *See* SFWF DEIS at E4-10 ("it is difficult to accurately predict future technology for . . . offshore wind").
[26] *See* SFWF DEIS at E4.
[27] SFWF DEIS at E4-10.

pre-development environments. To this end, BOEM must establish and ensure a robust, long-term scientific plan to monitor the effects of offshore wind development on marine mammals, sea turtles, fish, bats, birds, and other species and their habitats before, during, and after the first large-scale commercial projects are constructed. This monitoring data must be made readily available to stakeholders and the public to inform future decisions in the growing offshore wind industry and minimize risks associated with offshore development. Without strong monitoring in place, we lose the ability to detect and understand potential impacts. It also risks setting an under-protective precedent for offshore wind development generally, and future offshore wind development in particular. Monitoring must inform and drive future project siting, design, implementation, and mitigation as well as potential changes to existing operations to avoid or minimize negative impacts to wildlife and other natural resources.

BOEM must also collaborate with state efforts and agencies (*e.g.*, New York State Department of Environmental Conservation, New York State Environmental Facilities Corporation, New York State Geospatial Advisory Council, New York State Energy Research and Development Authority), scientists, non-governmental organizations, the wind industry, and other stakeholders to use information from monitoring and other research and evolving practices and technology to inform cumulative impacts analyses moving forward. Likewise, the Empire Wind Draft EIS must include more specific information related to how monitoring impacts of offshore wind development and operation on wildlife and their habitats will inform management practices as new information becomes available. As monitoring informs management practices, BOEM must require continued monitoring and employment of adaptive management practices in the Draft EIS as a condition of continued operation and maintenance by Empire Wind. This will ensure that BOEM can swiftly minimize damages of unintended or unanticipated impacts to ecosystems or wildlife and inform strategies for future wind projects to avoid potential impacts.

B. BOEM Must Identify the Climate and Air Quality Benefits

Climate change will result in a wide range of significant adverse environmental impacts in the Empire Wind Project Area. As identified by BOEM in previous environmental analyses for offshore wind projects, these impacts include:

- "alter ecological characteristics of benthic habitat, EFH [essential fish habitat], invertebrates, and finfish, primarily through increasing water temperatures."[28]
- ocean acidification, contributing to "reduced growth or the decline of reefs and other habitats formed by shells" and to "the reduced growth or decline of invertebrates that have calcareous shells" and "lead to shifts in prey distribution and abundance."[29]
- ocean warming affects coastal habitats and "influence[s] finfish and invertebrate migration and may increase the frequency or magnitude of disease."[30]

These climate impacts will affect a broad range of species utilizing coastal and marine ecosystems including marine mammals, turtles, birds, and fish. A number of impact-producing factors (IPFs) in previous offshore wind environmental reviews are related to climate change. For instance, "increased

[28] *E.g.,* SFWF DEIS at 3-15.
[29] *E.g., Id.* at E3-4, 3-15, E2-7.
[30] *E.g., Id.* at 3-6.

storm frequency and severity during breeding season can reduce productivity of bird nesting colonies and kill adults, eggs, and chicks."[31] These same IPFs may result in "changes in nesting and foraging habitat abundance and distribution, and changes to migration patterns and timing."[32] For sea turtles, climate change would alter existing habitats, rendering some areas unsuitable for some species and more suitable for others.[33] These IPFs also have the potential to "result in impacts on marine mammals" including physiological stress and behavioral changes,"[34] as well as "reduced breeding, and/or foraging habitat availability, and disruptions in migration."[35] These impacts must be accounted for in the Empire Wind Draft EIS.

Additionally, as BOEM has already observed, offshore wind generation will likely directly displace fossil fuel generation. Due to offshore wind's ability to displace more highly polluting fossil resources with clean energy, the climate impacts of the proposed offshore wind buildout would be net climate beneficial. As explained in prior comments to the agency, if 22 GW of offshore wind displaced coal generation, over a 30-year period this would result in a net reduction in carbon dioxide (CO_2) emissions of 2.89 billion tons.[36] If these 22 GW offshore wind energy were displacing gas, it would still be displacing nearly 1.5 billion tons of CO2 emissions and significant methane emissions. Consequently, cumulative effects of offshore wind development may result in long-term, low-intensity beneficial cumulative impacts on wildlife and long-term beneficial impacts on demographics, employment, and economics.[37]

These climate benefits can also be monetized using the social cost of carbon to illustrate differences between the social benefits of a project and the relative social cost of the alternatives. The social and environmental costs of greenhouse gas emissions are readily quantifiable and BOEM should consider them in evaluating project impacts and impacts of alternatives. For example, the Interagency Working Group on Social Cost of Carbon has produced estimates for the social cost of carbon in order to "allow agencies to incorporate the social benefits of reducing CO_2 emissions into cost-benefit analyses of regulatory actions that impact cumulative global emissions."[38] The working group presents values for social costs from 2015 to 2030, assuming discount rates of 5%, 3%, 2.5% and the 95th percentile of the 3% discount rate.[39] These values range from $11 to $212 (in 2007 dollars) per metric ton of CO_2.[40] These values could be used to monetize the costs imposed by the net greenhouse gas emissions associated with failing to procure the full 22 GW of offshore wind. Using the working group values, annual climate costs of procuring electricity from 22 GW of coal rather than 22 GW of offshore wind range (assuming a 50% capacity factor in both cases) range from just over $1 billion/year (in 2007$) using a 5% discount

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[31] *E.g., Id.* at E2-7.
[32] *E.g., Id.* at H-45.
[33] *E.g., Id.* at H-68.
[34] *E.g., Id.* at E3-15, E3-17.
[35] *E.g., Id.* at E3-19.
[36] Comments of National Wildlife Federation et al. Submitted in Response to the Bureau of Ocean Energy Management Draft Environmental Impact Statement for the Deepwater South Fork Wind Farm and South Fork Export Cable Project, 86 Fed. Reg. 1520 (January 8, 2021) (submitted Feb. 22, 2021) at 9-13.
[37] *E.g., Id.* at H-68, E3-25, E3-29.
[38] Interagency Working Group on Social Cost of Carbon, United States Government, Technical Support Document: - Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis – Under Executive Order 12866 at 2 (July 2015 revision), available at https://www.whitehouse.gov/sites/default/files/omb/inforeg/scc-tsd-final-july-2015.pdf.
[39] *Id.*
[40] *Id.*

rate and the 2020 social cost of carbon[41] to more than $8.3 billion/year (in 2007$) using a 2.5% discount rate and the 2050 social cost of carbon of $95/ton.[42] These social benefits would increase when calculated for 30 GW or more of offshore wind.

Even absent direct quantification through the social cost of carbon, there are adverse economic impacts from climate change that exist and should be accounted for in the Empire Wind Draft EIS. These impacts include, as noted in previous BOEM analyses:

- Property or infrastructure damage and increased insurance costs and reduced economic viability of coastal communities resulting from sea level rise and increased storm severity/frequency;
- Damage to structures, infrastructures, beaches, and coastal land, with numerous economic impacts resulting from erosion and deposition of sediments;
- Adverse impacts on commercial and for-hire fishing, individual recreational fishing, and sightseeing resulting from ocean acidification, altered habitats, altered migration patterns, and increased disease frequency in marine species.[43]

Air emissions present a similar story to climate emissions, but with the additional dimension of environmental justice and locational benefits to pollution impacts. Based on previous analyses of offshore wind projects, air quality impacts should be anticipated during construction with smaller and more infrequent impacts anticipated during decommissioning.[44] Previous analyses have shown a "minor beneficial" improvement in air quality is expected from offshore wind development coming online and displacing fossil fuels,[45] which can offer modest reprieve to environmental justice populations who suffer disproportionately from these impacts.[46] These impacts, including the beneficial impacts, need to be considered in the Empire Wind Draft EIS.

In considering the environmental justice impacts, BOEM must look at how power plants are frequently located in or close to population centers and disproportionately located in or near communities of color, lower income communities, and Indigenous communities. The ability of offshore wind to displace fossil fuel generation thus has a potentially important environmental justice benefit. This displacement could be particularly pronounced, as offshore wind facilities' generation often coincides with afternoon peak demand.[47] Offshore wind may be especially helpful in displacing the dirtiest peaking units, providing especially large air quality benefits and benefits to environmental justice communities.

C. The Draft EIS Must Consider a Reasonable Range of Alternatives

An EIS must "inform decision makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment."[48] This requirement has

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[41] 23.9 million metric tons CO2 * $12/ton CO2 * (22 GW/6 GW) = $1.05 billion (2007$).
[42] 23.9 million metric tons CO2 * $95/ton CO2 * (22 GW/6 GW) = $8.3 billion (2007$).
[43] SFWF DEIS at E3-29.
[44] *Id.* at A-45.
[45] *See e.g.*, VW1 FEIS, at ES-14.
[46] *Id.* at 3-152.
[47] Dep't of Energy, Office of Energy Efficiency & Renewable Energy, Top 10 Things You Didn't Know About Offshore Wind Energy, https://www.energy.gov/eere/wind/articles/top-10-things-you-didnt-know-about-offshore-wind-energy (last visited Apr. 28, 2021).
[48] 40 C.F.R. § 1502.1.

been described in former regulations as "the heart of the environmental impact statement."[49] The courts describe the alternatives requirement equally emphatically, citing it as the "linchpin" of the EIS.[50] Even under current regulations, which several commenters are challenging as illegal, the agencies must "[e]valuate reasonable alternatives to the proposed action, and, for alternatives that the agency eliminated from detailed study, briefly discuss the reasons for their elimination."[51] Consideration of alternatives is required by (and must conform to the independent terms of) both sections 102(2)(C) and 102(2)(E) of NEPA.

To ensure BOEM can perform a sufficient NEPA review of the Empire Wind Project, the Construction and Operations Plan (COP) must provide enough specifics on each possible configuration covered by the proposed project design envelope (PDE) to enable evaluation of impacts on affected species and to fully evaluate the proposal. For example, it would be insufficient to simply identify the total number of turbines that might be built, because the timing of pile driving is also critical to evaluating noise-related impacts to marine mammals and other species. Additionally, to encompass the full range of reasonably foreseeable impacts, BOEM's analysis must include an alternative that combines the most disruptive components for each option included in the envelope. The design envelope alternative also cannot be conceived or analyzed so broadly that it impairs BOEM's duty to effectively "inform decision makers and the public of the reasonable alternatives which would avoid or minimize impacts," as NEPA requires.[52]

D. BOEM Should Analyze the Environmental Impacts from Gravity-Based Foundations and Monopile Foundations as Separate Alternatives

Our organizations recommend that the EIS analyze the impacts from gravity-based foundations separate from those of monopile foundations, to clearly illuminate the pros and cons of the various foundation types on the area's wildlife and existing uses. As offshore wind development's PDE portrays the greatest expected impact, it will be necessary to add a section that teases apart the impacts from these two very different technologies. BOEM should consider how to present several scenarios (*e.g.*, 100% use of gravity-based foundations, 100% use of monopile foundations, a mix of gravity-based and monopile foundations) to allow the public to understand how various impacts could be decreased by adopting a particular alternative. Clearly identifying impacts by foundation type will also help develop relevant agency minimization, mitigation, and monitoring requirements.

E. BOEM Must Comply with Section 106 of the National Historic Preservation Act and Recognize and Respect Tribes' Sovereign Status and Collaborate Directly with Tribal Governments in a Consultative Process

During preparation of this EIS, BOEM intends to ensure that the NEPA process will meet its National Historic Preservation Act (NHPA) obligation. The construction of wind turbine generators (WTGs), offshore substation, installation of electrical support cables, operations and maintenance (O&M) facility, port facilities, and development of staging areas are ground- or seabed-disturbing activities that could directly affect archaeological resources. Section 106 of the NHPA requires Federal agencies to "take into

[49] 40 C.F.R. § 1502.14 (repealed 2020).
[50] *Monroe County Conservation Council v. Volpe*, 472 F.2d 693 (2d Cir. 1972).
[51] 40 C.F.R. § 1502.14(a).
[52] *Id.* § 1502.1.

account the effects of their undertakings on historic properties."[53] It also gives the Advisory Council on Historic Preservation an opportunity to comment.[54] The Section 106 process balances historic preservation concerns with the needs of federal agencies while involving interested parties.[55]

Robust consultation with states and tribes under Section 106 is paramount to ensuring the Project appropriately considers impacts on historic state and tribal resources.[56] Additionally, it is necessary that during development proper precautions are taken in case unknown cultural resources are uncovered.[57] It is critical that the project include best management practices developed collaboratively with tribes for cultural resource protection in order to avoid, minimize, and mitigate any potential adverse impacts to cultural resources.

Executive Order 13175 mandates all executive agencies recognize and respect tribal sovereign status and engage in "regular, meaningful, and robust consultation with Tribal officials in the development of Federal policies that have Tribal implications."[58] We encourage BOEM to also adopt early consultation as envisioned in Secretary Haaland's recent Secretarial Order:

> Bureaus/Offices will proactively begin consultation with potentially impacted Tribes, both those currently in the proposed area and those with a historic presence, as well as engage potentially impacted environmental justice communities early in the project planning process. "Early in the project planning process" includes when a Bureau/Office has enough information on a proposed action to determine that an environmental assessment or an environmental impact statement will be prepared.[59]

[53] 36 C.F.R. § 800.1.
[54] *Id.*
[55] *Id.*
[56] Successful compliance with Section 106 involves identifying state, tribal, and private interests involved in historic preservation within the development areas. Relevant State or Tribal Historical Preservation officers (SHPO or THPO respectively) must be involved in the Section 106 process, along with any private preservation groups with appropriate legal or economic interests. BOEM must identify which historic properties are listed, or are eligible for listing, on the National Register of Historic Places that could be affected by the project. BOEM must assess the project's impact on these properties to determine if any adverse effects "diminish the characteristics qualifying a property for inclusion in the national register." (36 C.F.R § 800.5.) Collaborative efforts between BOEM, SHPO, THPO, and any private preservation groups can result in agreed upon measures to minimize or mitigate known adverse effects. These collaborations should continue throughout project development in case any unknown cultural or archeologic resources are discovered during development.
[57] If any additional or previously unidentified cultural resources are located during project implementation, the find must be protected from operations and reported immediately to the SHPO or THPO staff. All operations in the vicinity of the find will be suspended until the site is visited and appropriate recordation and evaluation is made by the SHPO or THPO staff.
[58] Exec. Order No. 13,175, 65 Fed. Reg. 67,249, 67,249–50 (Nov. 6, 2000) (mandating that agencies "respect Indian tribal self-government and sovereignty" when "formulating and implementing policies" that affect tribal interests). Reinforced in the Memorandum on Tribal Consultation and Strengthening Nation-to-Nation Relationships. Jan. 26, 2021. https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/26/memorandum-on-tribal-consultation-and-strengthening-nation-to-nation-relationships/.
[59] Secretarial Order No. 3399, at § 5(c). Apr. 16, 2021. https://www.doi.gov/sites/doi.gov/files/elips/documents/so-3399-508_0.pdf.

Native American and Alaska Native Tribes are sovereign governments recognized as self-governing under federal law, and the U.S. government has a "trust responsibility" to those tribes.[60] The federal government has special fiduciary obligations to protect Native resources and uphold the rights of Indigenous peoples to govern themselves on tribal lands.[61] In carrying out this duty, federal officials are "bound by every moral and equitable consideration to discharge the federal government's trust with good faith and fairness."[62] Acting in accord with these trust responsibilities requires nation-to-nation consultation from the first opportunity.

III. Gravity-Based Foundations Offer Significant Environmental Benefits and Flexibility

Our organizations welcome Empire Wind's embrace of gravity-based foundations as a preferred foundation type. Gravity-based foundations offer several environmental benefits over the other offshore wind foundations evaluated in the COP. Most significantly, gravity-based foundations do not require pile driving and thus avoid the noise impacts stemming from that activity.[63] Pile driving noise has been identified as a stressor of high concern for marine wildlife and the health of the broader marine ecosystem.[64] Sensitivity to the loud impulsive sound that propagates through the water column and substrate from pile driving extends to marine mammals, sea turtles, fish, and benthic and pelagic invertebrates, some of which support economically valuable fisheries. Potential impacts of unmitigated exposure to pile driving noise include physical injury, hearing impairment, habitat displacement, stress, disruption of vital behaviors such as feeding, breeding, and communication, and other health effects.[65] Particle motion caused by pile driving is also expected to result in impacts to species in the water column as well as the seabed, although these impact pathways require further study.[66]

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[60] *Id*.

[61] *Eric v. Sec'y of U. S. Dep't of Hous. & Urban Dev.,* 464 F. Supp. 44 (D. Alaska 1978).

[62] *United States v. Payne*, 264 U.S. 446, 448 (1924); *accord Yukon Flats School Dist. V. Native Village of Venetie* Tribal Govt't, 101 F.3d 1286 (9th Cir. 1996) *rev'd on other grounds* 522 U.S. 520 (1998); *see also* 84 Fed. Reg. 1200–01 (Feb.1, 2019) (including 229 Alaska Native entities in the list of tribes recognized as having the immunities and privileges of "acknowledge Indian tribes by virtue of their government-to-government relationship with the United States.") Note that the trust doctrine includes duties to manage natural resources for the benefit of tribes and individual landowners, and the federal government has been held liable for mismanagement. (*See United States v. Mitchell*, 463 U.S. 206 (1983) (holding that the Department of the Interior was liable for monetary damages for mismanaging timber resources of the Quinault tribe in violation of the agency's fiduciary duty.)

[63] Our groups are highly supportive of fixed foundation types that significantly reduce noise during installation, including gravity-based foundations, suction buckets (or "caissons"), and jack-up foundations (see, *e.g.*, http://www.windbaseoffshore.com/), and encourage BOEM to incentivize full consideration of these foundations for all fixed-foundation wind energy projects in the United States.

[64] "New York State Offshore Wind Master Plan Environmental Sensitivity Analysis. Final Report." NYSERDA Report 17-25. Prepared for New York State Energy Research and Development Authority by Ecology and Environment Engineering, P.C., New York, New York, (November 2017). Available at: https://www.nyserda.ny.gov/-/media/Files/Publications/Research/Biomass-Solar-Wind/Master-Plan/17-25i-Environmental-Sensitivity.pdf.

[65] See, *e.g.*, Weilgart, L. "The Impacts of Anthropogenic Ocean Noise on Cetaceans and Implications for Management," Canadian Journal of Zoology 85, no. 11 (2007): 1091-1116; Weilgart, L. "The Impact of Ocean Noise Pollution on Fish and Invertebrates," OceanCare and Dalhousie University (May 2018). Available at: https://www.oceancare.org/wpcontent/uploads/2017/10/OceanNoise_FishInvertebrates_May2018.pdf.

[66] Sophie L. Nedelec, James Campbell, Andrew N. Radford, Stephen D. Simpson, and Nathan D. Merchant (2016) Particle motion: the missing link in underwater acoustic ecology. Methods in Ecology and Evolution V7, 836–842.

By entirely avoiding the impact of pile driving noise, the installation of gravity-based foundations represents 'best practice' in the context of the mitigation hierarchy (avoid, minimize, mitigate) for this impact producing factor.[67] As developers will not need the same level of noise protection in place, gravity-based foundations may offer the flexibility to construct year-round (*e.g.*, avoiding seasonal restrictions designed to protect North Atlantic right whale from pile driving noise) in certain regions, such as the New York Bight, as long as a mandatory 10 knot vessel speed restriction is in place, and eliminate the need for expensive underwater noise reduction and attenuation technologies (*e.g.*, hydro sound dampers, bubble curtains, etc.).

While our organizations support consideration of gravity-based foundations for the Empire Wind project and are encouraged about the potential project's minimal noise footprint, we acknowledge that there remains much to learn about the potential impacts of gravity-based foundations in the United States. We urge BOEM to work closely with Equinor to review the project's potential impacts and to establish a thoughtful and rigorous long-term scientific monitoring program with the view to inform the responsible development of future offshore wind energy projects that employ this foundation type.

One of the primary environmental considerations for gravity-based foundations is the impact to the benthos. Gravity-based foundations require more seabed preparation and scour protection relative to monopile foundations. Scour protection may comprise rocks (*i.e.*, crushed rock or boulders), rocks bags, or concrete blocks that are placed around the monopile or gravity-based foundation to prevent scouring of seabed material.[68] The amount of seabed covered by the gravity-based foundation and associated scour protection is over seven times larger than what is required of a monopile foundation and associated scour protection.[69] However, because seabed preparation for gravity-based foundations is undertaken to a greater depth below the seafloor than monopiles (18.7 feet below the seafloor relative to 8.2 feet), the volume of scour protection required for the entire project (approx. 174 turbines total for Empire Wind 1 and 2) is approximately 8 times that required if monopiles were used (*i.e.*, 145,037 cubic yards relative to 17,551 cubic yards).[70]

Due to the greater degree of seabed preparation and scour protection for gravity-based foundations, BOEM must carefully consider how potential negative impacts to the benthos, particularly designated Essential Fish Habitat for large numbers of species,[71] can be avoided, minimized, mitigated, and monitored. Local-scale impacts should be avoided by micro-siting foundations away from sensitive

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[67] IUCN and The Biodiversity Consultancy. "Mitigating biodiversity impacts associated with solar and wind energy development: guidelines for project developers" (2021). Available at: https://portals.iucn.org/library/node/49283.

[68] Empire Wind Construction and Operations Plan (EOW COP) at 3-17- to 3-18.

[69] *Id*. at Table 3.3-9; Gravity-based foundations require 609 feet in diameter of scour protection (excluding filter layer) relative to 226 feet in diameter for monopiles. This translates to approximately 7.25 times more area of seafloor covered for gravity-based foundations than monopiles.

[70] *Id*.

[71] According to the 2019 Empire Wind environmental mitigation plan prepared for the NYSERDA Environmental Technical Working Group (E-TWG), EFH has been designated in the lease area for various life stages of more than two dozen nonmigratory managed species, including finfish, sharks and rays, and invertebrates. Designated EFH for three (3) coastal migratory pelagic and seventeen (17) highly migratory managed fish species also occurs in the lease area. Available at: https://a6481a0e-2fbd-460f-b1df-f8ca1504074a.filesusr.com/ugd/78f0c4_289703fdb51f4bc3a30b7e3f1dc71d85.pdf.

species and habitats. The substrate where the project is to be sited is predominantly sand and mud;[72] thus, the potential impacts from introducing significant levels of rocky scour should be carefully considered, particularly on sand lance and benthic invertebrates that form a significant foundation of the trophic pyramid in sand and mud benthos.

To minimize and mitigate potential scour protection impacts for all foundation types, including gravity-based foundations, BOEM should consider requiring scour protection follow a Nature-Based Design approach. Nature-Based Design refers to options that can be integrated with or added to the design of offshore wind infrastructure to create suitable habitat for species or communities whose natural habitat has been modified, degraded, or reduced.[73] A rigorous scientific monitoring program for the lifetime of the project will help assess the impact of changes to benthic habitat and community composition and help determine the degree to which scour protections should be removed or left in place during the project's eventual decommissioning.

In addition to benthic considerations, the design of an offshore wind farm (utilizing any foundation type), such as the location, number of turbines, and foundation types, may affect local and regional hydrodynamics.[74] As discussed further in Section IV(E)6(d), as tidal currents move past offshore wind foundations, they generate a turbulent wake that contributes to a mixing of the stratified water column which, with large-scale wind energy buildout, could significantly affect the stratification of a water column, including in the New York Bight's "Cold Pool."

BOEM should follow the monitoring guidance set forth in the New York State Energy and Research Development Authority (NYSERDA) Environmental Stratification Workgroup Report[75] and undertake research similar to that conducted in Europe for monopile foundations[76] to better understand the effects of individual gravity-based foundations, as well as the cumulative effects of large-scale build out, on mixing and stratification in the New York Bight, including potential impacts on the development of the Cold Pool, and any indirect impacts on fish and invertebrates, including prey aggregations of higher trophic level predators.[77]

Finally, while gravity-based foundations eliminate pile driving noise, there will be some noise generated during installation (*i.e.*, from dynamic position systems, seabed preparation, etc.). BOEM, in

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[72] Battista, T. W. Sautter, M. Poti, E. Ebert, L. Kracker, J. Kraus, A. Mabrouk, B. Williams, D.S. Dorfman, R. Husted, and C.J. Jenkins. 2019. Comprehensive Seafloor Substrate Mapping and Model Validation in the New York Bight. OCS Study BOEM 2019-069 and NOAA Technical Memorandum NOS NCCOS 255. 187 pp. doi:10.25923/yys0-aa98. Available at: https://repository.library.noaa.gov/view/noaa/21989

[73] Sensu, Hermans et al. 2020. Nature-Inclusive Design: A catalog for offshore wind infrastructure. https://edepot.wur.nl/518699

[74] Segtnan OH, Christakos K. 2015. Effect of offshore wind farm design on the vertical motion of the ocean. Energy Procedia 80(2015): 213-222.

[75] Available at: https://drive.google.com/file/d/15i0sGK9FyQDgS5pipnfefrH7tA5FBHMq/view.

[76] See, *e.g.*, Schultze, L. K. P., et al. "Increased mixing and turbulence in the wake of offshore wind farm foundations," *Id*.

[77] At least 2 NOAA documents that speak about the impact of offshore wind on copepods and prey availability: https://apps-nefsc.fisheries.noaa.gov/rcb/publications/soe/SOE_NEFMC_2021_Final-revised.pdf. *See* slide 4 ("Offshore Wind Risks: Right whales may be displaced and altered local oceanography could affect distribution of their zooplankton prey."); See, also, page 13 of the Species in the Spotlight Report for a discussion of OSW impacts. https://media.fisheries.noaa.gov/2021-04/SIS%20Action%20Plan%202021_NARightWhale-FINAL%20508.pdf.

coordination with National Marine Fisheries Service (NMFS), should use Empire Wind as an opportunity to characterize source noise levels during the installation of gravity-based foundations, as well as potential exposure levels for in-water species (*see*, *also*, section IV(E) on impacts to marine mammals). This information should be used to ensure that mitigation and monitoring protocols required during the installation of gravity-based foundations are as protective as possible.

IV. Comments Regarding Resource and Specific Impacts

The following recommendations for the Project's impact assessments apply generally to the resource or ecosystem evaluation of impacts, as well as comments concerning impacts to species.

A. BOEM Must Be Transparent as to How Impacts are Quantitatively or Qualitatively Assessed

The definitions of potential adverse and beneficial impact levels (*i.e*., negligible, minor, moderate, and major) include language that provides minimal guidance on how impacts may be quantified. BOEM should look to previous analyses for more meaningful definitions. For example, adverse moderate and major impact levels in previous analyses include "notable and measurable" and "regional or population-level impact."[78] In addition, the definitions of negative factors included in previous analyses specify "habitat" and "species common to the proposed Project area," which places the impact analyses in an ecosystem context instead of a species-by-species context.[79] For example, "The extent and quality of *local habitat for both special-status species and species common to* the Lease area," and "The *richness or abundance of local species common* to the Lease Area."[80] The terms "richness" and "abundance" are both quantifiable ecological terms that have been described in decades of ecological literature.

More transparent information on how the level of an IPF is quantitatively or qualitatively assessed is needed. As a general matter, the impact analysis should be undertaken in an objective, transparent, and, where possible, quantitative manner. In the absence of available data, BOEM should acknowledge that an IPF is indeterminate and that additional research is needed. BOEM should provide detail on how IPFs and associated criteria have been quantitatively or qualitatively measured in the Draft EIS.

B. Ecosystem Change Should Not Be Framed as "Beneficial"

The Empire Wind Draft EIS should not use value-laden terms (*e.g.*, "beneficial") to describe changes in ecosystems or species. It should instead be objectively described as ecosystem *change*. While we agree that some offshore wind activities may result in a change in the ecosystem and, in some cases, an increase in the abundance of certain species or in overall diversity, we caution against the Empire Wind Draft EIS representing these changes as "beneficial." This is especially the case because it is unclear what implications these changes may have on the wider ecosystem. We recommend that the Empire Wind Draft EIS remain objective in language used in its impact analysis (*e.g.*, by using terminology such as "increase," "decrease," and "change").

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[78] *E.g.,* SFWF DEIS at 3.1.1, Tbl 3.1.1-1 and 3.1.1-2.
[79] *E.g., Id.*
[80] *E.g., Id.* (emphasis added).

C. The Empire Wind Draft EIS Should Account for Ecosystem Uncertainty

BOEM should adopt a precautionary approach to account for fundamental gaps in our understanding of species and their behavioral responses and employ the best available scientific methods to monitor and, if necessary, design mitigation strategies. As a general matter throughout the development and operation of offshore wind projects, BOEM should ensure the necessary research and monitoring is carried out to address the substantial uncertainties regarding offshore wind and wildlife interactions. For instance, we do not know the degree to which bats, marine birds, and nocturnal migrants may interact with offshore wind turbines in U.S. waters and whether those interactions will lead to population-level impacts. Many of these species are currently facing stressors on land, which may make their populations more vulnerable to additional take. Based on this research, mitigation options may be needed to ensure species' health and provide the certainty that will allow for further ramp up of the industry. Improved and sustained data compilation before and after construction as well as during operation would also advance understanding of species' occurrence in the Empire Wind Project Area and region. As the United States offshore wind industry moves forward, we recommend BOEM support the comprehensive analysis of these baseline data and ongoing data compilation and analyses and undertake a regional approach to data analysis to enhance collaboration with developers, scientists, managers, and other stakeholders.

As a general matter, BOEM should also take immediate measures to address data uncertainty related to the influence of climate change on coastal and marine species and habitats (*e.g.*, range shifts). Acknowledging global climate change as a potential cumulative impact is not enough. BOEM should act expeditiously to obtain additional empirical data on current shifts in species and habitat distributions and work to improve its predictive modeling of future species distributions and factor this information into offshore wind project siting, construction, and operations to account for uncertainty related to climate-induced dynamic shifts in distribution (*e.g.*, marine mammals, birds, forage fish, and sharks). [81]

BOEM also retains the ability to consider adoption of supplemental mitigation measures if monitoring or the agency's data collection efforts identify an unexpected negative impact. While it would be inappropriate for BOEM to rely on an adaptive management plan to address environmental considerations in lieu of necessary mitigation measures, the agency is allowed and encouraged to adopt further adaptive management measures if needed.

D. Benthic Resources

Offshore wind projects structurally modify large areas of benthic habitat. For Empire Wind, the PDE indicates that gravity-based foundations would have around a nine acre seabed footprint and monopile foundations would have just under a 0.8 acre seabed footprint, including scour protection.[82] This will necessarily impact benthic invertebrates, which provide a foundation for the marine trophic pyramid, but also impact demersal fishes, and bottom-foraging pelagic animals.

[81] 40 C.F.R. § 1502.21(b) (Explaining the propositions that the agency has an obligation to obtain information essential to a reasoned choice among alternatives, unless the cost of doing so is unreasonable).

[82] EOW COP 3-8, Table 3.3-3.

1. For Pile-Driven Foundations

While pile-driven foundations occupy less benthic habitat than gravity bases, they are the greatest source of noise of all base configurations. Much of what is known about pile driving noise is what is propagated into the water column from the pile as it is struck. Impulsive noise from pile driving can damage fish,[83] marine mammals,[84] sea turtles, and zooplankton,[85] and degrade the acoustic habitat upon which the majority of marine species rely.

What has not been evaluated in pile driving operations is the noise propagated through the substrate by Rayleigh waves[86] and their direct impact on benthic invertebrates and demersal fish. The benthic sediment and substrate serve as habitat for many invertebrates, polychaete annelids, mollusks, crustaceans (including amphipods, crabs, lobster, snapping and mantis shrimp), and echinoderms, as well as lower trophic level fishes such as the sand lance and gobies. These critical organisms serve as the foundation of the trophic pyramid. These animals have adapted to the subtle dynamics of their habitat to find food, avoid predation, and otherwise communicate with conspecifics and co-inhabitants of their environment, and the delicate sensory systems that they use to survive could be damaged by the excessive impulse noise of pile driving.

There is nominal data on how these benthic organisms respond to substrate-borne noise and vibration, although it is known that chronic noise is a stress factor for bivalves[87] and arthropods.[88] In a study by Solan et. al (2016),[89] it was found that chronic shipping and construction noise disrupted the burrowing and bioirrigation[90] activities of the North Sea Langoustine.[91] Langoustine "fluff up" the sediment of the North Sea, providing habitat for burrowing worms, amphipods, crabs, and other marine invertebrates – the foundation of the area's trophic pyramid. If pile driving noise significantly interrupts burrowing and bioirrigation activities such that the substrate is allowed to settle, it may become less like mud and more like concrete. Compromising the habitability of this benthic habitat will affect all marine life dependent

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[83] Robert Abbott, Ph.D. James A. Reyff "San Francisco – Oakland Bay Bridge East Span seismic safety project: Fisheries and hydroacoustic monitoring program compliance report." 2004 See: http://www.biomitigation.org/reports Available as "Revised Fisheries Compliance Report"

[84] Michael Dähne, Anita Gilles , Klaus Lucke, Verena Peschko, Sven Adler, Kathrin Krügel, Janne Sundermeyer, and Ursula Siebert (2013) Effects of pile-driving on harbour porpoises (Phocoena phocoena) at the first offshore wind farm in Germany. Environmental Research Letters V. 8:17

[85] Robert D. McCauley, Ryan D. Day, Kerrie M. Swadling, Quinn P. Fitzgibbon, Reg A. Watson & Jayson M. Semmens "Widely used marine seismic survey air gun operations negatively impact zooplankton." Nature Ecology & Evolution 1, Article number: 0195 (2017) doi:10.1038/s41559-017-0195

[86] https://en.wikipedia.org/wiki/Rayleigh_wave The Rayleigh wave is a surface wave that propagates along the surface of a semi infinite elastic solid.

[87] Charifi M, Sow M, Ciret P, Benomar S, Massabuau J-C (2017) The sense of hearing in the Pacific oyster, *Magallana gigas*. PLoS ONE 12(10): e0185353. https://doi.org/10.1371/journal.pone.0185353

[88] Pine MK, Jeffs AG, Radford CA (2012) Turbine Sound May Influence the Metamorphosis Behavior of Estuarine Crab *Megalopae*. PLoS ONE 7(12):

[89] Solan, M., Hauton, C., Godbold, J. et al. Anthropogenic sources of underwater sound can modify how sediment-dwelling invertebrates mediate ecosystem properties. Sci Rep 6, 20540 (2016). https://doi.org/10.1038/srep20540

[90] Bioirrigation is how much the organism moves water in and out of the sediment by its actions.

[91] University of Southampton News, (5 February 2016) Man -made underwater sound may have wider ecosystem effects than previously thought. https://www.southampton.ac.uk/news/2016/01/underwater-sound-biodiversity-study.page

upon it. Decreases in bioirrigation could also decrease carbon sequestration and nutrient recycling, with the potential consequence of the sediment becoming anoxic.[92]

While these studies were not all focused on installation and operation of monopile-mounted turbines, it is possible that the effects of noise from these structures–from the pile driving installation, to the chronic turbine noise propagated down the monopile into the benthic substrate—would impact benthic-inhabiting taxa in unpredictable ways.[93] Additionally, as mentioned earlier, particle motion caused by pile driving may also result in impacts to species in the seabed.[94]

Pile-driven bases also confer acoustical energy from the turbine masts into the substrate, which becomes a chronic noise problem as the turbines operate. While these noises may seem subtle, benthic-inhabiting creatures use substrate vibrations to sense their surroundings and these vibrations may elevate vigilance, or mask biologically important acoustical cues, causing stress and compromising the organisms' natural history.[95] Mitigating this impact would require acoustically decoupling the mast from the pile-driven base, or if the mast is below the waterline, acoustically decoupling the turbine from the mast. But noise profiles of the equipment should be fully measured prior to developing the field.

BOEM must take these impacts into consideration in assessing pile driving as the turbine deployment option.

2. For Gravity Based Foundations

This term refers particularly to sub-surface structures that utilize mass – typically concrete, to serve as a mounting platform for a turbine mast. Gravity bases are suitable for greater depths than monopiles – the tallest being the "Troll A" platform in the North Sea at 370m (1200ft.).[96] Installation is typically done by assembling prefabricated components and deploying them at sea,[97] and slip-forming for poured-in-place components.[98] The bases disturb the largest area of seafloor of all base technologies, but due to the mass of the bases, they transmit the least amount of turbine operating noise into the surrounding marine habitat. As noted in Section III, the noise impacts of these bases should be analyzed, as well as the how the bases and scour protection change the benthic habitat and community composition.

92 Solan, M., Hauton, C., Godbold, J. et al. Anthropogenic sources of underwater sound can modify how sediment-dwelling invertebrates mediate ecosystem properties. Sci Rep 6, 20540 (2016). https://doi.org/10.1038/srep20540

93 Roberts L, Elliott M. Good or bad vibrations? Impacts of anthropogenic vibration on the marine epibenthos. Sci Total Environ. 2017 Oct 1;595:255-268. doi: 10.1016/j.scitotenv.2017.03.117. Epub 2017 Apr 4. PMID: 28384581.

94 Nedelec et al. (2016).

95 Pine MK, Jeffs AG, Radford CA (2012) Turbine Sound May Influence the Metamorphosis Behavior of Estuarine Crab *Megalopae*. PLoS ONE 7(12):

96 Knudsen, A.; Skjaeveland, H.; Lindseth, S.; and Hoklie, M., "Record-Breaking Water Depth for Fixed Concrete Platforms," Proceedings of the Offshore Technology Conference, Houston, TX, 1994, pp. 453-462.

97 http://www.oceanresource.co.uk/Sea-Breeze.html

98 https://www.slipform.us/slipforming-hebron-offshore-gbs/

E. Impacts to Marine Mammals

1. Status of Marine Mammals in the Empire Wind Project Area

Of the marine mammal species occurring in the New York Bight, the North Atlantic right whale, fin, sei, sperm, and blue whales are listed as endangered under the Endangered Species Act (ESA) and as depleted and strategic stocks under the Marine Mammal Protection Act (MMPA). In addition, humpback whales occurring in the New York Bight are part of the Gulf of Maine stock which is considered strategic under the MMPA.[99]

a) North Atlantic right whales

The survival of the North Atlantic right whale rests on a knife-edge. The best population estimate for the beginning of 2019 is just 368 individuals[100] and 14 animals have since been reported to have died.[101] Moreover, the best population estimate for the beginning of 2018 has been revised down from 412 individuals[102] to 383 individuals.[103] The new 2019 and revised 2018 estimate a significant decrease in survival during the last three years as a result of the ongoing Unusual Mortality Event (UME).[104] Additionally, scientists from the New England Aquarium now believe that "low birth rates coupled with whale deaths means there could be no females left in the next 10 to 20 years."[105] The decline of the species over the past decade is also deeply disturbing. Based on the best population estimate for the species as well as recently documented deaths, approximately 127 animals have been killed since 2011.[106]

The Project Area is part of the NMFS-designated migratory corridor Biologically Important Area (BIA) for the North Atlantic right whale.[107] Since 2010, North Atlantic right whale distribution and habitat use has shifted in response to climate change-driven shifts in prey availability.[108] Best available scientific

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[99] National Marine Fisheries Service (NMFS). 2020. Draft U.S. Atlantic and Gulf of Mexico marine mammal stock assessments -- 2020.

[100] Pace, R.M., "Revisions and further evaluations of the right whale abundance model: Improvements for hypothesis testing." NOAA Technical Memorandum NMFS-NE-269. April 2021. Available at: https://apps-nefsc.fisheries.noaa.gov/rcb/publications/tm269.pdf?utm_medium=email&utm_source=govdelivery.

[101] NMFS, "2017-2021 North Atlantic right whale Unusual Mortality Event," *supra.*

[102] Pettis, H.M., Pace III, R. M., and Hamilton, P.K., "North Atlantic Right Whale Consortium 2019 Annual Report Card," Report to the North Atlantic Right Whale Consortium (2019). Available at: https://www.narwc.org/uploads/1/1/6/6/116623219/2019reportfinal.pdf.

[103] Pettis, H.M., Pace III, R. M., and Hamilton, P.K., "North Atlantic Right Whale Consortium 2020 Annual Report Card." Report to the North Atlantic Right Whale Consortium (2020). Available at: https://www.narwc.org/uploads/1/1/6/6/116623219/2020narwcreport_cardfinal.pdf.

[104] NMFS, "2017-2021 North Atlantic right whale Unusual Mortality Event," *supra.*

[105] Davie, E., "New population estimate suggests only 356 North Atlantic right whales left," CBC News (Oct. 29, 2020). Available at: https://www.cbc.ca/news/canada/nova-scotia/356-north-atlantic-right-whales-left-2020-population-1.5779931.

[106] Pettis, H.M., *et al.*, "North Atlantic Right Whale Consortium 2020 Annual Report Card," *supra*.; Pace, R.M., "Revisions and further evaluations of the right whale abundance model: Improvements for hypothesis testing," *supra*; NMFS, "2017-2021 North Atlantic right whale Unusual Mortality Event," *supra.*

[107] LaBrecque, E., C. Curtice, J. Harrison, S.M.V. Parijs, and P.N. Halpin. 2015. Biologically important areas for cetaceans within U.S. waters – East Coast region. Aquatic Mammals 41(1):17-29.

[108] Record, N., Runge, J., Pendleton, D., Balch, W., Davies, K., Pershing, A., Johnson, C., Stamieszkin, K., Ji, R., Feng, Z. and Kraus, S., "Rapid Climate-Driven Circulation Changes Threaten Conservation of Endangered North Atlantic Right Whales," *Oceanography*, vol. *32*, pp. 162-169 (2019).

information, including regional shipboard and aerial surveys,[109] acoustic detections,[110] photo-identification data,[111] stranding data,[112] a series of Dynamic Management Areas (DMAs) declared by NMFS pursuant to ship strike rule,[113] and prey data,[114] indicate that North Atlantic right whales now rely heavily on the waters within the New York Bight *year-round*. During the New York State Department of Environmental Conservation (NYSDEC) aerial surveys conducted in the New York Bight monthly from March 2017 through February 2020, right whales were sighted during every season except summer.[115]

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[109] Whitt, A.D., K. Dudzinski, and J.R. Laliberté. 2013. North Atlantic right whale distribution and seasonal occurrence in nearshore waters off New Jersey, USA, and implications for management. Endangered Species Research 20:50-69; NEFSC (Northeast Fisheries Science Center) and SEFSC (Southeast Fisheries Science Center). 2020. 2019 annual report of a comprehensive assessment of marine mammal, marine turtle, and seabird abundance and spatial distribution in US waters of the western North Atlantic Ocean - AMAPPS II; Leiter, S.M., K.M. Stone, J.L. Thompson, C.M. Accardo, B.C. Wikgren, M.A. Zani, T.V.N. Cole, R.D. Kenney, C.A. Mayo, and S.D. Kraus. 2017. North Atlantic right whale *Eubalaena glacialis* occurrence in offshore wind energy areas near Massachusetts and Rhode Island, USA. Endangered Species Research 34:45–59.

[110] Kraus, S.D., *et al*., *id*; Davis, G.E., Baumgartner, M.F., Bonnell, J.M., Bell, J., Berchick, C., Bort Thorton, J., Brault, S., Buchanan, G., Charif, R.A., Cholewiak, D., *et al.*, "Long-term passive acoustic recordings track the changing distribution of North Atlantic right whales (*Eubalaena glacialis*) from 2004 to 2014," *Scientific Reports*, vol. 7, p. 13460 (2017); Davis, G.E., M.F. Baumgartner, J.M. Bonnell, J. Bell, C. Berchok, J. Bort Thornton, S. Brault, G. Buchanan, R.A. Charif, D. Cholewiak, C.W. Clark, P. Corkeron, J. Delarue, K. Dudzinski, L. Hatch, J. Hildebrand, L. Hodge, H. Klinck, S. Kraus, B. Martin, D.K. Mellinger, H. Moors-Murphy, S. Nieukirk, D.P. Nowacek, S. Parks, A.J. Read, A.N. Rice, D. Risch, A. Širović, M. Soldevilla, K. Stafford, J.E. Stanistreet, E. Summers, S. Todd, A. Warde, and S.M. Van Parijs. 2017. Long-term passive acoustic recordings track the changing distribution of North Atlantic right whales (*Eubalaena glacialis*) from 2004 to 2014. Scientific Reports 7(1):13460; Davis, G.E., M.F. Baumgartner, P.J. Corkeron, J. Bell, C. Berchok, J.M. Bonnell, J. Bort Thornton, S. Brault, G.A. Buchanan, D.M. Cholewiak, C.W. Clark, J. Delarue, L.T. Hatch, H. Klinck, S.D. Kraus, B. Martin, D.K. Mellinger, H. Moors-Murphy, S. Nieukirk, D.P. Nowacek, S.E. Parks, D. Parry, N. Pegg, A.J. Read, A.N. Rice, D. Risch, A. Scott, M.S. Soldevilla, K.M. Stafford, J.E. Stanistreet, E. Summers, S. Todd, and S.M. Van Parijs. 2020. Exploring movement patterns and changing distributions of baleen whales in the western North Atlantic using a decade of passive acoustic data. Global Change Biology 26(9):4812-4840.

[111] Hamilton, P., "North Atlantic Right Whale Catalog Update, Recent Genetic Findings and Whale Naming Results," Presentation at the North Atlantic Right Whale Consortium Annual Meeting (Oct. 29, 2020).

[112] Asaro, M.J., "Update on US Right Whale Mortalities in 2017," NOAA Fisheries, November 30, 2017. Available at: https://www.greateratlantic.fisheries.noaa.gov/protected/whaletrp/trt/meetings/2017%20Nov/asaro_usstrandings_nov2017.pdf; 2017–2021 North Atlantic Right Whale Unusual Mortality Event https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2021-north-atlantic-right-whale-unusual-mortality-event.

[113] NOAA Fisheries Interactive DMA Analyses: https://apps-nefsc.fisheries.noaa.gov/psb/surveys/interactive-monthly-dma-analyses/. Although there are challenges in the use of opportunistic sightings data (no area systematically surveyed, effort not corrected for, and potential for counting an individual whale more than once), they are a proxy for habitat used by North Atlantic right whales, as validated by NMFS's management actions based on these data, including the implementation of DMAs.

[114] Pendleton, D.E., Pershing, A., Brown, M.W., Mayo, C.A., Kenney, R.D., Record, N.R., and Cole, T.V.N., "Regional-scale mean copepod concentration indicates relative abundance of North Atlantic right whales," Marine Ecology Progress Series, vol. 378, pp. 211-225 (2009); NOAA Northeast Fisheries Science Center, "Ecology of the Northeast US Continental Shelf – Zooplankton." Available at: https://www.nefsc.noaa.gov/ecosys/ecosystem-ecology/zooplankton.html.

[115] Tetra Tech and LGL. 2020. Final comprehensive report for New York Bight Whale Monitoring Aerial Surveys, March 2017 – February 2020. Technical report prepared by Tetra Tech, Inc. and LGL Ecological Research Associates, Inc. Prepared for New York State Department of Environmental Conservation, Division of Marine Resources, East Setauket, NY.

Right whales have been acoustically detected in near-real time and/or in archived acoustic recordings conducted by the Wildlife Conservation Society and Woods Hole Oceanographic Institution from November to April every year since 2016, and have also been detected in October, May, June or July depending on the year.[116] However, right whales were acoustically detected year-round in the New York Bight during the NYSDEC's passive acoustic monitoring study conducted from October 2017 through October 2019[117] and based on the acoustics study by Davis *et al*. (2017) that included additional data sources for the New York Bight.[118] Therefore, this species should be expected to be present in the Project Area year-round.

Protection of North Atlantic right whale migration and foraging habitat is essential, and further research to determine whether right whales are engaging in these activities in the New York Bight should be undertaken. Foraging areas with suitable prey density are limited relative to the overall distribution of North Atlantic right whales, and a decreasing amount of habitat is available for resting, pregnant, and lactating females.[119] This means that unrestricted and undisturbed access to suitable areas, when they exist, is extremely important for the species to maintain its energy budget.[120] Scientific information on North Atlantic right whale functional ecology also shows that the species employs a "high-drag" foraging strategy that enables them to selectively target high-density prey patches, but is energetically expensive.[121] Thus, if access to prey is limited in any way, the ability of the whale to offset its energy expenditure during foraging is jeopardized. In fact, researchers have concluded: "[R]ight whales acquire their energy in a relatively short period of intense foraging; even moderate changes in their feeding behavior or their prey energy density are likely to negatively impact their yearly energy budgets and

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[116] Murray, A., Wildlife Conservation Society. Pers. comm., 7 Jul 2021.

[117] Estabrook, B.J., K. B. Hodge, D. P. Salisbury, D. Ponirakis, D. V. Harris, J. M. Zeh, S. E. Parks, and A.N. Rice. 2019. Year 1 annual survey report for New York Bight whale monitoring passive acoustic surveys October 2017-October 2018. Contract C009925. Prepared for Division of Marine Resources, New York State Department of Environmental Conservation, Albany, NY by Bioacoustics Research Program, Cornell Lab of Ornithology, Cornell University, Ithaca, NY; Estabrook, B.J., K. B. Hodge, D. P. Salisbury, D. Ponirakis, D. V. Harris, J. M. Zeh, S. E. Parks, and A.N. Rice. 2019. Year 2 annual survey report for New York Bight whale monitoring passive acoustic surveys October 2018 – October 2019. Contract C009925. Prepared for Division of Marine Resources, New York State Department of Environmental Conservation, Albany, NY by Bioacoustics Research Program, Cornell Lab of Ornithology, Cornell University, Ithaca, NY.

[118] Davis, G.E., M.F. Baumgartner, J.M. Bonnell, J. Bell, C. Berchok, J. Bort Thornton, S. Brault, G. Buchanan, R.A. Charif, D. Cholewiak, C.W. Clark, P. Corkeron, J. Delarue, K. Dudzinski, L. Hatch, J. Hildebrand, L. Hodge, H. Klinck, S. Kraus, B. Martin, D.K. Mellinger, H. Moors-Murphy, S. Nieukirk, D.P. Nowacek, S. Parks, A.J. Read, A.N. Rice, D. Risch, A. Širović, M. Soldevilla, K. Stafford, J.E. Stanistreet, E. Summers, S. Todd, A. Warde, and S.M. Van Parijs. 2017. Long-term passive acoustic recordings track the changing distribution of North Atlantic right whales (Eubalaena glacialis) from 2004 to 2014. Scientific Reports 7(1):13460.

[119] Van der Hoop, J., Nousek-McGregor, A.E., Nowacek, D.P., Parks, S.E., Tyack, P., and Madsen, P, "Foraging rates of ram-filtering North Atlantic right whales." *Functional Ecology*, vol. 33, pp. 1290-1306 (2019); Plourde, S., Lehoux, C., Johnson, C. L., Perrin, G., and Lesage, V. "North Atlantic right whale (*Eubalaena glacialis*) and its food: (I) a spatial climatology of Calanus biomass and potential foraging habitats in Canadian waters." *Journal of Plankton Research*, vol. 41, pp. 667-685 (2019); Lehoux, C., Plourde S., and Lesage, V., "Significance of dominant zooplankton species to the North Atlantic Right Whale potential foraging habitats in the Gulf of St. Lawrence: a bioenergetic approach." DFO Canadian Science Advisory Secretariat (CSAS) Research Document 2020/033 (2020). Gavrilchuk, K., Lesage, V., Fortune, S., Trites, A.W., and Plourde, S., "A mechanistic approach to predicting suitable foraging habitat for reproductively mature North Atlantic right whales in the Gulf of St. Lawrence." DFO Canadian Science Advisory Secretariat (CSAS) Research Document 2020/034 (2020).

[120] *Id*.

[121] Van der Hoop, J., *et al*., *id.*

therefore reduce fitness substantially."[122] North Atlantic right whales are already experiencing significant food-stress: juveniles, adults, and lactating females have significantly poorer body condition relative to southern right whales and the poor condition of lactating females may cause a reduction in calf growth rates.[123] Indeed, North Atlantic right whale body lengths have been decreasing since 1981, a change associated with entanglements in fishing gear as well as other cumulative stressors.[124] Undisturbed access to foraging habitat is necessary to adequately protect the species, as is the minimization of disturbance during the species' energetically expensive migration.

b) Other large whales species and stocks

In addition to North Atlantic right whales, humpback and fin whales may occur year-round in the New York Bight and use this region as more than just migratory habitat.[125] The occurrence of humpback whales, particularly feeding whales, in these waters has been increasing in recent years.[126] Fin whales are also known to feed in the New York Bight, particularly during spring and summer.[127] In fact, NMFS has identified a biologically important feeding area for fin whales east of Montauk Point from March to October.[8] While helpful in identifying key areas of importance, the BIAs are not comprehensive and are intended to be periodically reviewed and updated to reflect the best available scientific information.[128] We encourage BOEM to incorporate findings from the updated BIA process that NMFS is currently undertaking.

Ongoing UMEs exist for humpback and minke whales. There have been UMEs for the Atlantic population of minke whales since January 2017 and humpback whales since January 2016. Alarmingly, 107 minke whales have stranded between Maine and South Carolina from January 2017 to July 2021.[129] Elevated numbers of humpback whales have also been found stranded along the Atlantic Coast since January 2016 and, in a little over five years, 150 humpback whale mortalities have been recorded (data through 6 July 2021), with strandings occurring in every state along the East Coast.[130] Partial or full necropsy

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[122] *Id*.

[123] Christiansen, F., Dawson, S.M., Durban, J.W., Fearnbach, H., Miller, C.A., Bejder, L., Uhart, M., Sironi, M., Corkeron, P., Rayment, W., Leunissen, E., Haria, E., Ward, R., Warick, H.A., Kerr, I., Lynn, M.S., Pettis, H.M., & Moore, M.J., "Population comparison of right whale body condition reveals poor state of the North Atlantic right whale." *Marine Ecology Progress Series*, vol. 640, pp. 1-16 (2020).

[124] Stewart, J.D., Durban, J.W., Knowlton, A.R., Lynn, M.S., Fearnback, H., Barbaro, J., Perryman, W.L., Miller, C.A., and Moore, M.J., "Decreasing body lengths in North Atlantic right whales," *Current Biology*, published online (3 June 2021). Available at: https://www.cell.com/current-biology/fulltext/S0960-9822(21)00614-X.

[125] Whitt, A.D., J.A. Powell, A.G. Richardson, and J.R. Bosyk. 2015. Abundance and distribution of marine mammals in nearshore waters off New Jersey, USA. Journal of Cetacean Research and Management 15:45-59.

[126] *Id*.; Pierre-Louis, K. 2017. "Why Whales are Back in New York City." Popular Science. June 7.
Available at: https://www.popsci.com/new-york-city-whales#page-4.

[127] Whitt *et al*. (2015), *id*.

[128] "However, these BIAs are meant to be living documents that should be routinely reviewed and revised to expand the number of species covered and to update the existing BIAs as new information becomes available." Van Parijs, S. M., "Letter of introduction to the Biologically Important Areas issue." Aquatic Mammals, vol. 41, p.1 (2015).

[129] NOAA-NMFS, "2017-2021 Minke whale Unusual Mortality Event along the Atlantic Coast," *supra*; NOAA-NMFS, "2017-2021 North Atlantic right whale Unusual Mortality Event." Available at: https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2021-minke-whale-unusual-mortality-event-along-atlantic-coast

[130] NOAA-NMFS, "2016-2021 Humpback whale Unusual Mortality Event along the Atlantic Coast." Available at: https://www.fisheries.noaa.gov/national/marine-life-distress/2016-2021-humpback-whale-unusual-mortality-

examinations have been conducted on approximately half of the stranded animals and a significant portion showed evidence of pre-mortem vessel strikes. NMFS recently designated the Gulf of Maine humpback whale stock, which occurs in the New York Bight, as a strategic stock under the MMPA based on the total estimated human-caused average annual mortality and serious injury to this stock, including from vessel strikes.[131]

c) Harbor porpoise

Harbor porpoise also require special attention during offshore wind energy development because of their extreme sensitivity to noise. Harbor porpoise are substantially more susceptible to temporary threshold shift (*i.e.*, hearing loss) from low-frequency pulsed sound than are other cetacean species that have thus far been tested.[132] European studies demonstrate that harbor porpoises are easily disturbed by the low-frequency noise produced by pile driving operations during offshore wind energy development. Harbor porpoises have been reported to react to pile driving beyond 20 km and may be displaced from areas for months or years after construction.[133] Both captive and wild animal studies show harbor porpoises abandoning habitat in response to various types of pulsed sounds at well below

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event-along-atlantic-coast; NOAA-NMFS, "2017-2021 Minke whale Unusual Mortality Event along the Atlantic Coast." Available at: https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2021-minke-whale-unusual-mortality-event-along-atlantic-coast, "2016-2021 Humpback whale Unusual Mortality Event along the Atlantic Coast," *supra*.

[131] National Marine Fisheries Service (NMFS). 2020. Draft U.S. Atlantic and Gulf of Mexico marine mammal stock assessments -- 2020.

[132] Lucke, K., Siebert, U., Lepper, P.A., and Blanchet, M.A., "Temporary shift in masked hearing thresholds in a harbor porpoise (*Phocoena phocoena*) after exposure to seismic airgun stimuli." *Journal of the Acoustical Society of America,* vol. 125 (2009): 4060-4070.

[133] *See*, *e.g.*, Carstensen, J., Henriksen, O. D., and Teilmann, J., "Impacts of offshore wind farm construction on harbour porpoises: acoustic monitoring of echolocation activity using porpoise detectors (T-PODs)." *Mar. Ecol. Prog. Ser.* vol. 321 (2006): 295-308; Evans, P.G.H. (ed.), "Proceedings of the ECS/ASCOBANS Workshop: Offshore wind farms and marine mammals: impacts and methodologies for assessing impacts." *ESC Special Publication Series,* no. 49 (2008): 50-59, 64-65, available at http://www.ascobans.org/sites/default/files/document/MOP6_5-06_WindFarmWorkshop_1.pdf ; Tougaard, J., Carstensen, J., Teilmann, J., Skov, H., and Rasmussen, P., "Pile driving zone of responsiveness extends beyond 20 km for harbor porpoises (*Phocoena phocoena*, (L.))." *Journal of the Acoustical Society of America,* vol. 126 (2009): 11-14.; Brandt, M. J., Diederichs, A., Betke, K., and Nehls, G., "Responses of harbor porpoises to pile driving at the Horns Rev II offshore wind farm in the Danish North Sea," *Marine Ecology Progress Series,* vol. 421 (2011): 205-216.; Dähne, M., Gilles, A., Lucke, K., Peschko, V., Adler, S., Krügel, K., Sunderleyer, J., and Siebert, U., "Effects of pile-driving on harbor porpoises (*Phocoena phocoena*) at the first offshore wind farm in Germany." *Environmental Research Letters,* vol. 8 (2013): 025002.

120 dB (re 1 uPa (RMS))[134] and, in fact, evidence of the acoustic sensitivity of the harbor porpoise has led scientists to call for a revision to the NMFS acoustic exposure criteria for behavioral response.[135]

Harbor porpoise have been acoustically detected in and around the New York-New Jersey Harbor Estuary during most months of the year, with peaks in detection occurring in the spring and winter.[136] Impacts to harbor porpoises must therefore also be minimized and mitigated to the full extent practicable during offshore wind siting and development in the New York Bight, including in nearshore areas being considered for cable landings.

d) BOEM's permitting standards

Given concerns regarding the health of the region's whale species, and the critically endangered status of the North Atlantic right whale in particular, BOEM is obligated to protect these species from additional harmful impacts of human activities. The agency is also obligated by NEPA to consider the full range of potential impacts on all marine mammal species. Considering the elevated threat to federally protected large whale species and populations in the Atlantic, emerging evidence of dynamic shifts in the distribution of large whale habitat, and acoustic sensitivity of the harbor porpoise, BOEM must ensure that any potential stressors posed by site assessment activities on affected species and stocks are avoided, minimized, mitigated, and monitored to the full extent possible.[137]

2. BOEM Must Use Best Available Scientific Information to Analyze Impacts to Marine Mammals

As stated in Section IV(E)1 above, distribution and habitat use of North Atlantic right whales and other large whale species and stocks have undergone significant climate-driven shifts. Best available scientific information indicates that North Atlantic right whales, endangered fin whales, and humpback whales now heavily rely on the waters of the New York Bight year-round and that the New York Bight is an important seasonal foraging habitat for fin whales and humpback whales.[138]

To adequately assess the occurrence of and potential impacts to marine mammals in the New York Bight, it is extremely important that BOEM consider a variety of local and regional data sources. For example, the NYSDEC aerial surveys and passive acoustic monitoring data must be combined to provide

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[134] *See, e.g.*, Bain, D.E., and Williams, R., "*Long-range effects of airgun noise on marine mammals: responses as a function of received sound level and distance"* Report by Sea Mammal Research Unity (SMRU), 2006.; Kastelein, R.A., Verboom, W.C., Jennings, N., de Haan, D., "Behavioral avoidance threshold level of a harbor porpoise (*Phocoena phocoena*) for a continuous 50 kHz pure tone." *Journal of the Acoustical Society of America*, vol. 123 (2008): 1858-1861.; Kastelein, R.A., Verboom, W.C., Muijsers, M., Jennings, N.V., van der Heul, S., "The influence of acoustic emissions for underwater data transmission on the behavior of harbour porpoises (*Phocoena phocoena*) in a floating pen." *Mar. Enviro. Res.* Vol. 59 (2005): 287-307; Olesiuk, P.F., Nichol, L.M., Sowden, M.J., and Ford, J.K.B., "Effect of the sound generated by an acoustic harassment device on the relative abundance and distribution of harbor porpoises (*Phocoena phocoena*) in Retreat Passage, British Columbia." *Marine Mammal Science,* vol. 18 (2002): 843-862.

[135] Tougaard, J., Wright, A. J., and Madsen, P.T., "Cetacean noise criteria revisited in the light of proposed exposure limits for harbor porpoises," *Marine Pollution Bulletin.* vol. 90 (2015): 196-208.

[136] Rekdahl, M. Wildlife Conservation Society. Pers. comm., 7 Jul 2021.

[137] 16 U.S.C. § 1371(a)(5)(D)(ii)(I)(2020).

[138] Chou, E., Rekdahl, M., Kopelman, A.H., Brown, D.M., Sieswerda, P.L., DiGiovanni Jr., R., Good, C.P., and Rosenbaum, H.C. Occurrence of baleen whales in the New York Bight, 1998-2027: Insights from opportunistic data. Marine Biodiversity Records. Submitted.

a comprehensive look at the recent occurrence of large whales in the New York Bight. Additional data sources that should be assessed include Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys,[139] NYSERDA digital aerial surveys,[140] and the New Jersey Ecological Baseline Study.[141] Where possible, density estimate modeling for the Project Area should include these multiple data sources.

BOEM currently relies on estimates of marine mammal densities derived from the habitat-based density model (the "Roberts *et al*." model) produced by the Duke University Marine Geospatial Ecology Laboratory.[142] While this model has been updated to incorporate additional data sources,[143] the current density estimates rely entirely on shipboard and aerial line-transect surveys, meaning the models exclude data obtained through passive acoustic monitoring and other long-term sightings data, including for the New York Bight and other regions of the East Coast. Recent aerial surveys[144] and records available through additional sightings databases (*e.g.*, NMFS Right Whale Sighting Advisory System;[145] Northeast Fisheries Science Center (NEFSC) Monthly DMA analysis[146]) and passive acoustic monitoring (*e.g.*, Robots4Whales detections,[147] Acoustic Right Whale Occurrence,[148] large whale acoustics[149]) are

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[139] NEFSC (Northeast Fisheries Science Center) and SEFSC (Southeast Fisheries Science Center). 2020. 2019 annual report of a comprehensive assessment of marine mammal, marine turtle, and seabird abundance and spatial distribution in US waters of the western North Atlantic Ocean - AMAPPS II.

[140] J. Robinson Willmott, J.C., M. Vukovich, A. Pembroke. 2021. Digital aerial baseline survey of marine wildlife in support of offshore wind energy. Overview and summary, Report Number 21-07. Prepared for New York State Energy Research and Development Authority by Normandeau Associates Inc. with APEM Ltd.

[141] GMI (Geo-Marine Inc.). 2010. Ocean/Wind power ecological baseline studies January 2008 - December 2009. Final report. New Jersey Department of Environmental Protection, Trenton, New Jersey; Whitt, A.D., K. Dudzinski, and J.R. Laliberté. 2013. North Atlantic right whale distribution and seasonal occurrence in nearshore waters off New Jersey, USA, and implications for management. Endangered Species Research 20:50-69.

[142] Roberts, J.J., Best, B.D., Mannocci, L., Fujioka, E., Halpin, P.N., Palka, D.L., Garrison, L.P., Mullin, K.D., Cole, T.V., Khan, C.B. and McLellan, W.A., "Habitat based cetacean density models for the U.S. Atlantic and Gulf of Mexico," *Scientific Reports,* vol. 6, p.22615 (2016); Roberts J.J., Mannocci L., and Halpin P.N., "Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2016-2017 (Opt. Year 1)." Document version 1.4. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC (2017); Roberts J.J., Mannocci L., Schick R.S., and Halpin P.N., "Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2017-2018 (Opt. Year 2)." Document version 1.2 - 2018-09-21. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC. (2018).

[143] *Id*.

[144] Tetra Tech and LGL. 2020. Final comprehensive report for New York Bight Whale Monitoring Aerial Surveys, March 2017 – February 2020. Technical report prepared by Tetra Tech, Inc. and LGL Ecological Research Associates, Inc. Prepared for New York State Department of Environmental Conservation, Division of Marine Resources, East Setauket, NY.

[145] NOAA Fisheries, "NOAA Right Whale Sighting Advisory System." Available at: https://fish.nefsc.noaa.gov/psb/surveys/MapperiframeWithText.html.

[146] Northeast Fisheries Science Center, "Interactive Monthly DMA Analysis." Available at: https://apps-nefsc.fisheries.noaa.gov/psb/surveys/interactive-monthly-dma-analyses/

[147] Woods Hole Oceanographic Institution, "Robots4Whales." Available at: http://dcs.whoi.edu/.

[148] Northeast Fisheries Science Center, "Acoustic Indicators of Right Whale Occurrence." Available at: https://apps-nefsc.fisheries.noaa.gov/psb/surveys/interactive-monthly-dma-analyses/.

[149] Davis, G.E., M.F. Baumgartner, J.M. Bonnell, J. Bell, C. Berchok, J. Bort Thornton, S. Brault, G. Buchanan, R.A. Charif, D. Cholewiak, C.W. Clark, P. Corkeron, J. Delarue, K. Dudzinski, L. Hatch, J. Hildebrand, L. Hodge, H. Klinck, S. Kraus, B. Martin, D.K. Mellinger, H. Moors-Murphy, S. Nieukirk, D.P. Nowacek, S. Parks, A.J. Read, A.N. Rice, D.

not incorporated. As such, the estimated densities may significantly underrepresent the density and seasonal presence of large whales in the New York Bight. The North Atlantic right whale model has been updated with additional regional data; this latest Version 11 was released in February 2021.[150] The Roberts et al. model for the U.S. Atlantic will be updated again during Spring 2022.[151]

In addition to these new models, BOEM should utilize Project Area-specific and regional survey data and passive acoustic data to provide a comprehensive assessment of occurrence and density in order to evaluate potential impacts to marine mammal species. BOEM must require that all data are used to ensure that any potential shifts in habitat usage by North Atlantic right whales and other large whale species and stocks are reflected in sound exposure modeling associated with offshore wind development. We suggest one approach to achieving this would be to convene all data holders (*e.g.,* NYSDEC, NYSERDA, Wildlife Conservation Society, Northeast Fisheries Science Center, Woods Hole Oceanographic Institution) with the acoustic modeling team (*e.g.*, JASCO) to collate an updated data set of best available scientific information in a format compatible with undertaking an updated acoustic impact analysis.

As a general matter, integration of local data sources, including opportunistic sightings data, that collect fine-scale information on factors driving marine mammal distribution, with those gathered through systematic broad-scale surveys better reflecting current marine mammal presence, abundance, and density, will provide a more accurate impact assessment. BOEM must take steps now, in coordination with the National Oceanic and Atmospheric Administration (NOAA), to develop a dataset that more accurately reflects marine mammal presence; this is crucial to guide development of the project-level EIS.

3. Advancing Monitoring and Mitigation During Offshore Wind Energy Development

While the best available scientific information justifies the use of seasonal restrictions to temporally separate survey activity from North Atlantic right whales in some areas, it is becoming increasingly clear that there may not be a time of "low risk" for this species. The population size is now so small that any individual-level impact is of great concern. In addition, climate-driven changes in oceanographic conditions, and resulting shifts in prey distribution, are rapidly changing the spatial and temporal

Risch, A. Širović, M. Soldevilla, K. Stafford, J.E. Stanistreet, E. Summers, S. Todd, A. Warde, and S.M. Van Parijs. 2017. Long-term passive acoustic recordings track the changing distribution of North Atlantic right whales (*Eubalaena glacialis*) from 2004 to 2014. Scientific Reports 7(1):13460.; Davis, G.E., M.F. Baumgartner, P.J. Corkeron, J. Bell, C. Berchok, J.M. Bonnell, J. Bort Thornton, S. Brault, G.A. Buchanan, D.M. Cholewiak, C.W. Clark, J. Delarue, L.T. Hatch, H. Klinck, S.D. Kraus, B. Martin, D.K. Mellinger, H. Moors-Murphy, S. Nieukirk, D.P. Nowacek, S.E. Parks, D. Parry, N. Pegg, A.J. Read, A.N. Rice, D. Risch, A. Scott, M.S. Soldevilla, K.M. Stafford, J.E. Stanistreet, E. Summers, S. Todd, and S.M. Van Parijs. 2020. Exploring movement patterns and changing distributions of baleen whales in the western North Atlantic using a decade of passive acoustic data. Global Change Biology 26(9):4812-4840; Estabrook, B.J., K. B. Hodge, D. P. Salisbury, D. Ponirakis, D. V. Harris, J. M. Zeh, S. E. Parks, and A.N. Rice. 2020. Year-2 annual survey report for New York Bight whale monitoring passive acoustic surveys October 2018- October 2019. Contract C009925. Prepared for Division of Marine Resources, New York State Department of Environmental Conservation, Albany, NY by Bioacoustics Research Program, Cornell Lab of Ornithology, Cornell University, Ithaca, NY.

[150] https://seamap.env.duke.edu/models/Duke/EC/EC_North_Atlantic_right_whale_history.html

[151] https://seamap.env.duke.edu/models/Duke/EC/

patterns of habitat use for North Atlantic right whales and other large whale species.[152] Therefore, we recommend BOEM work with NMFS and other relevant agencies, experts, and stakeholders, towards developing a robust and effective near real-time monitoring and mitigation system for North Atlantic right whales and other endangered and protected species (*i.e.*, fin, sei, minke, and humpback whales) during all phases of offshore wind energy development.

The ability to reliably detect North Atlantic right whales and other species on a near real-time basis and adjust survey (and future construction) activities accordingly (*e.g.*, if an endangered whale species is detected within X meters distance of the survey/construction area then no survey/construction activity will be undertaken within a defined time period) would enable BOEM and NMFS to adaptively manage and mitigate risks to protected species in near real-time while affording flexibility to offshore wind energy developers. This approach could be used in conjunction with seasonal restrictions in North Atlantic right whale foraging areas (*e.g.*, off southern New England), or potentially year-round in the Mid-Atlantic region where a changing climate is leading to novel spatial and temporal habitat-use patterns. A near real-time monitoring and mitigation approach would also minimize risks posed by North Atlantic right whale seasonal restrictions to other protected species that may be present at high densities at times when North Atlantic right whales are expected to be present in lower numbers (*e.g.*, humpback whale and fin whale foraging aggregations that occur in the summer months in the New York Bight when North Atlantic right whale presence may be relatively low). An added benefit is that the biological data collected could be used to inform future wind energy development activities and adaptive management.

There are several technologies in various stages of development that would allow near real-time detection of protected species (*e.g.*, Robots4Whales[153]) and convey that information to decision makers (*e.g.*, "Mysticetus"[154]) to inform mitigation action. Near real-time monitoring systems are already being deployed to mitigate risks to North Atlantic right whales. For example, an unmanned acoustic glider capable of auto-detecting North Atlantic right whale calls is currently informing decisions being made by Transport Canada on when to impose vessel speed restrictions in the Laurentian Channel. Ten-knot speed limits can be issued within an hour of North Atlantic right whales being detected.[155] BOEM should coordinate with NMFS to evaluate the current status of near real-time detection technologies and develop recommendations for an integrated near real-time monitoring and mitigation system that combines, at minimum, both visual and acoustic detections.[156] As part of this work, the acoustic

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[152] Davis, G.E., *et al*., "Exploring movement patterns and changing distributions of baleen whales in the western North Atlantic using a decade of passive acoustic data," supra note 87; Davis, G.E., Baumgartner, M.F., Bonnell, J.M., Bell, J., Berchick, C., Bort Thorton, J., Brault, S., Buchanan, G., Charif, R.A., Cholewiak, D., *et al*., "Long-term passive acoustic recordings track the changing distribution of North Atlantic right whales (Eubalaena glacialis) from 2004 to 2014," Scientific Reports, vol. 7, p. 13460 (2017); Record, N., Runge, J., Pendleton, D., Balch, W., Davies, K., Pershing, A., Johnson, C., Stamieszkin, K., Ji, R., Feng, Z. and Kraus, S., "Rapid Climate-Driven Circulation Changes Threaten Conservation of Endangered North Atlantic Right Whales," Oceanography, vol. 32, pp. 162-169 (2019).

[153] Woods Hole Oceanographic Institution WHOI and WHOI/WCS, "Robots4Whales," supra note 39.

[154] Available at: https://www.mysticetus.com/.

[155] *See, e.g.*, CBC News, "Underwater glider helps save North Atlantic Right Whales from Ship Strikes" (Aug. 30, 2020). Available at: https://www.cbc.ca/news/canada/new-brunswick/nb-north-atlantic-right-whales-underwater-glider-1.5701984.

[156] *See, e.g*., Johnson, H.D., Baumgartner, M.F., and Taggart, C.T., "Estimating North Atlantic right whale *(Eubalaena glacialis*) location uncertainty following visual or acoustic detection to inform dynamic management," Conservation Science and Practice, vol. 2, art. e267 (2020).

detection ranges for different species of large whale should be modeled for each offshore wind energy area (*i.e.*, accounting for site-specific oceanographic conditions, ambient and anthropogenic noise levels, etc.) to inform the subsequent expansion of the near real-time monitoring and mitigation approach to other protected large whale species.

It is also of paramount importance that BOEM encourage and promote adaptive management and robust long-term monitoring to assess impacts as offshore wind energy is developed and operational. This is imperative considering the effects of a changing climate on large whale species and other cumulative anthropogenic stressors. With the U.S. offshore wind energy at its start, it is critical that the impact of offshore wind operations on marine wildlife and the ocean ecosystem be closely monitored to guide the industry's adaptive management and future development. It is vital that we gain an understanding of baseline environmental conditions prior to large-scale offshore wind energy development in the United States. To this end, BOEM must coordinate with NMFS to establish and fund a robust, long-term scientific plan to monitor the effects of offshore wind energy development on marine mammals and other species before, during, and after large-scale commercial projects are constructed. Without strong baseline data collection and environmental monitoring in place, we risk losing the ability to detect and understand potential impacts and risk setting an under-protective precedent for future offshore wind energy development. Such monitoring must inform and drive future mitigation as well as potential practical changes to existing operations to reduce any potential impacts to natural resources and wildlife.

4. BOEM Must Adopt Strong Measures to Protect the North Atlantic Right Whale and Other Large Whales during Construction and Operation

The imperiled status of the North Atlantic right whale demands the implementation of strong protective measures to safeguard this species during the construction and operations of Empire Wind. BOEM must also require strong protections for other endangered and threatened marine mammal species, including those currently experiencing a UME. BOEM must take all necessary precautions to reduce the number of Level A takes (any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal or marine mammal stock in the wild) and Level B takes (any act that has the potential to disturb [but not injure] a marine mammal or marine mammal stock in the wild by disrupting behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering)[157] for large whales to be as close to zero as possible. In general, when designing mitigation, BOEM must require the most protective measures possible for all endangered and at-risk species, including fin whales, humpback whales, and minke whales, as well as harbor porpoises.

Pile driving noise during the construction phases has been identified as a stressor of high concern for marine mammals. Potential impacts of unmitigated exposure to pile driving noise include physical injury, hearing impairment, disruption of vital behaviors such as feeding, breeding, and communication, habitat displacement, stress, and other health effects.

Gravity-based foundations, as proposed by Empire Wind, do not require pile driving and thus avoid the noise impacts stemming from this activity. By entirely avoiding the impact of pile driving noise, the installation of gravity-based foundations unequivocally represents 'best practice' in the context of the mitigation hierarchy for this impact producing factor.

[157] 16 U.S.C. 1361 §§ 101(a)(5)(A) and (D), 86 Fed. Reg. 1520 (Posted January 4, 2021).

Due to the different level of impact posed to marine mammals from gravity-based relative to pile-driven foundations, we present two sets of mitigation recommendations for North Atlantic right whales and other large whale species below, one for gravity-based foundations, and the other for pile-driven foundations.

While gravity-based foundations avoid the impacts of pile driving noise, their installation is not necessarily noise free, and the potential use of dynamic positioning systems and other noise related to installation vessels may still lead to some level of behavioral disturbance (*see also* Section IV(E)6(b)). As gravity-based foundations are a new technology in the U.S., it will be important to monitor the levels of noise emitted during installation at the source, and model the level of potential noise exposure to large whales and other marine mammals, to inform the most appropriate mitigation approaches for future offshore wind energy projects for which gravity-based foundations are used.

a) Mitigation recommendations for gravity-based foundations

The mitigation measures below reflect our current (July 2021) set of recommendations for all large whale species during construction and operations of gravity-based foundations in the New York Bight and Mid-Atlantic. Please note that these recommendations may be subject to change as new information becomes available, additional or updated mitigation measures are incorporated, and the near real-time monitoring and mitigation system for large whales is advanced (Section IV(E)3).

i. Clearance zone and exclusion zone distances:
   1. BOEM, in consultation with NMFS, should design clearance and exclusion zone distances for North Atlantic right whales and other large whale species in a manner that eliminates Level A take and minimizes behavioral harassment to the full extent practicable during the installation of gravity-based foundations, considering noise levels expected to be generated during installation.

ii. Shutdown requirements:
   1. When the application of monitoring methods defined in subsection (iii) results in a detection of a North Atlantic right whale or other large whale species within the relevant clearance zone (as defined based on noise levels expected during installation; *see* subsection (i)), installation of gravity-based foundations should not be initiated.
   2. When the application of monitoring methods defined in subsection (iii) results in a detection of a North Atlantic right whale or other large whale species within the relevant exclusion zone (as defined based on noise levels expected during installation; *see* subsection (i)), installation of gravity-based foundations should be halted unless continued installation activities are necessary for reasons of human safety or installation feasibility.
   3. Once halted, installation may resume after use of the methods set forth in subsection (iii) and the lead Protected Species Observer (PSO) confirms no North Atlantic right whales or other large species have been detected within the relevant clearance zones.

iii. Real-time monitoring requirements and protocols during clearance and installation:
   1. Monitoring of the clearance and exclusion zones will be undertaken using near real-time passive acoustic monitoring (PAM), and should be undertaken from a vessel other than the installation vessel, or from a stationary unit, to avoid the hydrophone being masked by installation-related noise.

2. Monitoring of the clearance and exclusion zone will be undertaken by vessel based PSOs stationed at the installation site. On each vessel, there must be a minimum of four PSOs following a two-on, two-off rotation, each responsible for scanning no more than 180° of the horizon per gravity-based foundation installation location.
3. Acoustic and visual monitoring should begin at least 60 minutes prior to the commencement or installation activity and should be conducted throughout the duration of installation. Visual monitoring should continue until 30 minutes after installation.
4. The deployment of additional observers and monitoring technologies (*e.g.*, infrared, drones, hydrophones) should be undertaken, as needed, to ensure the ability to monitor the established clearance and exclusion zones, including at night and during periods of poor visibility.

iv. Vessel speed restrictions:
1. All project-associated vessels should adhere to a 10-knot speed restriction at all times except in limited circumstances where the best available scientific information demonstrates that whales do not use the area.
2. Projects may develop, in consultation with NOAA, an "Adaptive Plan" that modifies these vessel speed restrictions. However, the monitoring methods that inform the Adaptive Plan must be proven effective using vessels traveling 10 knots or less and following a scientific study design. If the resulting Adaptive Plan is scientifically proven to be equally or more effective than a 10-knot speed restriction, the Adaptive Plan could be used as an alternative to a 10-knot speed restriction.

v. Other vessel-related measures:
1. All personnel working offshore should receive training on observing and identifying North Atlantic right whales and other large whale species.
2. Vessels must maintain a separation distances of at least 500 m for North Atlantic right whales and 100 m for other large whale species, and maintain a vigilant watch for North Atlantic right whales and other large whale species, and slow down or maneuver their vessels as appropriate to avoid a potential interaction with a North Atlantic right whale or other large whale species.
3. All vessels responsible for crew transport (*i.e.*, service operating vessels) should carry automated thermal detection systems to assist monitoring efforts while vessels are in transit (while maintaining a speed of 10 knots).

vi. Reporting:
1. BOEM should require Empire Wind to report all visual observations and acoustic detections of North Atlantic right whales to NMFS or the Coast Guard as soon as possible and no later than the end of the PSO shift. We note that, in some cases, such as with the use of near real-time autonomous buoy systems, the detections will be reported automatically on a preset cycle.
2. Empire Wind must immediately report an entangled or dead North Atlantic right whale or other large whale species to NMFS, the Marine Animal Response Team (1-800-900-3622), or the United States Coast Guard immediately via one of several available systems (*e.g.*, phone, app, radio). Methods of reporting are expected to advance and streamline in the coming years, and BOEM should require projects to commit to supporting and participating in these efforts.

b) Mitigation recommendations for pile driving

The mitigation measures below reflect our current (July 2021) set of recommendations for North Atlantic right whales during construction and operations of pile-driven turbines in the New York Bight and Mid-Atlantic. While these mitigation measures were designed specifically for North Atlantic right whales, some offer co-benefits to other large whale species (as identified in parentheses below). Please note that these recommendations may be subject to change as new information becomes available, additional or updated mitigation measures are incorporated, and the near real-time monitoring and mitigation system for large whales is advanced (Section IV(E)3).

i. Prohibition on pile driving during times of highest risk (North Atlantic right whales only):
    1. Pile driving should not occur during periods of highest risk to North Atlantic right whales, defined as times of highest relative density of animals during their migration, and times when mother-calf pairs, pregnant females, surface active groups (indicative of breeding or social behavior), or aggregations of three or more whales (indicative of feeding or social behavior) are, or are expected to be, present, as supported by review of the best available science at the time of the activity.
    2. If a near real-time monitoring system and mitigation protocol for North Atlantic right whales and other large whale species is developed and scientifically validated (*see* Section IV(E)3), the system and protocol may be used to dynamically manage the timing of pile driving and other construction activities to ensure those activities are undertaken during times of lowest risk for all relevant large whale species. The development of such a protocol is particularly important in the New York Bight where foraging aggregations of other large whale species are regularly observed in the summer and fall, coincident with the times that pile driving would most likely be undertaken based on times lower relative risk to North Atlantic right whales.

ii. Diel restrictions on pile driving (all large whale species):
    1. Pile driving shall not be initiated within 1.5 hours of civil sunset or in times of low visibility when the visual “clearance zone” and “exclusion zone” (as hereinafter defined) cannot be visually monitored, as determined by the lead PSO on duty.
    2. Pile driving may continue after dark only if the activity commenced during daylight hours and must proceed for human safety or installation feasibility reasons,[158] and if required night time monitoring protocols are followed (*see* subsection v).

iii. Clearance zone and exclusion zone distances (for a minimum of 10-12 dB noise reduction (*see* subsection viii); North Atlantic right whales only):
    1. A visual clearance zone and exclusion zone shall extend at minimum 5,000 m in all directions from the location of the driven pile for North Atlantic right whales.
    2. An acoustic clearance zone shall extend at minimum 5,000 m in all directions from the

[158] Installation feasibility refers to ensuring that the pile installation event results in a usable foundation for the wind turbine (*i.e.*, foundation installed to the target penetration depth without refusal and with a horizontal foundation/tower interface flange). In the event that pile driving has already started and nightfall occurs, the lead engineer on duty will make a determination through the following evaluation: 1) Use the site-specific soil data on the pile location and the real-time hammer log information to judge whether a stoppage would risk causing piling refusal at re-start of piling; and 2) Check that the pile penetration is deep enough to secure pile stability in the interim situation, taking into account weather statistics for the relevant season and the current weather forecast. Such determinations by the lead engineer on duty will be made for each pile location as the installation progresses and not for the site as a whole. This information will be included in the reporting for the project. For the avoidance of doubt, the determination that pile driving must proceed for human safety reasons need not be made by the lead engineer on duty.

location of the driven pile for North Atlantic right whales.

3. An acoustic exclusion zone shall extend at minimum 2,000 m in all directions from the location of the driven pile for North Atlantic right whales.
4. BOEM, in consultation with NMFS, must design clearance and exclusion zone distances for other large whale species in a manner that eliminates Level A take and minimizes behavioral harassment to the full extent practicable.

iv. Shutdown requirements (for a minimum of 10-12 dB noise reduction (*see* subsection viii); North Atlantic right whales only):

1. When the application of monitoring methods defined in subsection (v), below, results in either an acoustic detection within the acoustic clearance zone or a visual detection within the visual clearance zone of one or more North Atlantic right whales, pile driving should not be initiated.
2. When the application of monitoring methods defined in subsection (v) results in acoustic detection within the acoustic exclusion zone or a visual detection within the visual exclusion zone of one or more North Atlantic right whales, piling shall not be initiated or, if already underway, shall be shut down unless continued pile driving activities are necessary for reasons of human safety or installation feasibility.
3. In the event that a North Atlantic right whale is visually detected by PSOs at any distance from the pile, piling activities shall be shut down unless continued pile driving activities are necessary for reasons of human safety or installation feasibility.
4. Once halted, pile driving may resume after use of the methods set forth in subsection (v) and the lead PSO confirms no North Atlantic right whales or other large species have been detected within the relevant acoustic and visual clearance zones.

v. Real-time monitoring requirements and protocols during pre-clearance and when pile driving activity is underway (all large whale species):

1. Monitoring of the acoustic clearance and exclusion zone will be undertaken using near real-time PAM, assuming a detection range of at least 10,000 m, and should be undertaken from a vessel other than the pile driving vessel, or from a stationary unit, to avoid the hydrophone being masked by the pile driving vessel or development-related noise.
2. Monitoring of the visual clearance and exclusion zones will be undertaken by vessel based PSOs stationed at the pile driving site and on additional vessels circling the pile driving site, as required. On each vessel, there must be a minimum of four PSOs following a two-on, two-off rotation, each responsible for scanning no more than 180° of the horizon per pile driving location. Additional vessels must survey the clearance and exclusion zones at speeds of 10 knots or less.
3. Acoustic and visual monitoring should begin at least 60 minutes prior to the commencement or re-initiation of pile driving and should be conducted throughout the duration of pile driving activity. Visual monitoring should continue until 30 minutes after pile driving.
4. Passive acoustic monitoring and infrared technology must be used during any pile driving activities that extend into periods of darkness.
5. The deployment of additional observers and monitoring technologies (*e.g.*, infrared, drones, hydrophones) should be undertaken, as needed, to ensure the ability to monitor the established clearance and exclusion zones.

vi. Vessel speed restrictions (all large whale species):

1. All project-associated vessels should adhere to a 10-knot speed restriction at all times

except in limited circumstances where the best available scientific information demonstrates that whales do not use the area.

2. Projects may develop, in consultation with NOAA, an "Adaptive Plan" that modifies these vessel speed restrictions. However, the monitoring methods that inform the Adaptive Plan must be proven effective using vessels traveling 10 knots or less and following a scientific study design. If the resulting Adaptive Plan is scientifically proven to be equally or more effective than a 10-knot speed restriction, the Adaptive Plan could be used as an alternative to a 10-knot speed restriction.

vii. Other vessel-related measures (all large whale species):

1. All personnel working offshore should receive training on observing and identifying North Atlantic right whales and other large whale species.
2. Vessels must maintain a separation distance of 500 m for North Atlantic right whales and 100 m for other large whale species, maintain a vigilant watch for North Atlantic right whales and other large whale species, and slow down or maneuver their vessels as appropriate to avoid a potential interaction with a North Atlantic right whale or other large whale species.
3. All vessels responsible for crew transport (*i.e.*, service operating vessels) should carry automated thermal detection systems to assist monitoring efforts while vessels are in transit (while maintaining a speed of 10 knots).

viii. Underwater noise reduction (all large whale species):

1. BOEM should require a combination of near field (*e.g.*, reduced blow resonant panel noise abatement system,[159] hydrosound damper) and far field noise mitigation (*e.g.*, single bubble curtain), and/or a combination system (double bubble curtain) expected to achieve at least 15dB (SEL) noise attenuation taking, as a baseline, projections from prior noise measurements of unmitigated piles from Europe and North America. A minimum of 10 dB (SEL) must be attained in the field during construction in combined noise reduction and attenuation.[160]
2. Field measurements should be conducted on at least the first pile installed, and ideally data should be collected from a random sample of piles throughout the construction period. We do not, however, support field testing using unmitigated piles.
3. Sound source validation reports of field measurements must be evaluated by both BOEM and NMFS prior to additional piles being installed.

ix. Reporting (all large whale species):

1. BOEM should require Empire Wind to report all visual observations and acoustic detections of North Atlantic right whales to NMFS or the Coast Guard as soon as possible and no later than the end of the PSO shift. We note that, in some cases, such as with the use of near real-time autonomous buoy systems, the detections will be reported automatically on a preset cycle.
2. Projects must immediately report an entangled or dead North Atlantic right whale or

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[159] *See*, *e.g.*, AdBm Demonstration at Butendiek Offshore Wind Farm with Ballast Nedam "Attenuation of up to 36.8 dB was realized across all hammer strikes at this location." https://tethys.pnnl.gov/sites/default/files/publications/AdBm-2014.pdf

[160] According to the Empire Wind COP, "where pile-driven foundations are selected, Empire will consider the potential use of commercially available and technically feasible noise reducing technologies, in accordance with associated authorizations;" EOW COP at 5-266. However, attenuation factors of 8 dB and 12 dB were applied to all impact pile driving scenarios to evaluate potential mitigated underwater noise impacts, indicating Empire Wind is considering noise reduction levels within that range. EOW COP at M-24.

other large whale species to NMFS, the Marine Animal Response Team (1-800-900-3622), or the United States Coast Guard immediately via one of several available systems (*e.g.*, phone, app, radio). Methods of reporting are expected to advance and streamline in the coming years, and BOEM should require projects to commit to supporting and participating in these efforts.

5. BOEM Should Develop Regional Construction Calendars to Reduce Cumulative Noise Impacts

Building out offshore wind energy in the New York Bight will likely lead to multiple leaseholders developing individual projects on parallel timelines (as currently being demonstrated in the RI/MA and MA WEAs). If not well coordinated, these combined activities have the potential to lead to significant cumulative noise impacts on marine mammals and other marine life. BOEM should proactively address this issue and develop regional construction calendars in coordination with its sister agencies that schedule (spatially and/or temporally) noisy pre-construction and construction development activities in a way that reduces cumulative noise impacts.

6. Cumulative Impacts - Marine Mammals

a) BOEM Should Prepare a Programmatic EIS for the North Atlantic Right Whale

To best account for the impacts of the simultaneous development of multiple lease areas on the North Atlantic right whale, we stress that the agency must prepare a full Programmatic EIS encompassing all United States' East Coast renewable energy development as soon as possible to inform future offshore wind development. Currently, impact analyses are undertaken, and mitigation measures prescribed, on a project-by-project basis, leading to inconsistency and inefficiency. It would be highly beneficial to collectively consider available information on North Atlantic right whales in United States' waters to build a picture of responsible development accounting for the lifespan and migratory movements of the species, which have the potential to overlap with every WEA along the United States' East Coast on a twice-yearly basis (*i.e.*, northern and southern migration). A Programmatic EIS is also particularly timely given the climate-driven shifts in North Atlantic right whale habitat use observed over the past decade[161] as well as significant changes in their conservation status and major threats.[162] Such an approach will ensure that alternatives and mitigation measures are considered at the scale at which impacts would occur and may potentially help increase the pace of environmentally responsible offshore wind development along the United States' East Coast.

b) Vessel Speed Restrictions and Vessel Noise Reduction Must Be Incorporated into Cumulative Impact Analysis

Notwithstanding the preparation of a Programmatic EIS, all future cumulative impact analyses must include the following considerations concerning vessel speed restriction and vessel noise reduction:

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[161] Albouy, C., Delattre, V., Donati, G. *et al*. "Global vulnerability of marine mammals to global warming" *Scientific Reports,* vol. 10, No. 548 (2020); Silber, G.K., Lettrich, M.D., Thomas, P.O., *et al*., "Projecting Marine Mammal Distribution in a Changing Climate," *Frontiers of Marine Science*, vol. 4, no. 413 (2017).

[162] EarthTalk, January 18, 2010, "Despite Gains, One Third of the World's Marine Mammals Seen at Greater Risk," *Scientific American*, https://www.scientificamerican.com/article/earth-talks-marine-mammals/, accessed July 22, 2020.; Marine Mammal Commission, "Status of Marine Mammal Species and Populations," https://www.mmc.gov/priority-topics/species-of-concern/status-of-marine-mammal-species-and-populations/.

Vessel strikes remain one of the leading causes of large whale injury and mortality and are a primary driver of the existing UMEs. Serious injury or mortality can occur from a vessel traveling above 10 knots irrespective of its length,[163] and vessels of any length travelling below this speed still pose a serious risk.[164] The number of recorded vessel collisions on large whales each year is likely to grossly underestimate the actual number of animals struck, as animals struck but not recovered, or not thoroughly examined, cannot be accounted for.[165] In fact, observed carcasses of North Atlantic right whales from all causes of death may have only accounted for 36% of all estimated death during 1990-2017.[166]

Vessel strikes are one of the two main factors driving the North Atlantic right whale to extinction. North Atlantic right whales are particularly prone to vessel strike given their slow speeds, their occupation of waters near shipping lanes, and the extended time they spend at or near the water's surface.[167] Some types of anthropogenic noise have been shown to induce sub-surface positioning in North Atlantic right whales, increasing the risk of vessel strike at relatively moderate levels of exposure.[168] Scientists have deemed it "likely" that noise from pile driving during offshore wind development could lead to displacement of large whales and that this potential impact should be treated as "high importance."[169] It is possible that noise from large-scale site assessment and characterization activities will have the same effect. BOEM should therefore act conservatively and implement mitigation measures to prevent any further vessel collisions for North Atlantic right whales or other species of large whale currently experiencing an UME (*i.e.*, humpback whales and minke whales), as well as species such as fin whales, which, in light of the broad distributional shifts observed for multiple species, may be at potential future risk of experiencing an UME.

BOEM has significantly downplayed the risk of vessel strike to endangered whales in previous offshore wind permitting documents.[170] For example, in the recent South Fork Draft EIS, the agency notes that up to an additional 207 construction vessels associated with offshore wind development may be operating

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[163] NOAA-NMFS, "Reducing ship strikes to North Atlantic right whales." Available at: https://www.fisheries.noaa.gov/national/endangered-species-conservation/reducing-ship-strikes-north-atlantic-right-whales#:~:text=All%20vessels%2065%20feet%20(19.8,endangered%20North%20Atlantic%20right%20whales. To reflect the risk posed by vessels of any length, the Commonwealth of Massachusetts established a mandatory vessel speed restriction for all vessels (including under 20 meters) in the Cape Cod Bay SMA.

[164] Kelley, D. E., Vlasic, J. P. and Brilliant, S. W., "Assessing the lethality if ship strikes on whales using simple biophysical models," Marine Mammal Science, vol. 37, pp. 251-267 (2020).

[165] Reeves, R.R., Read, A.J., Lowry, L., Katona, S.K., and Boness, D.J., "Report of the North Atlantic Right Whale Program Review." 13–17 March 2006, Woods Hole, Massachusetts (2007) (prepared for the Marine Mammal Commission); Parks, S.E., Warren, J.D., Stamieszkin, K., Mayo, C.A., and Wiley, D., "Dangerous dining: surface foraging of North Atlantic right whales increases risk of vessel collisions." Biology Letters, vol. 8, p. 57-60 (2011).

[166] Pace III, R. M., Williams, R., Kraus, S. D., Knowlton, A. R. and Pettis, H. M.," Cryptic mortality of North Atlantic right whales," *Conservation Science and Practice*, e346 (2021).

[167] NOAA-NMFS, "Recovery plan for the North Atlantic right whale" (August 2004).

[168] Nowacek, D.P., Johnson, M.P., and Tyack, P.L., "Right whales ignore ships but respond to alarm stimuli," *Proceedings of the Royal Society of London B: Biological Sciences*, vol. 271, no. 1536 (2004).

[169] Kraus, S.D., Kenney, R. D. and Thomas, L., "A Framework for Studying the Effects of Offshore Wind Development on Marine Mammals and Turtles," Report prepared for the Massachusetts Clean Energy Center, Boston, MA 02110, and the Bureau of Ocean Energy Management (May 2019).

[170] SFWF DEIS.

within the geographic analysis area at the peak of projected offshore wind farm development in 2025.[171] Without further quantitative analysis of relative risk, BOEM states that "the overall increase in vessel activity is small relative to the baseline level and year to year variability of vessel traffic in the analysis area. In addition, the risk of marine mammal collisions is negligible for most wind farm construction activities."[172] BOEM then cites supposed mitigation as a means to minimize the potential for vessel collisions: "Timing restrictions, use of PSOs, and other mitigation measures required by BOEM and NMFS would further minimize the potential for fatal vessel interactions. These measures would effectively minimize but not completely avoid collision risk. Any incremental increase risk must be considered relative to the baseline level of risk associated with existing vessel traffic. Project O&M would involve fewer vessels that are smaller in size, and the level of vessel activity would be far lower than during construction. Smaller vessels (*i.e.*, less than 260 feet in length) pose a lower risk of fatal collisions than larger vessels (Laist *et al*. 2001)."[173] These arguments are flawed and do not represent current understanding of the vessel collision risk to large whales.

First, any interaction between a vessel and whale poses a risk of serious injury or mortality. This is true irrespective of the number of other vessels operating in the same location. As demonstrated by the documented deaths of North Atlantic right whale calves in July 2020 and February 2021, and the serious injury, thus, likely death of a third calf in January 2020, an addition of even a single vessel traveling at speeds over 10 knots pose an unacceptable risk. Thus, when analyzing impacts from vessel traffic, BOEM should concern itself less with "relative risk" and instead focus on the *actual* risk to the animal and the offshore wind project vessel.

Second, even through the lens of relative risk, the North Atlantic right whale cannot currently withstand *a single vessel strike* if the species is to survive. Reasonably foreseeable wind development activities will primarily occur off New Jersey, New York, and just outside this region, meaning that vessel activity associated with construction, including vessel transits, will be similarly concentrated in that region. As previously discussed (*see* Section E(1) above), New York and New Jersey waters represent an important year-round habitat for the North Atlantic right whale, a species for which vessel strike is a leading factor in its trajectory towards extinction. Vessel strikes therefore pose an unacceptable risk in this region and BOEM must acknowledge that any vessel operating in that region has the potential to strike a North Atlantic right whale and, in doing so, expedite the species' decline.

Third, BOEM's assumptions about smaller vessels posing lower risk of a fatal collision are not supported by best available science. Vessel strikes can result in either "blunt force trauma," where injuries can range from non-lethal superficial abrasions and contusions to severe lethal impact wounds resulting from contact with a non-rotating feature of the vessel, or "propeller-induced trauma," that results in incising wounds resulting from contact with the sharp, rotating, propeller of the vessel (also termed

[171] SFWF DEIS at 3-50.
[172] *Id*.
[173] *Id.*

"sharp force trauma").[174] Observations compiled by Laist *et al*. (2001)[175]—the primary reference cited by BOEM—suggest that the most severe injuries occur as a result of vessel strikes by large ocean-going vessels; this research has led to a number of mitigation and management actions in the United States and internationally. However, there is increasing recognition that smaller vessels can also cause lethal injury, even when traveling at relatively low speeds (*i.e.*, below 10 knots).[176] The NMFS Large Whale Ship Strike Database reveals that blood was seen in the water—indicative of serious injury—in at least half of the cases where a vessel known to be less than 65 feet in length struck a whale.[177] This is likely an underestimate of the magnitude of the threat, as small vessel collisions with whales are underreported.[178] Passengers have been knocked off their feet or thrown from the boat upon impact with a whale,[179] demonstrating this is also a significant human safety issue.

Fourth, BOEM's assertion that existing federally required mitigation measures will "minimize" collision risk is flawed. Beyond mandatory vessel speed restrictions within Seasonal Management Areas (SMAs), there are currently no federal requirements to reduce the speed of vessels associated with offshore wind development to 10 knots or less. Voluntary 10 knot speed reduction zones (*i.e.* NOAA DMAs and North Atlantic right whale "Slow Zones") offer an additional layer of protection, but a recent analysis undertaken by NMFS shows that compliance with voluntary speed reductions is woefully low.[180] PSOs stationed aboard a vessel may increase the likelihood that a whale is detected, but this approach cannot be relied upon particularly in periods of darkness or reduced visibility, and the whale would need to be detected with adequate time for the vessel captain to be alerted and to undertake evasive action (which may inadvertently strike another undetected whale). The use of vessel based PSOs may therefore provide some additional benefit when a vessel is already traveling at slow speeds (*i.e.*, less than 10 knots), but will provide little benefit for faster vessels. Vessel speed restrictions and additional mitigation and monitoring measures must therefore be explicitly required as part of the permitting process. BOEM should acknowledge the significant risk vessel strikes pose to North Atlantic right whales and other large whales and require the industry to reduce vessel speeds to 10 knots or less and take further measures to mitigate vessel collision risk.

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[174] Van der Hoop, J., Barco, S.G., Costidis, A.M., Gulland, F.M., Jepson, P.D., Moore, K.T., Raverty, S. and McLellan, W.A., "Criteria and case definitions for serious injury and death of pinnipeds and cetaceans caused by anthropogenic trauma," *Diseases of Aquatic Organisms*, *103*(3), pp.229-264 (2013);; Sharp, S.M., McLellan, W.A., Rotstein, D.S., Costidis, A.M., Barco, S.G., Durham, K., Pitchford, T.D., Jackson, K.A., Daoust, P.Y., Wimmer, T. and Couture, E.L., "Gross and histopathologic diagnoses from North Atlantic right whale Eubalaena glacialis mortalities between 2003 and 2018," *Diseases of Aquatic Organisms*, *135*(1), pp.1-31 (2020).

[175] Laist, D.W., Knowlton, A.R., Mead, J.G., Collet, A.S. and Podesta, M., "Collisions between ships and whales," *Marine Mammal Science*, *17*(1), pp.35-75 (2001).

[176] Kelley, D.E., Vlasic, J.P. and Brillant, S.W., "Assessing the lethality of ship strikes on whales using simple biophysical models," *Marine Mammal Science*, *37*(1), pp.251-267 (2021).

[177] Jensen, A.S. and Silber, G. K., "Large Whale Ship Strike Database," U.S. Department of Commerce, NOAA Technical Memorandum NMFS-OPR-25 (Jan. 2004) at 12–37.

[178] Hill, A.N., *et al*., "Vessel collision injuries on live humpback whales, Megaptera novaeangliae, in the southern Gulf of Maine," *Marine Mammal Science*, vol. 33, pp. 558–573 (2017); A.S. Jensen and G.K. Silber, *Large Whale Ship Strike Database*, U.S. Department of Commerce, NOAA Technical Memorandum NMFS-OPR-25 (Jan. 2004), at 12–37.

[179] Bigfish123, Comment to *Collision at Sea*, The Hull Truth (May 1, 2009, 5:44 am), http://www.thehulltruth.com/boating-forum/222026-collision-sea.html.

[180] National Marine Fisheries Service, "North Atlantic Right Whale (Eubalaena glacialis) Vessel Speed Rule Assessment," supra.

In addition, data are readily available (*e.g.,* on the Mid-Atlantic Data Portal[181]) to undertake a quantitative analysis of additional vessel strike risk posed by vessels associated with the offshore wind industry (*i.e.,* total number of vessels, proportion of vessels associated with reasonably foreseeable offshore wind activities, locations of the primary route between ports and WEAs, and marine mammal occurrence and density). We encourage BOEM to undertake this quantitative analysis to provide a more robust analysis in its future environmental impact statements.

Finally, BOEM should consider the level and potential impacts of vessel-related noise during construction, particularly noise emitted by dynamic positioning systems. Reported sources levels of noise from dynamical positioning system (DPS) vary among 177, 162–180, and 121–197 dB re 1 µPa (SPL) at 1 meter.[182] The latter intensity range reports frequencies in the 50–3,200 Hz range, within the hearing frequency of large whales and fish, and may have biologically significant effects. For example, research has shown mesopelagic fish migrate deeper in the water column upon exposure of DPS noise,[183] and there is extensive scientific literature on the impacts of continuous low frequency vessel noise on marine mammals and fish.[184]

DPS and other vessel noise differs from pile driving noise in its frequency spectrum and the fact it is continuous rather than impulsive noise. DPS and vessel noise will also occur in the construction area during times when pile driving is not occurring (*i.e.* before and after a pile is driven). Thus, it should not be expected that the noise from pile driving will simply negate the effects of vessel-related noise. BOEM should undertake an analysis of DPS and vessel-related noise associated with the construction of offshore wind energy development in the New York Bight, both for individual projects as well as cumulatively for the existing and reasonably foreseeable projects (a similar analysis should be undertaken for lease areas south of New England).

c) BOEM Should Analyze Large-scale Habitat Displacement for the North Atlantic Right Whale

We recommend that BOEM take a precautionary approach and acknowledge that it is not possible to assess all of the potential hazards of physical structures in water column at the current time and commit to an explicit monitoring plan that will allow for future assessment (*i.e.*, pre-, during-, and post-construction monitoring). The report, "A framework for studying the effects of offshore wind development on marine mammals and turtles,"[185] outlines detailed recommendations for monitoring the potential impacts of offshore wind on marine mammals, including long-term avoidance and/or displacement, by the top scientists and experts working in this field. It is vital that we gain an understanding of baseline environmental conditions prior to large-scale offshore wind development in the United States. To this end, BOEM must establish and fund a robust, long-term scientific plan to monitor for effects of offshore wind development on marine mammals *before* the first large-scale

[181] *See* https://portal.midatlanticocean.org/.

[182] MMO, 2015. Modelled mapping of continuous underwater noise generated by activities. A report produced for the marine management organisation, technical annex, MMO Project, 1097. ISBN: 978-1-909452-87-9. Tech. rep. 43 pp.

[183] Peña, M., 2019. Mesopelagic fish avoidance from the vessel dynamic positioning system. *ICES Journal of Marine Science*, *76*(3), pp.734-742.

[184] Erbe, C., Marley, S.A., Schoeman, R.P., Smith, J.N., Trigg, L.E. and Embling, C.B., 2019. The effects of ship noise on marine mammals—a review. *Frontiers in Marine Science*, *6*, p.606..

[185] Kraus, S.D., *et al.,* "A Framework for Studying the Effects of Offshore Wind Development on Marine Mammals and Turtles," *supra*.

commercial projects are constructed. Without this in place, we risk losing the ability to detect and understand potential impacts and set an under-protective precedent for future offshore wind development.

Given the acute vulnerability of the North Atlantic right whale, it is essential that, at a minimum, BOEM conduct a technical, quantitative analysis of the cumulative impacts of offshore wind development, against a baseline of other reasonably foreseeable actions, on the North Atlantic right whale population. This analysis should be incorporated into the agency's NEPA compliance documents. We note that the analysis proposed below is also relevant for other species of large whale found within the New York Bight. We recommend that the analysis quantify the percentage of the North Atlantic right whale population potentially exposed to conceivable impacts from offshore wind development on an annual basis[186] and, as a worse-case scenario, the potential impact on population viability of a permanent loss of foraging and other habitat within all lease areas expected to be developed. The analysis should also examine the additional energetic expenditure experienced if right whales were to avoid all lease areas expected to be developed during their migration. This is particularly important in light of new scientific information indicating the need for North Atlantic right whales to undertake efficient and uninterrupted foraging in order to maintain their energy budget.[187] The energetic implications for displacement of pregnant females during their southern migration (*e.g.,* offshore into the Gulf Stream) should also be taken into consideration.

Habitat avoidance may also result in North Atlantic right whales being displaced into shipping lanes, thereby increasing their risk of vessel strike. The analysis should therefore estimate the additional potential risk that habitat displacement into shipping lanes and the increased vessel traffic resulting from wind development itself may pose in terms of serious injury and mortality along the East Coast and evaluate that risk against that of species extinction. Such an analysis will allow BOEM to determine if existing mitigation measures are adequate or if potential impacts need to be managed as projects are developed concurrently and sequentially. For example, considering vessel collision risk for the entire East Coast may illuminate that more comprehensive vessel speed mitigation measures need to be in place at the project level in order to reduce the overall cumulative risk.

BOEM should conservatively assess the potential loss to the right whale of communication and listening range and assume that any substantial decrement will result in adverse impacts on the species' foraging, mating, or other vital behavior. A conservative approach is justified given the species' extreme vulnerability, where any additional stressor may potentially result in population-level impacts, and the difficulty in obtaining empirical data on population-level impacts on wild animals.

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[186] For example, by following the approach of Dr. Wing Goodale, Biodiversity Research Institute, in the analysis of "cumulative adverse effects" on four bird taxa. See, Goodale, W. (2018). Cumulative adverse effects of offshore wind energy development on wildlife. Presentation at the New York State Energy Research and Development Authority "State of the Science Workshop on Wildlife and Offshore Wind Development," Fox Hollow, Woodbury, New York, Nov. 14, 2018. Available at: http://www.briloon.org/uploads/BRI_Documents/Wildlife_and_Renewable_Energy/NYSERDA_workshop_Wing Goodale_CumulativeImpacts.pdf.

[187] Van der Hoop, J., *et al*., "Foraging rates of ram-filtering North Atlantic right whales," *supra*.

d) BOEM Should Monitor for Oceanographic Changes Caused by Large-Scale Build-Out of Offshore Wind Energy That May Affect the Marine Mammal Prey Base

The design of an offshore wind farm, such as the location, number of turbines, and foundation types, may affect local and regional hydrodynamics.[188] As tidal currents move past the offshore wind foundations they generate a turbulent wake that will contribute to a mixing of the stratified water column.[189] The loss of stratification within the wake of a single offshore wind turbine has been observed in the German Bight, a relatively shallow area of the North Sea with typical water depths between 20 and 50 m.[190] A single monopile was found to be responsible for 7-10% additional mixing to that of the bottom mixed layer, whereby approximately 10% of the turbulent kinetic energy generated by the structure is used in mixing.[191] Although the effect of a single turbine on stratification is relatively low, large-scale build-out of offshore wind energy (*i.e.*, 100 km^2) could significantly affect the vertical structure of a weakly stratified water column, and could modify the stratification regime and water column dynamics on a seasonal scale, depending on local conditions and turbine layout.[192] NOAA Fisheries recently acknowledged that large-scale build out of offshore wind energy in the Northeast region may cause local oceanographic changes that may affect the distribution of North Atlantic right whale prey.[193]

The “Cold Pool”' is a highly variable 20-60 m thick band of trapped cold, near-bottom water that exists during the spring, summer, and fall in the mid- and outer-shelf of the Mid-Atlantic Bight and Southern flank of Georges Bank. The Cold Pool has been shown to be one of a number of factors affecting phytoplankton productivity and the behavior and recruitment of pelagic and demersal fish.[194] Due to the Cold Pool’s effects on fish, an important prey base for marine mammals in the New York Bight, it is important to understand the oceanographic processes that influence it and whether offshore wind energy may alter its presence.

BOEM should explicitly consider the cumulative effects of offshore wind on oceanographic conditions, including stratification, and the resulting effects on fish habitat, as part of the New York Bight EIS. NYSERDA is funding research to model the effects of offshore wind development on Cold Pool stratification.[195] BOEM should incorporate the results of this study and findings from Europe[196] into the

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[188] Segtnan OH, Christakos K. 2015. Effect of offshore wind farm design on the vertical motion of the ocean. Energy Procedia 80(2015): 213-222.

[189] Schultze, L. K. P., L. M. Merckelbach, J. Horstmann, S. Raasch, and J. R. Carpenter. "Increased mixing and turbulence in the wake of offshore wind farm foundations." *Journal of Geophysical Research: Oceans* 125, no. 8 (2020): e2019JC015858.

[190] *Id*.

[191] *Id*.

[192] *Id*.; Carpenter JR, Merckelbach L, Callies U, Clark S, Gaslikova L, Baschek B (2016) Potential Impacts of Offshore Wind Farms on North Sea Stratification. PLoS ONE 11(8): e0160830. https://doi.org/10.1371/journal.pone.0160830

[193] NOAA Fisheries, “State of the Ecosystem New England,” Presentation to the New England Fishery Management Council, 15 April 2021.

[194] Malone TC, Hopkins TS, Falkowski PG, Whitledge TE. 1983. Production and transport of phytoplankton biomass over the continental shelf of the New York Bight. Continental Shelf Research 1: 305-337; Sullivan MC, Cowen RK, Steves BP. 2005. Evidence for atmosphere-ocean forcing of yellowtail flounder (*Limanda ferruginea*) recruitment in the Middle Atlantic Bight. Fisheries Oceanography 14: 386-399.

[195] *See*, https://portal.nyserda.ny.gov/servlet/servlet.FileDownload?file=00Pt000000DS6ouEAD.

[196] Schultze, L. K. P., *et al*. "Increased mixing and turbulence in the wake of offshore wind farm foundations," *supra*; Carpenter JR,,*et al*., Potential Impacts of Offshore Wind Farms on North Sea Stratification, *supra*.

analysis for Empire Wind's EIS. In addition, BOEM, in collaboration with NOAA and the states of New York and New Jersey, should establish baseline stratification conditions for the New York Bight and design and implement a monitoring system capable of detecting deviations from that baseline. In addition, BOEM should undertake research similar to that conducted in Europe[197] to better understand the effects of individual turbines and the cumulative effects of large-scale build out of offshore wind energy on mixing and stratification in the New York Bight.

e) BOEM Should Address Limitations of NMFS's Acoustic Thresholds

In determining the potential impact of noise from geophysical surveys, and construction and operations activities, BOEM should request new guidelines on thresholds for marine mammal behavioral disturbance from NMFS that are sufficiently protective and consistent with the best available science. Multiple marine species have been observed to exhibit strong, and in some cases lethal, behavioral reactions to sound levels well below the 160 dB threshold defined by NMFS for Level B take,[198] leading to calls from the scientific community for NMFS to revise its guidelines.[199] Acceptance of the current NMFS's acoustic threshold for Level B take will result in BOEM's significant underestimation of the impacts to marine mammals and potentially the permitting, recommendation, or prescription of ineffective mitigation measures (*e.g.*, under-protective exclusion zones).

F. Impacts to Sea Turtles

1. Status of Sea Turtles in the Empire Wind Project Area

Four sea turtle species are known to occur in the New York Bight: the endangered Kemp's ridley (*Lepidochelys kempii*) and leatherback (*Dermochelys coriacea*) turtles and the threatened green (*Chelonia mydas*) and loggerhead (*Caretta caretta*) turtles.[200] In addition to the sea turtle sightings data recorded during the NYSDEC aerial surveys in March 2017 through February 2020,[201] BOEM should also

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[197] *See*, *e.g*., chultze, L. K. P., *et al*. "Increased mixing and turbulence in the wake of offshore wind farm foundations," *id.*

[198] As defined pursuant to the Marine Mammal Protection Act "any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild." 50 C.F.R. § 216.3.

[199] *E.g.*, Evans, D.L. and England, G.R., "Joint interim report: Bahamas marine mammal stranding event of 15-16 March 2000" (2001); Nowacek, D.P., Johnson, M.P., and Tyack, P.L., "Right whales ignore ships but respond to alarm stimuli," *Proceedings of the Royal Society of London B: Biological Sciences*, vol. 271, no. 1536 (2004): 227-231; Parsons, E.C.M., Dolman, S.J., Wright, A.J., Rose, N.A., and Burns, W.C.G., "Navy sonar and cetaceans: Just how much does the gun need to smoke before we act?" *Marine Pollution Bulletin*, vol. 56 (2008): 1248-1257; Tougaard, J., Wright, A.J., and Madsen, P.T., "Cetacean noise criteria revisited in the light of proposed exposure limits for harbour porpoises," *Marine Pollution Bulletin*, vol. 90 (2015): 196-208; Wright, A.J., "Sound science: Maintaining numerical and statistical standards in the pursuit of noise exposure criteria for marine mammals," *Frontiers in Marine Science*, vol. 2, art. 99 (2015). Blackwell, S. B., Nations, C. S., McDonald, T. L., Thode, A. M., Mathias, D., Kim, K. H., . . . Macrander, A. M. (2015). Effects of Airgun Sounds on Bowhead Whale Calling Rates: Evidence for Two Behavioral Thresholds. PLOS ONE, 10(6). doi: 10.1371/journal.pone.0125720

[200] New York State Department of Environmental Conservation, "Sea Turtles of New York." NY.gov. Accessed July 24, 2018, https://www.dec.ny.gov/animals/112355.html.

[201] Tetra Tech and LGL. 2020. Final comprehensive report for New York Bight Whale Monitoring Aerial Surveys, March 2017 – February 2020. Technical report prepared by Tetra Tech, Inc. and LGL Ecological Research

consider AMAPPS,[202] NYSERDA digital aerial surveys,[203] the New Jersey Ecological Baseline Study in 2008-2009,[204] other regional data sources,[205] including stranding data, when assessing the current occurrence of sea turtles in the New York Bight. In addition, the relative use of nearshore areas as well as offshore areas by sea turtle species should be accounted for in models of sea turtle density and subsequent impact analysis.

Density estimates and maps for sea turtles are provided in the COP; however, the source of these estimates is unclear (although various sources are cited, none of these appear to be the primary source of the data). We assume that the COP is using the modeled sea turtle densities from the Navy OPAREA Density Estimate (NODE) for the Northeast OPAREAs.[206] However, the Navy's density estimates generated via modeling are outdated (used only NMFS aerial survey data collected prior to 2005), and no turtle density modeling has been conducted as part of the Duke University Marine Geospatial Ecology Laboratory's density models. It is our understanding that sea turtle density modeling with recent data is currently being conducted, and results may be available in early 2022. These models should include data from recent AMAPPS and other regional studies as mentioned previously. In addition, stranding[207] and tagging data[208] should also be assessed in order to determine the current occurrence of sea turtles in the Project Area.

Given that the ability to detect sea turtles during aerial surveys is highly variable, increased satellite and acoustic tagging will provide critical information on habitat use, behavior, residency, and migration. The NYSDEC and Atlantic Marine Conservation Society are working to increase satellite tagging of wild-caught sea turtles, and the New York Marine Rescue Center is conducting acoustic and satellite tagging

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Associates, Inc. Prepared for New York State Department of Environmental Conservation, Division of Marine Resources, East Setauket, NY.

[202] NEFSC (Northeast Fisheries Science Center) and SEFSC (Southeast Fisheries Science Center). 2020. 2019 annual report of a comprehensive assessment of marine mammal, marine turtle, and seabird abundance and spatial distribution in US waters of the western North Atlantic Ocean - AMAPPS II.

[203] Normandeau Associates Inc. and APEM Ltd. "Digital aerial baseline survey of marine wildlife in support of offshore wind energy: Summer 2017 taxonomic analysis summary report." Prepared for New York State Energy Research and Development Authority, Albany, New York, 2018; J. Robinson Willmott, J.C., M. Vukovich, A. Pembroke. 2021. Digital aerial baseline survey of marine wildlife in support of offshore wind energy. Overview and summary, Report Number 21-07. Prepared for New York State Energy Research and Development Authority by Normandeau Associates Inc. with APEM Ltd.

[204] GMI (Geo-Marine Inc.). 2010. Ocean/Wind power ecological baseline studies January 2008 - December 2009. Final report. New Jersey Department of Environmental Protection, Trenton, New Jersey.

[205] Kraus, S., *et al*., "Northeast large pelagic survey collaborative aerial and acoustic surveys for large whales and sea turtles. Final Report," supra.

[206] DoN (Department of the Navy). 2007. Navy OPAREA density estimates (NODE) for the Northeast OPAREAs: Boston, Narragansett Bay, and Atlantic City. Prepared for U.S. Fleet Forces Command by Geo-Marine, Inc. Contract number N62470-02-D-9997, CTO 0045 Norfolk, Virginia: Naval Facilities Engineering Command, Atlantic. Prepared by Geo-Marine, Inc., Hampton, Virginia.

[207] Sea Turtle Stranding and Salvage Network. https://www.fisheries.noaa.gov/state-coordinators-sea-turtle-stranding-and-salvage-network

[208] Dodge, K.L., B. Galuardi, and M.E. Lutcavage. 2015. Orientation behaviour of leatherback sea turtles within the North Atlantic subtropical gyre. Proceedings of the Royal Society B 282:20143129.

of rehabilitated and released sea turtles.[209] This further investment in tagging and tracking studies[210] would complement data collected via aerial surveys and provide a more complete picture of sea turtle occurrence and habitat use in the region. Additionally, sea turtle tagging and tracking studies, especially for green and hawksbill turtles, are needed to better understand movement, dive patterns and surface time, and habitat use which can, among other uses, help advise monitoring and avoidance, minimization, and mitigation strategies and generate more accurate estimates of sea turtle takes. Some satellite telemetry data are available from rehabilitated and released Kemp's ridley and green turtles[211] that suggests rehabilitated turtles are a good proxy for wild-caught turtles. Considering the costs and probably limited success rate of in-water tagging work for these three species, acoustic telemetry of rehabilitated turtles may be an effective means of gathering useful data. There is already significant investment underway for acoustic telemetry arrays in WEAs for highly migratory fish species, presenting an opportunity for cost-effective data collection on sea turtles. Thus, a combination of satellite tags (to collect data on surface availability to parameterize density models) and acoustic telemetry will improve understanding of sea turtle habitat use in the New York Bight.

2. Acoustic Impact Considerations for Sea Turtles

To date, injury and behavioral zones for sea turtles have not been calculated correctly for other offshore wind projects.[212] Moreover, fundamental gaps remain in our knowledge of the sensory (*e.g.*, hearing and navigation) ecology of sea turtles.[213] It has been determined that sea turtle hearing sensitivity overlaps with the frequencies and source levels produced by many anthropogenic sources; however, more research is needed to determine the potential physiological and behavioral impacts of these noise sources on sea turtles.[214] Currently, BOEM's standard operating conditions for activities such as pile

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[209] Summary Report of the New York Bight Sea Turtle Workshop. New York State Department of Environmental Conservation. https://www.dec.ny.gov/docs/fish_marine_pdf/dmrturtlereport.pdf

[210] See, *e.g.*, Dodge, K.L., *et al*. *id*.; Dodge, K.L., Galuardi, B. and Lutcavage, M.E., "Orientation behaviour of leatherback sea turtles within the North Atlantic subtropical gyre," Proceedings of the Royal Society B, vol. 282, art. 20143129 (2015); Winton, M.V., Fay, G., Haas, H.L., Arendt, M., Barco, S., James, M.C., Sasso, C., and Smolowitz, R., "Estimating the distribution and relative density of satellite-tagged loggerhead sea turtles using geostatistical mixed effects models," Marine Ecology Progress Series, vol. 586, pp. 217-232 (2018).

[211] Robinson, N.J., Deguzman, K., Bonacci-Sullivan, L., DiGiovanni Jr., R.A., and Pinou, T., "Rehabilitated sea turtles tend to resume typical migratory behaviors: satellite tracking juvenile loggerhead, green, and Kemp's ridley turtles in the northeastern USA," Endangered Species Research, vol. 43, pp. 133-143 (2020); New England Aquarium, unpublished data.

[212] SFWF DEIS at H-58 footnote states: "Short-term, underwater noise from Project construction, specifically from pile driving and vessels supporting installation is the most extensive potential Project effect and is therefore used to define the analysis area based on current behavioral effects thresholds for these activities. This area extends approximately 1,716 feet from each monopile foundation, 175 feet from vibratory pile driving, and approximately 300 feet from the SFEC corridor and vessel transit lanes." Also, DEIS at H-66 states, "Vibratory pile-driving noise can exceed levels associated with behavioral disturbance in sea turtles but only within a short distance (*i.e.*, less than 200 feet) from the source. Given this low exposure probability to vibratory pile-driving noise and the fact that vibratory pile-driving activities would be limited in extent, short term in duration, and widely separated, vibratory pile-driving noise effects on sea turtles would be negligible at the individual and population levels."

[213] *See*, *e.g.*, SFWF DEIS at H-765, H-70, H-76.

[214] Ridgway, S.H., E.G. Wever, J.G. McCormick, J. Palin, and J.H. Anderson. "Hearing in the giant sea turtle, Chelonia mydas." Proceedings of the National Academy of Sciences of the United States of America, vol. 64, no. 3 (1969):884-890.; Bartol, S.M., J.A. Musick, and M.L. Lenhardt. "Auditory evoked potentials of the loggerhead sea turtle (Caretta caretta)." Copeia, vol. 3 (1999):836-840.; Dow Piniak, W.E., S.A. Eckert, C.A. Harms, and E.M.

driving are based on a 180 dB (RMS) re 1 uPa exclusion zone,[215] which is the original generic acoustic threshold for assessing permanent threshold shift onset for cetaceans.[216] For forthcoming construction activities, at minimum BOEM must use NMFS's most recent pile driving calculator to obtain an accurate injury and behavioral radii for sea turtles during impact and vibratory pile driving. As the offshore wind industry advances, studies are needed to determine critical ratios and temporary and permanent threshold shifts so that accurate acoustic threshold limits for anthropogenic sound sources can be added to NMFS's sound exposure guidelines for protected species like sea turtles, and additional monitoring and avoidance, minimization, and mitigation protocols can be developed to minimize impacts to sea turtles during offshore wind development and operation and other anthropogenic activities. Monitoring of sea turtle sensory ecology must be conducted as soon as possible to advise efforts, and a conservative approach should be adopted in the meantime to guard against impacts to these threatened and endangered species.

3. Vessel Strike Mitigation

Mitigation measures for sea turtles should include a speed restriction of 10 knots for all vessels associated with wind energy development in the New York Bight at all times, regardless of whether vessels are transiting or on site. Risk of collision with sea turtles is greatest when vessels are traveling at speeds greater than 10 knots.[217] While vessels are often directed to slow speeds to 4 knots if a sea turtle is sighted within 100 m of the vessel's path, this is not a foolproof solution. Sea turtle detection – even when conducted by dedicated observers – is difficult unless the turtle surfaces close to the vessel, at which point it may not be possible to course-correct in time to prevent collision. Keeping ship speed to 10 knots improves the ability to adjust speeds.[218] Slowing to 4 knots from June 1 to November 30 while transiting through areas of visible jellyfish aggregations or floating vegetation lines or mats will improve protection for sea turtles, but the speed should be reduced from an upper limit of 10 knots.[219] A standard 10-knot vessel speed limit ensures protections for a wide array of ocean wildlife, and should be incorporated into the EIS.

Stringer. 2012. Underwater hearing sensitivity of the leatherback sea turtle (Dermochelys coriacea): Assessing the potential effect of anthropogenic noise. OCS Study BOEM 2012- 01156. Herndon, VA: U.S. Department of the Interior, Bureau of Ocean Energy Management.; Martin, K.J., S.C. Alessi, J.C. Gaspard, A.D. Tucker, G.B. Bauer, and D.A. Mann. "Underwater hearing in the loggerhead turtle (Caretta caretta): A comparison of behavioral and auditory evoked potential audiograms." The Journal of Experimental Biology, vol. 215, no. 17(2012):3001-3009; Piniak, W.E.D., D.A. Mann, C.A. Harms, T.T. Jones, and S.A. Eckert. "Hearing in the juvenile green sea turtle (Chelonia mydas): A comparison of underwater and aerial hearing using auditory evoked potentials." PLoS ONE, vol. 11, no. 10 (2016):e0159711.

[215] BOEM. 2016. Commercial wind lease issuance and site assessment activities on the Atlantic Outer Continental Shelf offshore New York. Environmental assessment. OCS EIS/EA BOEM 2016-042. Herndon, Virginia: United States Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs.

[216] NMFS. 2018. 2018 Revision to: Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (Version 2.0). Underwater acoustic thresholds for onset of permanent and temporary threshold shifts. NOAA Technical Memorandum NMFS-OPR-59. U.S. Department of Commerce, National Oceanic and Atmospheric Administration.

[217] Hazel, J., I.R. Lawler, H. Marsh, and S. Robson. 2007. "Vessel speed increases collision risk for the green turtle Chelonia mydas," Endangered Species Research 3:105–113.

[218] Kelley, D. E., Vlasic, J. P. and Brilliant, S. W., "Assessing the lethality if ship strikes on whales using simple biophysical models," Marine Mammal Science, vol. 37, pp. 251-267 (2020).

[219] SFWF DEIS at G-13.

4. Monitoring and Mitigation Requirements

No fewer than four PSOs should be available to monitor all exclusion zones for sea turtles for vibratory driving and impact pile driving, as well as for any necessary for high resolution geophysical and geotechnical survey activities. The vantage points and number of PSOs are critical factors for effective exclusion zone monitoring for sea turtles. To effectively monitor the full exclusion zone, multiple PSOs must be stationed at several vantage points at the highest level to allow each to continuously scan a section of the exclusion zone; a limited number of PSOs – even continuously moving around the vantage point – would still not be able to scan the entire exclusion zone. A minimum of four PSOs for all exclusion zone monitoring is recommended.[220] Monitoring reports must be made publicly available.

Moreover, PSOs must be NOAA-certified, and solely focused on monitoring for protected species. While training vessel crew members to additionally watch is beneficial, we caution this cannot be a substitution for trained PSOs as the vessel crew's top priority is vessel operations.

G. Impacts to Birds

The Draft EIS must address population level, cumulative impacts to avian populations from developing the Project and other areas in the Atlantic outer continental shelf (OCS) expected to be developed in the reasonably foreseeable future. In doing so, BOEM must consider impacts to a broad range of avian species which may be impacted by the Project, not limited to ESA-listed species, and be informed by the best available science. Recognizing that much remains unknown regarding the impacts of offshore wind to avian species in the United States, BOEM's evaluation of the Project in the Draft EIS must be based on an explicitly defined monitoring and adaptive management plan. This must include a commitment to sufficient standardized monitoring before and after construction, consistent with recommendations of the NYSERDA's Environmental Technical Working Group, and monitoring guidelines that emerge from the Regional Wildlife Science Entity.

Most importantly, the adaptive management plan must explicitly outline a strategy to employ adequate mitigation measures, based on the impacts observed through monitoring efforts. In this manner, the Draft EIS can account for the reasonably foreseeable impacts of developing this and future projects and a commitment to addressing those impacts. Further, BOEM should incorporate best monitoring and management practices into a regional adaptive management plan to adequately measure and mitigate cumulative impacts to birds from offshore wind developments expected across the Atlantic OCS for the reasonably foreseeable future. BOEM should promote the adoption of recommended standards across all projects moving forward to ensure that inferences from collected data can be compared across projects.

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[220] Infrared (IR) cameras and wearable night vision scopes at night and during low-visibility conditions are unlikely to be effective at detecting sea turtles. IR systems detect the temperature difference between body and environment when the animal is at the sea surface; however, sea turtles spend relatively little time at the water's surface where they could be detected and do not expel a lot of air or exhibit a lot of surface behavior which would enable IR detection. See, Verfuss, U.K., D. Gillespie, J. Gordon, T. Marques, B. Miller, R. Plunkett, J. Theriault, D. Tollit, D.P. Zitterbart, P. Hubert, and L. Thomas. 2017. Low visibility real-time monitoring techniques review. Report SMRUM-OGP2015-002 provided to IOGP.

1. The Draft EIS Must Consider the Full Scope of Impacts to Federally Protected Birds and Species that Trigger Conservation Obligations

BOEM must ensure that the Draft EIS retains consideration of the full range of potential impacts on all bird species known to forage or rest in or near the Project, or migrate through the area, including those species protected under the Migratory Bird Treaty Act (MBTA) and the ESA, as well as species of birds covered under obligations for conservation of birds under the Fish and Wildlife Conservation Act as amended in 1988,[221] Executive Order (EO) 13186 "Responsibilities of Federal Agencies to Protect Migratory Birds" (January 17, 2001),[222] North American Waterbird Conservation Plan,[223] the U.S. Shorebird Conservation Plan,[224] the Memorandum of Understanding (MOU) between the Department of the Interior U.S. Minerals Management Service and the Department of the Interior U.S. Fish and Wildlife Service (USFWS) regarding implementation of EO 13186,[225] the United Nations Convention on the Conservation of Migratory Species of Wild Animals (CMS),[226] and BOEM, Department of Interior (DOI), USFWS, and NOAA membership in the International Union for Conservation of Nature[227] (hereinafter collectively referred to as the "conservation obligations").

As we have commented to BOEM before, we are aware that the DOI and the USFWS are now relying on a new rule[228] which codifies an illegal interpretation of the MBTA and limits its scope to the purposeful take of birds.[229] Our organizations strongly oppose this rule as contrary to the plain language and intent of the law, and we urge BOEM to continue to implement its MBTA responsibilities as all previous administrations have done in the past, with explicit recognition that incidental take is prohibited. This would also be consistent with the memorandum of understanding that BOEM signed with USFWS in 2009 to protect migratory bird populations.[230] If DOI's new interpretation changes BOEM's analysis and associated requirements for impacts to migratory birds in any way, a detailed description and explanation of such changes must be included in the Draft EIS. We note that signatories of these comments (Natural Resources Defense Council, National Wildlife Federation, and National Audubon

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[221] 16 U.S.C. 2901-2911 (1988), https://www.fws.gov/laws/lawsdigest/FWCON.HTML.

[222] Exec. Order No.13186, 3 C.F.R. 1 (Jan. 10, 2001), https://www.energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/Req-EO13186migratorybirds.pdf.

[223] North American Waterbird Conservation Plan, *Waterbird Conservation for the Americas*, Version 1. https://www.fws.gov/migratorybirds/pdf/management/northamericawaterbirdconservationplan.pdf.

[224]Brown, S., C. Hickey, B. Harrington, and R. Gill, eds. 2001. The U.S. Shorebird Conservation Plan, 2nd ed. Manomet Center for Conservation Sciences, Manomet, MA.

[225] Memorandum of Understanding Between the Department of the Interior U.S. Minerals Management Service and the Department of the Interior U.S. Fish and Wildlife Service Regarding Implementation of Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds" (Jun. 4, 2009). https://www.boem.gov/Renewable-Energy- Program/MMSFWS_MBTA_MOU_6-4-09-pdf.aspx .

[226] Convention on the conservation of migratory species of wild animals, Bonn, 23 June 1979. https://www.cms.int/en/convention-text.

[227] IUCN Member List, https://www.iucn.org/about/members/iucn-members.

[228] 50 C.F.R. § 10 (2021).

[229] U.S. Department of the Interior, "The Migratory Bird Treaty Act Does Not Prohibit Incidental Take," Memorandum M- 37050 (Dec. 22, 2017), https://www.doi.gov/sites/doi.gov/files/uploads/m-37050.pdf.

[230] Memorandum of Understanding Between the Department of the Interior U.S. Minerals Management Service and the Department of the Interior U.S. Fish and Wildlife Service Regarding Implementation of Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds" (Jun. 4, 2009). https://www.boem.gov/Renewable-Energy-Program/MMSFWS_MBTA_MOU_6-4-09-pdf.aspx

Society), together with many other organizations and states, successfully challenged DOI's unlawful reinterpretation of the MBTA in court[231] and we expect BOEM and USFWS to respect the court's ruling.

The MBTA states that, "[u]nless and except as permitted by regulations . . . it shall be unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill . . . any migratory bird."[232] For decades, the DOI has interpreted the MBTA to encompass "incidental takes" of migratory birds, including from wind turbines. It was not until the 2017 Jorjani Opinion M-37050 that the DOI limited the MBTA's legal scope to only include actions that purposely take migratory birds.[233] However, on August 11, 2020, the United States District Court for the Southern District of New York found that "the Jorjani Opinion's interpretation runs counter to the purpose of the MBTA to protect migratory bird populations."[234] The court found that the statute's unambiguous text makes clear that killing a migratory bird "by any means or in any manner," regardless of how, is covered by the statute.[235] As such, the district court struck down the Jorjani Opinion as unlawful, restoring the MBTA's protections for migratory birds from incidental takes.[236] The unlawful reinterpretation does not relieve BOEM or FWS from their obligations for conservation of birds under the aforementioned federal laws, EO and MOU, as well as the MBTA.

In addition to ESA-listed species, at a minimum, the Draft EIS should include analyses of the following priority species, which are likely to use the Project array, to fulfill BOEM's conservation obligations:

- Least Tern, Gull-billed Tern, Black Skimmer, Band-rumped Storm Petrel, Fea's Petrel, Cory's Shearwater, Manx Shearwater, and Audubon's Shearwater are all marine birds occurring in the Atlantic OCS listed as USFWS Birds of Conservation Concern under the Fish & Wildlife Conservation Act, 1988 amendment.[237]
- American Golden-plover, Bicknell's Thrush, Bobolink, Buff-breasted Sandpiper, Pectoral Sandpiper, Chimney Swift, Connecticut Warbler, Semipalmated Sandpiper, Solitary Sandpiper, Upland Sandpiper, and Whimbrel are all trans-Atlantic migrating birds and USFWS Birds of Conservation Concern[238] with documented migratory paths through the Atlantic OCS,[239] and should therefore be prioritized for studies concerning risks to nocturnal migrants.
- Black-legged Kittiwake, Horned Grebe, Leach's Storm-petrel, Long-tailed Duck, Atlantic Puffin, and Chimney Swift are classified by the International Union for Conservation of Nature (IUCN) as Vulnerable.

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[231] *National Audubon Society v. U.S. Department of Interior*, No. 18-cv-08084 (S.D.N.Y 2019).
[232]Migratory Bird Treaty Act of 1918, 16 U.S.C. § 703 (1918).
[233] United States Department of Interior, *The Migratory Bird Treaty Act Does Not Prohibit Incidental Take*, Memo M-37050 (Dec. 14, 2017), https://www.doi.gov/sites/doi.gov/files/uploads/m-37050.pdf.
[234] *Natural Resources Defense Council v. United States DOI*, 2020 WL 4605235, at *6 (S.D.N.Y. Aug. 11, 2020).
[235] *Id.* at 28.
[236] *Id.* at 42-44.
[237] U.S. Fish and Wildlife Service. 2021. Birds of Conservation Concern 2021. United States Department of the Interior, U.S. Fish and Wildlife Service, Migratory Birds, Falls Church, Virginia. http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
[238] *Id.*
[239] Sorte FAL, Fink D. 2017. Projected changes in prevailing winds for transatlantic migratory birds under global warming.
Journal of Animal Ecology 86:273–284.

- Black Scoter, Common Eider, Semipalmated Sandpiper, Blackpoll warbler, Razorbill, and Sooty Shearwater are classified by IUCN as Near Threatened.
- Red Knot, Semipalmated Sandpiper, and Buff-breasted Sandpiper are classified by the CMS as Endangered.

Many of the species which may migrate through the Project Area are also protected under various state regulations, in addition to the federal ESA and the MBTA. The Draft EIS should consider impacts to species protected under New York and New Jersey's endangered species laws, as well as the species of greatest conservation need designated under the states' Wildlife Action Plans. However, the states' endangered species lists do not consider all vulnerable species which occur in federal waters in the New York Bight. Many species that occur in the Project Area are not considered vulnerable by the state, because they do not occur frequently in state jurisdiction, but are protected under other state laws. For example, Razorbill and Atlantic Puffin are both considered threatened in the state of Maine, occur regularly within the planned Project footprint, and are expected to be highly vulnerable to habitat loss from offshore wind. Additionally, recent research suggests that similar species are sensitive to underwater noise[240] and may experience physiological impacts from construction.

BOEM must additionally consider species prioritized for conservation by avian expert partners, including the Atlantic Flyway Shorebird Initiative, Partners in Flight, Atlantic Coast Joint Venture, and the North American Waterbird Plan. Along with ESA-listing and IUCN Redlist status, the species included on these initiative priority lists are of high national and international conservation concern. Their priority status by these entities highlights their vulnerability and is further indicative of the need for enhanced mitigation and conservation measures to ensure their survival.

Most notably, BOEM must consider impacts to Northern Gannet. This species' primary winter distribution overlaps with the Project array.[241] The Northern Gannet is considered vulnerable to both collision and displacement from offshore wind[242] and is also likely to face range loss as a result of climate change.[243]

The COP does not provide adequate species-specific impact assessments, even for ESA-listed species, Piping Plover, *rufa* Red Knot, and Roseate Tern. The Draft EIS must not rely on the COP for its evaluation of impacts and must evaluate the cumulative species-specific impacts in a manner that is appropriate for each species' ecology.

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[240] Anderson Hansen K, Hernandez A, Mooney TA, Rasmussen MH, Sørensen K, Wahlberg M. 2020. The common murre (*Uria aalge*), an auk seabird, reacts to underwater sound. The Journal of the Acoustical Society of America 147:4069–4074.

[241] Stenhouse IJ, Berlin AM, Gilbert AT, Goodale MW, Gray CE, Montevecchi WA, Savoy L, Spiegel CS. 2020. Assessing the exposure of three diving bird species to offshore wind areas on the U.S. Atlantic Outer Continental Shelf using satellite telemetry. Diversity and Distributions:ddi.13168.

[242] Robinson Willmot J, Forcey G, Kent A. 2013. The Relative Vulnerability of Migratory Bird Species to Offshore Wind Energy Projects on the Atlantic Outer Continental Shelf: An Assessment Method and Database. Page 294. Final Report to the U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs OCS Study BOEM 2013-207.

[243] Wilsey C, Bateman B, Taylor T, Wu JX, LeBaron G, Shepherd R, Koseff C, Friedman S, Stone R. Survival by Degrees: 389 Bird Species on the Brink. National Audubon Society: New York.

2. The Draft EIS Should Consider Local Population-level Impacts

In evaluating impacts to vulnerable species, BOEM must consider local population-level impacts in addition to flyway-wide impacts.

It would be inappropriate to rely on Marine-life Data and Analysis Team (MDAT) results to evaluate the total proportion of avian populations impacted by the Project. For one, the MDAT projections are rough estimates of relative density in the Atlantic OCS--they are not intended to assess avian habitat use at the Project scale and they cannot be interpreted as population proportions. The NYSERDA/Normandeau surveys provide a higher resolution picture of relative density, but these are also inappropriate to interpret as population proportions. Limitations of these analyses are provided in the following section.

BOEM should instead consider the population-level impacts of the project to potentially affected local populations, based on the best available science. Black Skimmers, as an example, are state-endangered in New Jersey and a species of special concern in New York. New Jersey and New York make up the northernmost range of the species along the Atlantic coast, so removing individuals from these local state breeding colonies may have a lower impact on the metapopulation along the Atlantic Coast. However, even small levels of take from the Project could be detrimental to the persistence of the populations in New York and New Jersey.

The COP also suggests that Brown Pelicans will not be significantly impacted by the Project because the Project is located at the northern limit of the species' range. Brown Pelicans are considered vulnerable to collision with offshore wind turbines. If the level of take from turbines within the New York Bight is enough to reduce the number of individuals within the area, this could potentially lead to a reduction in the species' range--which would be a significant impact to the population. Additionally, young-of-the-year Brown Pelicans disperse well north of their typical breeding range, so take of these individuals would negatively impact their recruitment into local rookeries.

BOEM should make sure in the Draft EIS to not minimize take to avian populations for the reasons outlined above.

3. BOEM Should Base Its Impact Analyses on Methods Appropriate for Each Species that Triggers Conservation Obligations

Radio and satellite telemetry and radar monitoring methods should be employed to evaluate risks to species which are likely to use the Project Area for migration. Many species use Long Island, adjacent to the Project Area, during migration. Red Knots, Piping Plover, and other shorebirds regularly visit Long Island's barrier islands and likely cross the Project Area as they head out over the Atlantic Ocean. Nocturnally migrating passerines from across North America similarly convene along New Jersey's coast prior to beginning their southward trans-Atlantic migration in the fall. Nocturnally migrating passerines often cross the New York Bight from stopover locations on Long Island, southern Connecticut, and Massachusetts and then make landfall along the New Jersey Coast. Beach nesting birds, like Piping Plover, American Oystercatcher, and Black Skimmer, cut across the Mid-Atlantic Bight and the Project Area to reach breeding grounds along New York and New England in the spring and on their return flights south. These interactions are fleeting, however, and would not be adequately captured using transect survey methods. Transect surveys are likely to underestimate the impacts to these populations, even when these species happen to be recorded during surveys. Therefore, transect surveys are inadequate for assessing the movements of birds migrating over the Atlantic OCS and are clearly not effective for nocturnal movements.

Satellite telemetry technology, supplemented with pressure sensors, should be prioritized for large-bodied birds, as this is the best method for gathering fine scale movement data and flight altitude. Radio telemetry is appropriate for smaller bodied birds, including song birds, but it should be reserved for these species, and the network of receiving stations in the offshore will need to be expanded significantly in order to evaluate the level of interaction between birds and the Project. Radio telemetry has been deployed extensively along the New York Bight coastline. BOEM must include the most recent available analyses from these data in the Draft EIS. We expect that the Draft EIS will include an evaluation of all relevant telemetry and radar data available for birds which may enter the Project Area (on and offshore), work with the Project developers to expand these monitoring methods to evaluate impacts of the Project, and outline these requirements within the Draft EIS.

Currently, there are no relevant radar data for the New York Bight. NEXRAD is very course and does not provide adequate resolution of flight altitudes to characterize collision risks for birds. We expect that BOEM will include marine radar as part of the monitoring requirements in the EIS for the Project.

4. The Draft EIS Should Account for the Limitations in the Survey Methods Used to Assess the Project Area for Avian Species Present

Given that there are no studies that document the responses of local avian populations to offshore wind development in United States' waters, BOEM should adopt a conservative approach in the Draft EIS's avian impact analysis. In doing so, BOEM must address the limitations of the survey methods used within the COP to assess avian impacts.

a) Limitations of Avian Surveys to Make Species-specific Assessments for Vulnerable Species

Empire Wind's COP bases the exposure assessment on NYSERDA/Normandeau surveys and MDAT projections.[244] Personned aerial surveys paired with vessel surveys, like those used in the NYSERDA surveys, can inform offshore wind siting that minimizes avian impacts, while also measuring the realized level of impacts when comparing survey results before and after construction. However, both aerial and vessel surveys have limitations and associated biases. They are most appropriate for larger bodied species that spend a great deal of time within the survey area (*e.g.*, alcids, gannet, phalarope, ducks). Transect surveys are less appropriate for assessing risk to migrants, as the surveys are not repeated frequently enough to catch migration events. Migration behavior is a dynamic response to endogenous and exogenous factors that require oversampling to ensure that infrequent events are not missed by chance alone.

Many species are left out of transects survey methods. Aerial surveys cannot appropriately address impacts to species that are potentially vulnerable to offshore wind but rarely occur in and around the WEAs under consideration. This is true for species for which populations are low enough that even small levels of take can have population-level effects (*e.g.*, endangered Black-capped Petrel) or species for which interactions with the WEA may be relatively rare but theoretically could result in large take levels under particular circumstances (*e.g.*, nocturnal trans-Atlantic migrants encountering the WEAs during inclement weather). Additionally, smaller avian taxa are difficult to distinguish at the species level

[244] EOW COP, Vol. III, p. 47.

during transect surveys. Alcids are rarely attributed to species using personned or digital aerial surveys. Sterna terns and small gulls are rarely attributable to species using any survey method (*i.e.*, aerial or vessel), and vessel surveys frighten away many marine birds. Additionally, Roseate Terns are known to use the offshore environment at night during staging periods[245] and migration[246] but transect surveys do not evaluate nocturnal activity for obvious safety reasons. Therefore, a comprehensive monitoring plan must include transect surveys in concert with additional methods to assess potential changes in distribution or migratory patterns before and after Project construction. Telemetry (*e.g.*, radio and/or satellite telemetry as appropriate) and marine radar monitoring methods must also be employed as they serve different (though complimentary) objectives for different suites of species.

Much of the purpose of these surveys is to collect background information regarding spatial trends which can be compared against data collected post-construction. Personned aerial surveys cannot be completed safely at wind development areas post-construction. We recommend that BOEM work with the Project developer to institute digital aerial surveys pre- and post-construction and include this requirement in the Draft EIS. As marketed, digital aerial surveys allow for surveys that fly at higher altitudes than personned surveys, reducing safety risks, while also allowing for surveys to be continued after wind farms have been constructed. While this is true given the current 12-15 MW turbines under consideration by the offshore wind farms with publicly available construction and operation plans, the 200-meter turbine blades in development in Virginia[247] will challenge the potential for even digital aerial surveys post-construction. Additionally, digital aerial survey technology is relatively new and its reliability for attributing observations to species and characterizing flight altitude has not yet been tested or published. As of now, it appears that federally endangered Roseate Terns can be distinguished from other sterna tern species for at least some proportion of occurrence events. However, the reliability of these photo identifications have not been verified. Additionally, Common Terns are considered threatened in New York and a species of concern in New Jersey. Records from Normandeau suggest that digital aerial photos of this species are less distinguishable from other sterna terns (namely Arctic and Forster's Tern). This is similarly true for storm petrel and alcid species, making it difficult to understand how these species distributions may be influenced by the development of the WEAs under consideration. Therefore, the rate of mis-identification for Roseate Tern and other species should be tested and published, and these rates should be incorporated into density estimates.

The MDAT predictive models, while excellent for estimating broad-scale, relative patterns of avian abundance along the Atlantic, are not of suitable resolution for reliably estimating distribution at a local scale. The MDAT models are wholly inappropriate for use in impact assessments and should only be used for broad scale planning purposes (such as determining Call Areas). Furthermore, even as it relates to broad scale evaluations, BOEM's own report indicates that the MDAT models are not suitable for

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[245] Loring, P., Ronconi, R., Welch, L., Taylor, P. and Mallory, M., 2017. Postbreeding dispersal and staging of Common and Arctic Terns throughout the western North Atlantic. Avian Conservation and Ecology 12:20.

[246] Loring, P., Paton, P., McLaren, J., Bai, H., Janaswamy, R., Goyert, H., and Sievert, P. 2019. Tracking offshore occurrence of Common Terns, endangered Roseate Terns, and threatened Piping Plovers with VHF arrays, Sterling (VA): US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM.

[247] Institute of Energy for Southeast Europe, Blades, Longer Than Two Football Fields, Could Help Bring Offshore 50 MW Wind Turbines to the World
https://www.iene.eu/blades-longer-than-two-football-fields-could-help-bring-offshore-50-mw-wind-turbines-to-the-world-p2488.html (visited Apr. 29, 2021).

predicting distribution and abundance for a rare and narrowly distributed species.[248] As a result, when these and other data deficiencies[249] are factored into the biological assessment, the density of ESA species within the Project Area is likely to be underestimated.

b) Sampling Biases in Survey Methods

As stated above and in previous comments to BOEM, raw data from transect surveys are not appropriate for addressing potential environmental impacts. The Draft EIS must address the biases of each monitoring method used in the COP and present published results from the associated studies that account for imperfect detection. Distance sampling is the most obvious method to address imperfect detection in transect surveys and we recommend that BOEM and developers incorporate this accepted method into their survey protocols.[250] Personned and digital aerial surveys, as well as vessel surveys are unable to reliably distinguish between similar-looking species in all cases. Digital area surveys may be able to attribute observations to species more frequently, but so far there are no peer-reviewed publications which document the reliability of this method. Vessel surveys, while occasionally better for attributing observations to species, are biased against species which sit on the water (sea ducks, waterbirds, alcids) and are more likely to flee from approaching vessels.[251] Aerial and vessel transect surveys are also unreliable for estimating flight height, as estimates of flight altitude are affected by the distance between observer and target and the aspect between the two.

Because of these biases, it would be inappropriate to assess the Project using raw data alone. It is also inappropriate to base an impact analysis on lumping the data together into species groups if species-specific extrapolations are available and statistically sound. The Draft EIS must not rely on the presentation of raw lumped data, and instead rely on models produced from these standardized collection methods and by species when appropriate. We expect a full analysis of the data from the NYSERDA/Normandeau surveys of the Project to be made publicly available and incorporated in the Draft EIS. This analysis should explicitly provide species-specific detection rates and species-specific photo identification success rates.

The COP also relied on flight heights discerned from NYSERDA surveys to assess collision risk. Flight height estimates from vessel surveys are generally biased low and should not be relied on to estimate average flight height.[252] Additionally, the number of species-specific detections was generally too low to provide an adequate sample from which to evaluate trends in flight height. Radar, LiDAR, and pressure

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[248] Curtice C., Cleary J., Shumchenia E., Halpin P.N. 2018. 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. Prepared on behalf of the Marine-life Data and Analysis Team (MDAT). Accessed at: http://seamap.env.duke.edu/models/MDAT/MDATTechnicalReport.pdf.

[249] The BRI spring tern surveys failed to identify any Roseate Terns. However of the total of 23 terns found, 22% were unidentified, and a high proportion of unidentified terns (86%) were noted in transit surveys to and from the lease area. The unpublished nanotag study did not include MOTUS receivers within the area, potentially skewing data results.

[250] Bradbury G, Trinder M, Furness B, Banks AN, Caldow RWG, Hume D. 2014. Mapping Seabird Sensitivity to Offshore Wind Farms. PLOS ONE 9:e106366. Public Library of Science.

[251] Henkel LA, Ford RG, Tyler WB, Davis JN. 2007. Comparison of aerial and boat-based survey methods for Marbled Murrelets *Brachyramphus marmoratus* and other marine birds: 8.

[252] Harwood AJP, Perrow MR, Berridge RJ. 2018. Use of an optical rangefinder to assess the reliability of seabird flight heights from boat-based surveyors: implications for collision risk at offshore wind farms. Journal of Field Ornithology 89:372–383.

sensor technologies should be relied upon in the Draft EIS and the limitations of each data collection method should be explicit within the Draft EIS.

It is also critical to note the extreme amount of sampling bias across much of the data used in the MDAT avian density models referenced in the COP. Not only do the data used in this model include vessel and aerial surveys which come with the sampling bias described above, but there is no standardization across data sources. Much of the data do not come from standardized protocols and are instead opportunistic observations from pelagic birding trips. Additionally, many of these opportunistic observations occur during chumming activities. This does not necessarily over inflate the number of birds overall, but it does confound model results by artificially creating higher densities of seabirds in vessel paths.

c) Effect of Survey Effort on Assessment Reliability

We applaud NYSERDA's efforts to date to survey avian activity along the New York Bight. However, these surveys are too temporally and spatially limited to detect changes in avian distribution from the Project development. While the survey coverage extends well beyond the Project footprint, it does not do so in all directions. Some species may experience displacement for up to 20 km from an offshore wind turbine array.[253] Therefore, any EIS must include information of avian distribution and occurrence for a minimum of 20 km surrounding the Project Area in order to completely understand which species may be impacted by developing the Project. Annual and seasonal variations in avian movement are also not well captured during the limited survey period, and therefore BOEM should work with developers to continue aerial surveys over the New York Bight wind planning areas, including a 20 km buffer, to capture this variation, beginning as soon as possible. Surveys should be repeated frequently enough to cover within and between seasonal and annual variation in avian distribution, so that changes in distribution caused by offshore wind development can be discerned from other sources.

5. The Draft EIS Should Address Collision Risk for Species Most at Risk of Collision and be Transparent in Its Use of Collision Risk Models

The Draft EIS should include a collision risk analysis on species that occur within a 20 km radius of the WEA and that trigger conservation obligations: ESA-listed endangered and threatened species, state-listed threatened, endangered, and species of concern, and IUCN listed endangered, threatened, and near threatened. These species include, but are not limited to Roseate Tern, Piping Plover, Red Knot, Common Tern, Least Tern, and Upland Sandpiper, including the risk to birds as they migrate through the projects. The Draft EIS should include the most recently available scientific information.

Based on MDAT models, the Mid-Atlantic Bight is a rich avian resource, containing a relatively high density of birds and relatively high diversity of species. While collision events during migration are likely to occur less frequently, these events have the potential to have large, population-level consequences during a short time period. The Project is placed within an essential migratory pathway for trans-Atlantic migratory songbirds and shorebirds. BOEM's Draft EIS needs to evaluate the cumulative risk of collision, as the likelihood of large migratory collision events will increase as the total offshore wind footprint increases.

[253] Peschko V, Mendel B, Müller S, Markones N, Mercker M, Garthe S. 2020. Effects of offshore windfarms on seabird abundance: Strong effects in spring and in the breeding season. Marine Environmental Research:105157.

a) Collision Risk for Passerines and Other Nocturnal Migrants

BOEM must sufficiently assess collision risks to nocturnal migrants in the Draft EIS. As addressed above, migration events are relatively infrequent, and therefore, survey transects of the Project are not appropriate for characterizing collision risk to nocturnal migrants. Likewise, radar studies conducted on Block Island,[254] while helpful in characterizing migration timing, do not reach the New York Bight and are based on a limited number of years. The Draft EIS must consider migration timing, variations in flight height, and the distance from shore at which nocturnal migrants reach maximum migration height. The Draft EIS should contain a full analysis of these study results and not rely on a simple summary of the raw data to inform its collision risk analysis for nocturnal migrants. In general, efforts to understand these impacts should rely on a combination of radar, telemetry, survey, and acoustic monitoring, and should not be based on a single technology alone.

When incorporating radio telemetry methods, receiving stations need to be installed in the offshore environment in such a way that avian movement in and around the WEAs can be adequately assessed prior to and following construction. BOEM should follow the monitoring protocols for automated radio telemetry currently in development by NYSERDA and USFWS.[255] We applaud this interagency effort to develop robust, scientifically sound monitoring protocols and to test the feasibility of floating receiving stations. Metocean platforms provide an excellent opportunity to deploy telemetry, acoustic, and marine radar technology in wind energy areas prior to construction and should be built to accommodate these instruments. BOEM needs to financially support the efforts to further this technology, adopt these methods into regional monitoring protocols for offshore wind development, ensure the success of this technology moving forward, and incorporate data from these efforts into this Draft EIS and other impacts analyses into the future.

Acoustic monitoring is especially inappropriate on its own to characterize the community of nocturnal migrants within the WEA. We recognize that BOEM is considering acoustic monitoring as a standardized monitoring method. However, evidence indicates that Empidonax flycatchers and vireos, two of the most abundant nocturnal migrant groups, do not emit nocturnal flight calls, and therefore, would not be accounted for using acoustic monitoring.[256] Additionally, acoustic monitoring does not adequately assess flux – a necessary value for assessing collision risk and estimating population-level impacts.

La Sorte and Fink (2017)[257] document the flights of species of migratory birds that migrate over the Atlantic Ocean: American Golden-Plover, Bicknell's Thrush, Blackpoll Warbler, Bobolink, Buff-breasted Sandpiper, Connecticut Warbler, Pectoral Sandpiper, Semipalmated Sandpiper, Solitary Sandpiper, and White-rumped Sandpiper. Two species classified by USFWS as Birds of Conservation Concern—Upland Sandpiper and Whimbrel, also cross the Atlantic Ocean during migration. We do not currently know

[254] Mizrahi D, Fogg T, Magarian V, Elia P, Hodgetts D, La Puma D. 2010. Radar Monitoring of bird and bat movement patterns on Block Island and its coastal waters. Report prepared for State of Rhode Island Ocean Strategic Area Management Plan.

[255] Williams K, Adams E, Gilbert A. (n.d.). USFWS Migratory Birds: Pam Loring, Scott Johnston Univ. of Rhode Island: Peter Paton:21. Accessed at https://www.briloon.org/uploads/BRI_Documents/Wildlife_and_Renewable_Energy/AutomatedVHF/NYSERDA%20PAC%20Webinar%20Radio%20Telemetry%2020200826_Final.pdf

[256] Evans WR, Rosenberg KV. 2000. Strategies for bird conservation: The Partners in Flight planning process; Proceedings of the 3rd Partners in Flight Workshop; 1995 October 1-5; Cape May, NJ:9.

[257] Sorte FAL, Fink D. 2017. Projected changes in prevailing winds for transatlantic migratory birds under global warming. Journal of Animal Ecology 86:273–284.

what the Project's turbine specifications will be. While there is evidence to suggest that nocturnal migrants typically fly above the rotor swept zone for current wind turbines in operation, we also know that nocturnal migrants fly lower, potentially within the rotor swept zone, during inclement weather and cross winds.[258] This risk cannot be discounted simply because it may be considered by the developer to be atypical. Under our changing climate, we can expect unfavorable crosswinds to become more frequent, and therefore must take a conservative approach to evaluate risk so that this risk is not underestimated.

Many species of conservation obligation, including ESA-listed Red Knot and Piping Plover, migrate over the Atlantic Ocean, many which take off from Long Island's southern shoreline. The current configuration of very high frequency (VHF) receiving towers does not allow for detailed characterization of flight paths for this species or any protected avian species using this tracking technology, and therefore, BOEM should take a conservative approach in the Draft EIS when evaluating potential impacts (cumulative or otherwise) to Piping Plover, Red Knot, and other species which may fly through the Project Area and other wind development areas expected in the foreseeable future. Relying on the current system of automated radio telemetry receivers to minimize risk is inappropriate, as the network of receivers has not been established offshore to the degree necessary. Additionally, automated radio telemetry does not adequately estimate flight height, though there are efforts underway to fill this information gap. Remote tracking studies that rely on the Motus passive VHF radio tracking system do, however, provide that Piping Plovers migrate nocturnally over open water, "directly across the mid-Atlantic Bight, from breeding areas in southern New England to stopover sites spanning from New York to North Carolina...at altitudes of 288 m (range of model uncertainty: 36-1,031 m),"[259] putting this ESA-listed species at high risk of collision with turbines, should their paths cross through the Project Area. The same study documented that Piping Plovers do, in fact, cross the Project Area, with 1 of approximately 60 successfully tagged Piping Plover crossing the Project Area. The authors suggest that this number would likely be higher if birds were sampled from New York and Connecticut and further suggested potentially high cumulative risk for the species.

It is imperative that BOEM invests in supporting further tracking efforts by constructing and maintaining a full network of telemetry receiving towers throughout the offshore environment to inform its Draft EIS. It is important to note that the VHF transmitters widely deployed along the coast have a limited lifespan. New solar-powered ultra-high frequency transmitters, which include on-board battery support for transmitting at night, should be the future focus for incorporating this technology.

The Draft EIS must produce a full picture of migratory pathways for songbirds and shorebirds. This could be realized with the addition of satellite tracking information from Movebank and the National Aeronautics and Space Administration's Icarus project for larger bodied shorebirds, additional research and tagging of priority bird species using radio and satellite telemetry technology as appropriate, and an expansion of the radio telemetry receiver network in the offshore environment. While we recognize the unlikelihood of implementing and completing new tracking studies prior to the publication of the Draft EIS, BOEM should outline their plans to fill these knowledge gaps to inform future offshore wind

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[258] Van Doren BM, Horton KG, Stepanian PM, Mizrahi DS, Farnsworth A. 2016. Wind drift explains the reoriented morning flights of songbirds. Behavioral Ecology 27:1122–1131. [262] EOW COP Volume II, p. 19.

[259] Loring PH, McLaren JD, Goyert HF, Paton PWC. 2020. Supportive wind conditions influence offshore movements of Atlantic Coast Piping Plovers during fall migration. The Condor 122. Available from https://doi.org/10.1093/condor/duaa028 (accessed February 9, 2021).

operation and siting processes. In addition, there should be a commitment to, and process outlined for, addressing unforeseen impacts through compensatory mitigation (*see* Section IV(G)11 on Compensatory Mitigation for Birds). The Draft EIS should use the data currently available to calculate the risk to these migratory birds, especially in regard to modern turbine height, and provide for tracking these migratory birds during the life of the project and over all the cumulative projects in the Atlantic OCS.

Additionally, the Draft EIS should explicitly outline BOEM's plan to implement collision detection and minimization measures during the operation of the Project and other planning areas. The mitigation measures outlined in the COP are wholly inadequate to monitor and mitigate risks to nocturnal migrants. Under the ESA and MBTA, developers are responsible for any take of migratory birds and ESA-listed species. However, without appropriate monitoring for collision detection, large collision events could have serious population-level impacts to migratory songbirds and shorebirds without any recourse. This is not an acceptable outcome, and BOEM must be clear in the Draft EIS of its plans to address this concern.

b) Collision Risk for Seabirds

The Draft EIS must adequately assess collision risk to seabirds. This must include an analysis, using the most current available science, of flight heights (averages and ranges), avoidance rates, and other relevant avian flight behavior at the very least. The Draft EIS must also consider the range of turbine specifications that could influence collision risk, including air gap, total rotor swept zone, and turbine height.

The Draft EIS must also provide results from BOEM's own analysis of the vulnerability of 177 species of birds that could come into contact with the WTGs in the cumulative OCS Wind Development Areas (WDAs) in the foreseeable future and incorporate this analysis into the cumulative impacts conclusions within the Draft EIS.[260] In doing so, the Draft EIS must be transparent in presenting the high level of uncertainty in the results, including high and low estimates for population-level cumulative impacts. Much of the high uncertainty in these models is a result of highly variable concentrations of seabirds throughout the year. BOEM needs to be explicit about these seasonally higher risks and not rely on annual averages. Many tubenoses, for example, congregate outside the breeding season near upwellings and other locations of high productivity. Such concentrated flocks, if occurring within the turbine array, could produce significantly large collision events, even if such events are relatively rare. The Draft EIS should consider this variability of large concentrations of birds even in short periods of time in its analysis of seasonal abundance when calculating risk to birds.

c) Collision Risk Models

We expect that BOEM will apply Collision Risk Models (CRMs) to evaluate avian impacts from the Project. While limited, CRMs are one of the only tools available to hypothesize potential impacts to birds from collision in the offshore environment. As such, CRMs provide a mechanism for testing outcomes (*e.g.*, observed collision rates) against the model predictions (*e.g.*, expected collision rates), and BOEM must address the need to collect the data necessary to test these hypotheses. We appreciate

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[260] Robinson Willmot J, Forcey G, Kent A. 2013. The Relative Vulnerability of Migratory Bird Species to Offshore Wind Energy Projects on the Atlantic Outer Continental Shelf: An Assessment Method and Database. Page 294. Final Report to the U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs OCS Study BOEM 2013-207.

how BOEM addressed our concerns in the Final EIS for Vineyard Wind 1 and reiterate our expectation that BOEM's collision risk analysis in the Draft EIS be complete and transparent.

The Draft EIS should include a CRM-driven analysis for all species of conservation obligation which may occur within 20 km of the Project footprint and for which a current CRM would be appropriate, even if the species has not been documented within the footprint of the Project. This should include a recent stochastic derivation of the Band model, such as the McGregor (2018)[261] version.

BOEM must be transparent in its CRM application. These models are extremely sensitive to the input parameters. A study by Cook et al. (2014) found that estimations of avoidance and collision risk from Band models were highly sensitive to the flux rate (total number of birds passing through the wind farm), corpse detection rate, rotor speed, and bird speed. Factors such as weather (*i.e.* wind speed and visibility) and habitat use would also affect the accuracy of these estimates, as such factors would greatly influence avian flight patterns and behavior.[262] Therefore, the Draft EIS must provide the inputs used in its analysis for public comment and transparency. Providing CRM results without transparency to the inputs and analytical process would never be acceptable from a scientific perspective and, therefore, should not be acceptable from BOEM. Providing inputs would show whether BOEM followed the guidance provided by Band in assessing collision risk. These details regarding inputs should include, but not be limited to, avoidance behavior, flight height, flight activity, flux rate, corpse detection rate, rotor speed, bird speed, and collision risk.

Additionally, CRMs should consider differences in daytime and nighttime flight patterns. As Band himself stipulates:

> For some species typical flight heights are dependent on the season, and in such a case it will be best to use seasonally dependent typical flight heights in assessing collision risk for each month, rather than average flight heights across the year...Flight activity estimates should allow both for daytime and night-time activity. Daytime activity should be based on field surveys. Night-time flight activity should be based if possible on nighttime survey; if not on expert assessment of likely levels of nocturnal activity...collision model[s] should take both day and night flights into account. Where there is no night-time survey data available, or other records of nocturnal activity, for the species in question, (or for other sites if not at this site), it should be assumed that the Garthe and Hüppop/ King et al. 1-5 rankings apply. These rankings should then be translated to levels of activity at night which are respectively 0%, 25%, 50%, 75% and 100% of daytime activity. These percentages are a simple way of quantifying the rankings for use in collision modelling, and they may to some extent be precautionary.[263]

[261] McGregor RM, King S, Donovan CR, Caneco B, Webb A. 2018. A Stochastic Collision Risk Model for Seabirds in Flight:61. https://tethys.pnnl.gov/sites/default/files/publications/McGregor-2018-Stochastic.pdf.

[262] Cook ASCP, Humphreys EM, Masden EA, Burton NHK. 2014. The Avoidance Rates of Collision Between Birds and Offshore Turbines. Scottish Marine and Freshwater Science 5:263.

[263] Band, B. 2012. Using a collision risk model to assess bird collision risks for offshore windfarms. SOSS report for The Crown Estate, Norway.
https://www.bto.org/sites/default/files/u28/downloads/Projects/Final_Report_SOSS02_Band1ModelGuidance.pdf.

There are new derivations of the Band model under development, namely the 3-D CRM for seabirds by the Shatz Energy Research Center[264] and stochastic CRM specific to ESA-listed species in southern New England from the University of Rhode Island.[265] These models should be applied, once available, in BOEM's assessments of avian impacts for offshore wind developments, as they will be better able to incorporate variation in input parameters.

Moreover, collision risk models provide a starting point, not an end point, from which to predict cumulative, population-level impacts across wind farms in the Atlantic OCS. Collision risk models are not found to be reliable in predicting mortality:

> Siting and permitting decisions for many European offshore wind facilities are informed by collision risk models, which have been created to predict the number of avian collisions for offshore wind energy facilities. However, these models are highly sensitive to uncertainties in input data. The few empirical studies at land-based wind facilities that have compared model-estimated collision risk to actual mortality rates found only a weak relationship between the two, and due to logistical difficulties, the accuracy of these models has not been evaluated in the offshore environment.[266]

BOEM should pursue studies to not only verify CRM utility in the offshore environment, but should also move toward viable collision detection requirements for the Project and future offshore wind developments.

6. The Draft EIS Cannot Ignore the Habitat Loss that Birds May Experience Beyond the Footprint of the Project Construction and Operation

As we have mentioned above and in previous comments regarding proposed offshore wind projects on the Atlantic OCS, BOEM should not limit the impact assessment to the project footprint. Birds are not only disturbed from foraging, staging, roosting, and nesting habitat in the immediate vicinity of development. Evidence from construction and operation at offshore wind farms suggest that marine birds may be disturbed up to at least 20 km from an operating wind farm.[267] Though flight-initiation distances are highly variable, nesting and foraging shorebirds can be disturbed from coastal anthropogenic activities more than 200 meters away.[268] Diving marine birds may also be heavily

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[264] Seabird Distribution in 3D: Assessing Risk from Offshore Wind Energy Generation, Shatz Energy Research Center (2020), https://schatzcenter.org/2020/04/seabird3dstudy/.

[265] *Transparent Modeling of Collision Risk for Three Federally-Listed Bird Species to Offshore Wind Development*, US Fish and Wildlife Service Wildlife Service with University of Rhode Island (Oct. 29, 2020) https://www.boem.gov/sites/default/files/documents/environment/environmental-studies/Transparent-modeling-of-collisionrisk-for-three-federally-listed-bird-species-to-offshore-wind-development_1.pdf.

[266] Allison, T. D., Diffendorfer, J. E., Baerwald, E. F., Beston, J. A., Drake, D., Hale, A. M., Hein, C. D., Huso, M. M., Loss, S. R., Lovich, J. E., Strickland, M. D., Williams, K. A., & Winder, V. L. (2019). Impacts to wildlife of wind energy siting and operation in the United States. Issues in Ecology, vol. 21, Ecological Society of America.

[267] Peschko V, Mendel B, Müller S, Markones N, Mercker M, Garthe S. 2020. Effects of offshore windfarms on seabird abundance: Strong effects in spring and in the breeding season. Marine Environmental Research:105157.

[268] Glover HK, Weston MA, Maguire GS, Miller KK, Christie BA. 2011. Towards ecologically meaningful and socially acceptable buffers: Response distances of shorebirds in Victoria, Australia, to human disturbance. Landscape and Urban Planning 103:326– 334.

impacted from the noises associated with pile driving.[269] Underwater noise impacts to diving birds must be considered in the Draft EIS, and cannot be limited to an assessment of the Project footprint. Additionally, vessel traffic can largely disrupt wintering marine birds,[270] and construction activities can have impacts to birds and their prey which will not end immediately after construction—these are modifications to the habitat which will not return to a healthy state until long after construction activities.[271] Given the avian distribution in the New York Bight, it is likely that coastal bird communities will be heavily disturbed during construction activities.

Construction activities from the cable laying and pile driving will likely impact birds, regardless of timing. Beach nesting birds, like Piping Plover, American Oystercatcher, Least Tern, and Black Skimmer, may be present in and around the Project March through September; Red Knots, Semipalmated Sandpiper, and Black-bellied Plover may be affected by construction activities in spring and fall. Marine birds, such as Northern Gannets, shearwater, and petrel, will be present within the Project Area during the winter. If the construction of cable routes is timed to avoid beach nesting birds, then it will likely impact wintering seaducks. While it may not be possible to avoid impacts entirely, the Draft EIS needs to be transparent in addressing these impacts and provide a path to mitigate these impacts.

While Piping Plover and Red Knot may fly through the Project Area, the Draft EIS must also consider the potential impacts of developing the Project to these ESA-listed species onshore. Piping Plover or tern chicks within 100 m of onshore construction activities will require the developer hire a spotter to prevent the chicks from encountering harm during activities. Additionally, no construction activities may be allowed on the beach or intertidal zone within 100 m of piping plover chicks or nests, as this would starve breeding plovers of necessary foraging habitat. Migrating Red Knots rely on the mudflats along New Jersey's coast to rest and refuel during their fall migration. The Draft EIS must consider the impacts of building out the Project to these species, even when the activities associated with development fall outside the Project footprint. As we further discuss in Section IV(I)1 on the Empire Wind 2 potential cable routes, the Empire Wind 2 cable landing falls within a globally recognized Important Bird Area (IBA). If BOEM approves a cable route option through undeveloped sections of this IBA, it will not be possible to avoid construction that causes significant disruptions to the bird communities that rely on this IBA throughout the year. BOEM should take steps to avoid cable routes with significant ecological impacts, as the preferred cable route proposed is less likely to cause significant disturbance.

7. The Draft EIS Should Outline BOEM's Expectation for Monitoring and Adaptive Management Meant to Address Realized Impacts to Birds Resulting from Project Construction and Operation

In addition to accounting for potential avian impacts in the Draft EIS, as we have reiterated repeatedly herein, BOEM must provide its plan to monitor bird activity in the Project and surrounding area before,

[269] Anderson Hansen K, Hernandez A, Mooney TA, Rasmussen MH, Sørensen K, Wahlberg M. 2020. The common murre (Uria aalge), an auk seabird, reacts to underwater sound. The Journal of the Acoustical Society of America 147:4069–4074.

[270] Mendel B, Schwemmer P, Peschko V, Müller S, Schwemmer H, Mercker M, Garthe S. 2019. Operational offshore wind farms and associated ship traffic cause profound changes in distribution patterns of Loons (Gavia spp.). Journal of Environmental Management 231:429–438.

[271] Perrow MR, Gilroy JJ, Skeate ER, Tomlinson ML. 2011. Effects of the construction of Scroby Sands offshore wind farm on the prey base of Little tern Sternula albifrons at its most important UK colony. Marine Pollution Bulletin 62:1661–1670.

during, and after construction. We suggest that BOEM clearly outline monitoring requirements and coordinate with other stakeholders, including the Project developer, NYSERDA, and the Regional Wildlife Science Entity, to support the development of a regional monitoring plan for birds and other wildlife.

Monitoring for adverse effects requires multiple modes of evaluation in a coordinated framework pre- and post-construction. Radar, vessel and aerial surveys, acoustic monitoring, and telemetry are all complimentary tools that provide data necessary for evaluating impacts, though none of these tools provides the full picture when used alone.

a) Collision Monitoring

Post-construction fatality monitoring onshore is a key component of Tier 4 of the FWS Land-Based Wind Energy Guidelines.[272] Many wind projects onshore conduct post-construction monitoring, especially on public lands managed by the Department of Interior's Bureau of Land Management. Developers survey for carcasses around a radius from the turbines, under an a priori protocol, to determine avian mortality rates. The data are adjusted for searcher efficiency, carcass persistence, and other sources of bias.

This practice is entirely impractical at sea for obvious reasons, however, that does not relieve BOEM from requiring post-construction fatality monitoring—an obligation that the onshore wind industry has committed to and is required to fulfill. There is ongoing, rapid development of imaging and bird strike technologies used in the European Union and the United Kingdom, and such technologies are also being developed in the United States. Grant funding from the Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy, state energy agencies, and others supports technical and economic advancement of offshore and onshore wind. The DOE Wind Energy Technologies Office invests in energy science research and development activities that enable the innovations needed to advance wind systems, reduce the cost of electricity, and accelerate the deployment of wind power.

DOE has recently funded development of collision detection technology from the Albertani Lab[273] at Oregon State University and WT Bird from WEST, Inc.[274] Similar technologies are being tested at Block Island Wind Project and other offshore locations in the European Union and United Kingdom and are making rapid gains in being effective, officially verified, commercially available, and affordable at scale in the near future, possibly at the same time as the Project would be ready for construction and operation.[275] However, these technologies must be fully integrated into turbine design before they can be deployed. The DOE is currently evaluating the development status of these integrated systems based on their readiness for offshore wind deployment.[276] BOEM must support the development of these

[272] U.S. Fish and Wildlife Service. 2012. U.S. Fish and Wildlife Service land-based wind energy guidelines. OMB Control No, 10180148. U.S. Department of Interior, Fish and Wildlife Service, Hadley, MA. Available from https://www.fws.gov/ecologicalservices/es-library/pdfs/WEG_final.pdf.

[273] Clocker K, Hu C, Roadman J, Albertani R, Johnston ML. 2021. Autonomous Sensor System for Wind Turbine Blade Collision Detection. IEEE Sensors Journal:1–1.

[274] Verhoef JP, Eecen PJ, Nijdam RJ, Korterink H, Scholtens HH. 2003. WT-Bird A Low Cost Solution for Detecting Bird Collisions:46.

[275] Dirksen S. 2017. Review of methods and techniques for field validation of collision rates and avoidance amongst birds and bats at offshore wind turbines. Sjoerd Dirksen Ecology.

[276] Brown-Saracino J. 2018. State of the Science: Technologies and Approaches for Monitoring Bird and Bat Collisions Offshore. RENEWABLE ENERGY:23. Available at

technologies and must drive turbine developers to integrate these systems into their turbine designs. We cannot wait on offshore wind project developers to drive the market, BOEM must require this type of collision monitoring and work with the industry to support the development of these technologies to make deploying them a reality.

The incorporation of these new monitoring technologies, and hopefully a standardized technology, should be a required element in the post-construction monitoring plan for the Project. BOEM should standardize the methodology for using these new technologies across all projects in the Atlantic OCS to incorporate mortality data, and possibly displacement data, into ongoing cumulative effects analyses and adaptive management strategies, to validate collision risk models, and to measure impacts on ESA-listed species and other species of conservation obligation by augmenting tracking data with data from on-site detection technology.

In previous EIS documents, BOEM has suggested that mortality monitoring rely on carcass monitoring around the base of the offshore wind turbines. This is contrary to the standard protocol for post-construction monitoring at onshore wind projects, where a radius from the turbine is prescribed as the search area and includes where birds may be propelled or thrown from the actual turbine structure and blades after collision. The offshore structures anticipated to be installed have very little available structure on which a dead or injured bird could land. Defining the structure as a search area, if it means the turbine base or nacelle (since no injured or dead birds could be found on the blades), is woefully inadequate. Only updated technology will detect bird strikes or mortalities in the appropriate range established by onshore post-construction mortality studies. The Empire Wind COP does not include this or any specific monitoring to assess direct mortality. The Draft EIS must address this inadequacy in the COP and mandate a protocol for adequately monitoring mortality events.

The Draft EIS should specifically include the adoption of collision detection technologies when they are verified and commercially available and BOEM's support for their development and testing. The shared cost of development and implementation of these technologies across all lessees and with BOEM, if standardized, would avoid an undue economic burden on individual projects.

Additionally, BOEM must require that lease applicants report mortality events promptly and publicly.

b) Monitoring for Displacement and Barrier Effects

We appreciate the steps BOEM has taken to date to improve monitoring standards at projects in the Atlantic OCS and we expect BOEM to further expand these requirements to better cumulative impacts across projects.

Within the Draft EIS for South Fork and the Final EIS for Vineyard Wind 1, BOEM proposed that the industry develop a monitoring framework in coordination with the federal and state jurisdictions, to include, at a minimum:

- Acoustic monitoring for birds and bats
- Installation of Motus receivers on WTGs in the WDA and support with upgrades or maintenance of two onshore Motus receivers

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https://www.briloon.org/uploads/BRI_Documents/Wildlife_and_Renewable_Energy/NYSERDA_workshop_JocelynBrown-Saracino.pdf.

- Deployment of up to 150 Motus tags per year for up to 3 years to track roseate terns, common terns, and/or nocturnal passerine migrants
- Pre- and post-construction boat surveys
- Avian behavior point count surveys at individual WTGs
- Annual monitoring[277]

We support these admirable expectations and expect that BOEM will expand on this framework in the Draft EIS to specify how this monitoring should be carried out to collect the best available data.

Monitoring pre- and post-construction should be designed in such a way as to be able to discern any changes to avian spatial distribution that might be a result of construction and operation of the Project. A monitoring plan should incorporate the suggestions previously provided to BOEM on October 23, 2020 via the Avian Considerations recommendations.[278]

More specifically, we recommend that efforts to track avian movement include both satellite and automated radio telemetry, as appropriate, and these efforts should not be limited to Roseate Terns, Common Terns, and nocturnal passerine migrants. Technically speaking, while the passive radio telemetry receivers for these efforts are considered part of the Motus network, the tags themselves are VHF and ultra high frequency radio transmitters. BOEM and developers should follow recommendations by USFWS Northeast Migratory Bird Office when deploying receivers and tags, using the specifications best able to capture migratory routes in the offshore environment.

As we have specified to BOEM previously, we further suggest that transect surveys be accompanied by telemetry and radar studies. Radar surveys can provide a broad overview for comparison of flight paths, especially for nocturnal migrants which could not be captured during daytime survey efforts,[279] while telemetry, especially satellite telemetry with pressure sensors, can gather high resolution distribution and flight path data for priority species.

8. The Draft EIS Should Evaluate Cumulative Impacts to Avian Populations from the Project and All Other Foreseeable Development Offshore

In the past, BOEM has failed to provide any reasonable scientific evidence to support its cumulative impact assessment for birds resulting from wind farm construction and operation in the Atlantic OCS.

In regard to the South Fork project, BOEM assessed only localized impacts to forests from construction, namely “the removal of 2.4 acres of deciduous forest for the interconnection facility and a small area (0.1 acre) of upland wildlife habitat at the selected O&M facility.”[280] BOEM further asserted that the resulting impacts would be “localized and temporary, including avoidance and displacement, although no individual fitness or population-level effects would be expected.”[281] The assumption that removal of

[277] SFWF DEIS, Table G-2.
[278] “Re:BOEM’s obligations under Migratory Bird Treaty Act in Vineyard I Construction and Operation Plan Environmental Impact Statement.” Submitted to BOEM Oct. 23, 2020; Available here: https://drive.google.com/file/d/1SNv6_3296W_S-c-OgMsfiKDAGFu7fOr4/view?usp=sharing
[279] Desholm M, Kahlert J. 2005. Avian collision risk at an offshore wind farm. Biology Letters 1:296–298. Royal Society.
[280] SFWF DEIS, at H-48.
[281] *Id.*

deciduous forest only creates short-term impacts and that displacement and habitat loss do not impact survival and fecundity is simply false. BOEM must take a full annual and life cycle approach in the Draft EIS for Empire Wind, addressing the various population vital rates which may be affected for species potentially impacted from build out of the Project.

Loss et al. (2013) estimates that the average annual mortality rate for birds from turbines onshore is 3.58 birds/MW (95% C.I.=3.05-4.68).[282] The Draft EIS must use this range to estimate potential cumulative impacts from the Project over, at minimum, the predicted 30-year lifespan of the Project. While the exact turbine models to be deployed are not yet known, BOEM should provide, at minimum, estimates based on the specifications provided in the COP.[283] Furthermore, BOEM should model how the Loss et al. estimates could change in response to increased height and rotor swept area for larger turbines, enlisting existing flight altitude data from nearshore studies.

These calculations only address direct mortality from collisions and do not include the rates of mortality driven by barrier effects and habitat loss. Barrier effects and displacement can have significant energetic costs for birds and can additionally result in increased foraging rates. Both can have consequences for individual survival and can decrease rates of egg laying and fledging.

The Draft EIS must provide a quantitative assessment of the cumulative effects from wind farm build out in the OCS, including population viability analyses which consider changes in vital rates that result from both direct and indirect impacts. BOEMs cumulative impact level should reflect these estimates. In the past, BOEM has prescribed impact levels to birds based on immediate impacts or impacts to species detected during surveys within the proposed development footprint. These limited evaluations are not acceptable. We expect BOEM to be fully transparent in its impact level assignments in the Draft EIS, clearly outlining the best available science and analyses that lead to each impact level assignment.

9. BOEM Cannot Assume that Larger Turbines, Further Apart, Reduces Risks to Birds

There is no substantial evidence to suggest that larger turbines, spaced farther apart, reduces risks to birds, and it should be a goal of BOEM to understand the effects of displacement and mortality relative to turbine size and spacing. The size of turbines has grown substantially over the past decade, and this trend is expected to continue. Vineyard Wind specified in its project design envelop for Vineyard Wind 1 plans to use 14 MW turbines, which have a 220-meter rotor swept zone and are estimated to reach a maximum height of 260 meters above sea level. University of Virginia is currently developing 200-meter-long blades to power a 50 MW turbine, with a potential rotor swept zone of approximately 400 meters.

Given that the tower height would need to be more than 200 m in height to accommodate rotor blades of this size, turbines could soon reach heights greater than 400 meters above sea level. Studies, like

[282] Loss SR, Will T, Marra PP. 2013. Estimates of bird collision mortality at wind facilities in the contiguous United States. Biological Conservation 168:201–209.

[283] EOW COP, Vol. I, Table 4.4-1, p. 58

those from Krijgsveld et al. (2009),[284] Smallwood and Karas (2009),[285] and Johnston et al. (2014),[286] which suggest that fewer, larger turbines reduce avian collision risk, are based on turbines less than 5 MW. As turbines increase in size, they are more likely to encroach on airspace occupied by nocturnal migrants[287] while not necessarily avoiding airspace occupied by relatively lower flying foraging marine bird species. Conversely, studies by Loss et al. (2013),[288] Choi et al. (2020),[289] and Huso et al. (2020)[290] find that bird deaths not only increase with turbine size, but also suggest that the number of bird deaths from collision with wind turbines is proportional to the number of MW produced in a wind farm. Turbulence above and below the rotor swept zone can affect flight performance. If this should make birds more susceptible to physical interactions with turbines, then larger turbines would only increase that risk. Additionally, limiting risk evaluations to the rotor swept zone neglects the risk of collision from the tower itself and turbulence around the rotor swept zone.

Suggestions that increased spacing (1 nm) between turbines would reduce risks to birds from both collision and displacement is unfounded, as offshore wind farms in Europe do not provide this level of spacing, and therefore there is no operational comparison to be made. Instead, increased spacing means fewer turbines and less energy production within the footprint of the project, so more projects (and more space) will be necessary to meet state and national energy goals. Furthermore, greater space between turbines may increase collision risk if species vulnerable to collision end up using the wind farm more frequently. Unfortunately, these are all unknowns until these configurations are developed and operational. BOEM will need to fund studies to answer these questions either through tax revenue or through the preferred method of financial support from offshore wind project developers.

The Draft EIS should include a risk assessment, considering the full range of the potential rotor swept zone provided in the COP, to assess 1) impacts from collision and barrier effects to migrating birds, and 2) potential increased habitat loss that may need to occur in order to reach offshore wind energy goals.

10. Adaptive Management and Mitigation for Birds

The Draft EIS should provide more certainty that the developer will use adaptive management for birds and collect sufficiently robust data to inform mitigation strategies to avoid and minimize impacts to birds.

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[284] Krijgsveld KL, Akershoek K, Schenk F, Dijk F, Dirksen S. 2009. Collision Risk of Birds with Modern Large Wind Turbines. Ardea 97:357–366. Netherlands Ornithologists' Union.

[285] Smallwood KS, Karas B. 2009. Avian and Bat Fatality Rates at Old-Generation and Repowered Wind Turbines in California.

The Journal of Wildlife Management 73:1062–1071.

[286] Johnston, A., A.S.C.P. Cook, L.J. Wright, E.M. Humphreys, and N.H.K. Burton. 2014. Modeling Flight Heights of Marine Birds to More Accurately Assess Collision Risk with Offshore Wind Turbines. Journal of Applied Ecology 51, 31-41.

[287] *Id*.

[288] Loss SR, Will T, Marra PP. 2013. Estimates of bird collision mortality at wind facilities in the contiguous United States. Biological Conservation 168:201–209.

[289] Choi DY, Wittig TW, Kluever BM. 2020. An evaluation of bird and bat mortality at wind turbines in the Northeastern United States. PLOS ONE 15:1–22. Public Library of Science.

[290] Huso MMP, Conkling TJ, Dalthrop DH, Davis M, Smith H, Fesnock A, Katzner T. 2020. Bigger not necessarily better for wind turbines: Wildlife mortality scales with energy production. In review.

According to USFWS Land-Based Wind Energy Guidelines (2012),[291] DOI has adopted the National Research Council's 2004 definition of adaptive management, which states:

> Adaptive management promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity. It is not a 'trial and error' process, but rather emphasizes learning while doing. Adaptive management does not represent an end in itself, but rather a means to more effective decisions and enhanced benefits. Its true measure is in how well it helps meet environmental, social, and economic goals, increases scientific knowledge, and reduces tensions among stakeholders.

Further, the Supplement to the Draft EIS for the Vineyard Wind I project acknowledged that:

> Adaptive management could be used for many resources, particularly regulated fisheries and wildlife resources (including birds, benthic resources, finfish, invertebrates, essential fish habitat, marine mammals, and sea turtles), which would be closely monitored for potential impacts. *If data collected are sufficiently robust, BOEM or other resource agencies could use the information obtained to support potential regulation changes, or new mitigation measures for future projects.*[292]

The Draft EIS for the South Fork stated:

> BOEM worked with USFWS to develop standard operating conditions for commercial leases and as terms and conditions of plan approval and are intended to ensure that the potential for adverse impacts on birds is minimized. The standard operating conditions have been analyzed in recent EAs and consultations for lease issuance and site assessment activities, and BOEM's recent approval of the Virginia Offshore Wind Technology Advancement Project (BOEM 2016a). Some of the standard operating conditions originated from best management practices in the ROD for the 2007 Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf (MMS 2007:Section 2.7). BOEM and USFWS work with the lessees to develop post-construction plans aimed at monitoring the effectiveness of measures considered necessary to minimize impacts to migratory birds with the flexibility to consider the need for modifications or additions to the measures.[293]

To provide regulatory certainty to lease applicants, the Draft EIS should explicitly outline protocols for monitoring, adaptive management, and mitigation.

The South Fork Draft EIS suggested the following minimization measures:

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[291] USFWS (2012). U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines. p. 8. Available at https://www.fws.gov/ecological-services/es-library/pdfs/WEG_final.pdf.
[292] VW1 SEIS, Table A-10 (emphasis added).
[293] SFWF DEIS, Table H-40.

> Install bird deterrent devices (including painting a turbine blade black [May et al. 2020]) to minimize bird attraction to operating turbines and on the offshore substations (OSSs), where appropriate and where DWSF determines such devices can be employed safely...The SFWF wind turbine generators (WTGs) would be widely spaced apart allowing bird species to avoid individual WTGs and minimize risk of potential collision.[294]

While painting turbines black is an admirable action, the proposed action was hardly a commitment. Additionally, the referenced study by May et al. (2020) suggests that the efficacy of this deterrent requires further study.[295] Should BOEM make this a requirement, this could provide an excellent opportunity to institute adaptive management—studying the efficacy of black turbine blades in reducing collisions in order to inform best management at future wind farms. Painting a blade black to reduce motion smear is likely to be more effective for birds active during daylight hours compared to nocturnally active ones (*e.g.*, nocturnal migrants and nocturnally foraging terns).

As we have addressed previously, widely spacing turbines is not a minimization strategy, as there is little evidence to suggest that turbine spacing reduces risks to birds. However, this too could provide an opportunity to learn from this management practice and adapt management for future wind developments from this knowledge.

Instituting adaptive management, using the two strategies above as examples, will require robust collision monitoring. As we have noted in this document and in other letters to BOEM, collecting bird carcasses is an inadequate method for estimating collisions in the offshore environment. Instead, collision monitoring will need to use technology from which we can rapidly learn the variables contributing to collision risk and adjust management accordingly—including informed curtailment strategies as necessary.

The framework for adaptive management should include operational adjustments that are reasonable and cost effective and include advances in detection and avoidance technology. For example, the adaptive management framework should include smart curtailment to contain reasonable loss of energy production, seasonal adjustments based on mortality data as needed to compare with defined thresholds, and other operations that are proven to be effective in case of a rare event of mortality of a significant species or number of birds. These are practices used in adaptive management at some onshore wind facilities and in European Union offshore wind facilities. There are systems currently in operation that provide data and early warning thresholds to wind farm operators and commercial and military airfields that feed into operational curtailment. Their incorporation into the leasing process early will permit BOEM to require their adoption as new technologies become available.

An adaptive management framework requires a level of coordination and commitment that goes well beyond the Project under consideration. BOEM and USFWS must commit to providing a structure that ensures this across the offshore wind landscape.

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[294] *Id.*, Table G-1.

[295] May R, Nygård T, Falkdalen U, Åström J, Hamre Ø, Stokke BG. 2020. Paint it black: Efficacy of increased wind turbine rotor blade visibility to reduce avian fatalities. Ecology and Evolution n/a. Available from https://onlinelibrary.wiley.com/doi/abs/10.1002/ece3.6592 (accessed August 24, 2020).

11. Compensatory Mitigation for Birds

Compensatory mitigation is another tool that should be used to offset adverse impacts of the Project.

Given the current technology, there are no viable options for effectively minimizing the impacts of developing the Project to the extent needed to protect birds from harmful and long-term impacts. Furthermore, migratory birds pose significant conservation challenges, as many originate from other regions and actions to increase their populations require significant investment of time and resources to restore equivalent habitat. The breadth of species potentially affected, and the migratory nature of these species will require environmental compensatory mitigation.

The number of birds affected is uncertain due to the lack of available technology to accurately measure impacts (*e.g.*, collisions) on a species level or the fate of those birds after a collision event (*e.g.*, injury, morbidity, or mortality). We further note that, as discussed above, the agencies still have conservation obligations under frameworks, including ESA and MBTA. Based on studies of ESA listed species alone (discussed above), it seems likely that birds protected by federal laws will be killed in collisions with turbines under the currently anticipated industry build-out scenario. As such, compensatory mitigation should be provided for bird mortality resulting from development of the Project and other offshore wind development, and particularly for species of conservation concern.

Directed mitigation can result in meaningful beneficial outcomes. For example, the Montrose restoration, a $63 million mitigation package compensated for migratory seabirds in Mexico, efforts in part which led to the recovery and delisting of Pacific Brown Pelican.[296]

Mitigation more effectively compensates for impacts when conducted on a project and population-specific basis. This model is encouraged for offshore wind energy development impacts. However, if a project-by-project approach proves difficult to operationalize, a compensatory mitigation fund could be developed and administered by trustees of federal agencies. Following the model of other forms of development, this would most appropriately be funded by the developers whose actions are resulting in the impacts, with funding amounts based on likely or actual impacts (*see* below).

Quantifying compensatory mitigation for birds should initially be based on a generous estimate of the number of birds that could be killed in collisions with turbines, including ESA listed species and nocturnal migrants. Evaluating mitigation necessary to effectively compensate for these losses should utilize resource equivalency analysis, which accounts for the fact that birds at different life stages do not functionally equate in conservation importance (*e.g.*, one additional hatchling does not functionally replace a breeding adult bird). This approach has been used extensively for addressing bird losses resulting from losses of birds to oil spills and contaminants in California. For example, under NEPA, the Damage Assessment and Restoration Plan / Environmental Assessment for the Luckenbach Spill called for a number of mitigation projects to compensate for the losses of migratory birds in distant countries where those species originate, such as Mexico, Canada and New Zealand, in the amount of $21M.[297]

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[296] Endangered and Threatened Wildlife and Plants; Removal of the Brown Pelican (Pelecanus occidentalis) From the Federal List of Endangered and Threatened Wildlife, 74 Fed. Reg. 59444 (November 17, 2009). https://www.federalregister.gov/documents/2009/11/17/E9-27402/endangered-and-threatened-wildlife-and-plantsremovalof-the-brown-pelican-pelecanus-occidentalis.

[297] Luckenbach Trustee Council. 2006. S.S. Jacob Luckenbach and Associated Mystery Oil Spills Final Damage Assessment and Restoration Plan/`Environmental Assessment. Prepared by California Department of Fish and

Quantities and supporting analyses should be re-evaluated as collision monitoring data become available and additional mitigation provided as necessary.

Compensatory mitigation requirements under the ESA were essentially ignored by the previous administration. We urge the current administration to observe compensatory mitigation requirements for species currently listed and under listing consideration for the ESA which may be impacted by offshore wind development: Piping Plover, Red Knot, Roseate Tern, and Black-capped Petrel.

Seabirds are long lived and have delayed maturity and low fecundity. This life history means that adult survival is the main driver of population change. Mortality from offshore wind energy development is likely additive and, if skewed to breeding adults, will likely have a greater potential to drive declines in population trajectories. These unique life-history traits require a substantial and long-term commitment to reach the offset needed. Given that compensatory mitigation is time-consuming from concept to success, we urge the developers and agencies to commit to this and initiate action as soon as possible.

H. Impacts to Bats

Little data exist on bats and offshore wind energy, although research has shown that bat fatalities are common at land-based wind facilities[298] with the potential for cumulative impacts to cause population-level declines.[299] How bats use the offshore environment is not well understood, although a report prepared by Peterson et al. (2016)[300] for DOE found that bats were present at all surveyed locations in the Mid-Atlantic, Gulf of Maine, and Great Lakes, with bats detected up to 130 km (70.2 nautical miles) from the mainland. Therefore, BOEM should be conservative in its analysis, as bats are present in Empire Wind's lease area[301] and a lack of available information on impacts to bats from offshore wind does not indicate impacts are unlikely.

We applaud Empire Wind for sharing their bat acoustic survey data and encourage BOEM to require developers and their consultants to follow suit and share all monitoring data and additionally submit all bat acoustic data to the Bat Acoustic Monitoring Portal, BatAMP.[302] However, the analysis in the COP overly relies on this acoustic survey data to conclude that risk to bats is limited, which, as discussed below, likely underestimates potential impacts. Further, BOEM should not base its risk assessment for bats on low acoustic activity offshore because, at land-based wind facilities, pre-

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Game, National Oceanic and Atmospheric Administration, United States Fish and Wildlife Service, National Park Service.

[298] Arnett, Edward B., and Erin F. Baerwald. (2013). "Impacts of Wind Energy Development on Bats: Implications for Conservation." In Bat Evolution, Ecology, and Conservation, 435–56. New York, NY: Springer New York. https://doi.org/10.1007/978-1-4614-7397-8_21.

[299] Frick, W. F., E. F. Baerwald, J. F. Pollock, R. M. R. Barclay, J. A. Szymanski, T. J. Weller, A. L. Russell, S. C. Loeb, R. A. Medellin, and L. P. Mcguire. (2017). "Fatalities at Wind Turbines May Threaten Population Viability of a Migratory Bat." Biological Conservation 209: 172–77. https://doi.org/10.1016/j.biocon.2017.02.023; Population-Level Risk to Hoary Bats Amid Continued Wind Energy Development: Assessing Fatality Reduction Targets Under Broad Uncertainty. EPRI, Palo Alto, CA: 2020. 3002017671.

[300] Peterson, Trevor S, Steven K Pelletier, and Matt Giovanni. (2016). "Long-Term Bat Monitoring on Islands, Offshore Structures, and Coastal Sites in the Gulf of Maine, Mid-Atlantic, and Great Lakes—Final Report." Topsham, ME, USA. Prepared for the U.S. Department of Energy.

[301] *See* EOW COP, Appendix R.

[302] https://batamp.databasin.org/

construction bat activity surveys are a poor predictor of post-construction fatalities[303] and low levels of bat calls do not indicate bats are not present.[304]

As discussed in detail below, the COP does not adequately analyze the potential impacts to bats from the operations of Empire Wind. The Draft EIS must address population-level, cumulative impacts to bat populations from Empire Wind, other offshore wind developments expected in the Atlantic OCS, and terrestrial development in the reasonably foreseeable future. Recognizing that much remains unknown regarding the impacts to bats from offshore wind in the United States, BOEM's evaluation of the Project in the Draft EIS must be based on an explicitly defined monitoring and adaptive management plan. This plan must include a commitment to sufficient standardized monitoring before construction and during operation and commit Empire Wind to using improved technology as it is developed to adequately evaluate impacts. Most importantly, the adaptive management plan must outline a strategy to employ adequate mitigation measures, based on the impacts observed through monitoring efforts. In this manner, the Draft EIS can account for the reasonably foreseeable impacts of the Project and commit to addressing those impacts. Further, BOEM should incorporate best monitoring and management practices into a regional adaptive management plan to adequately measure and mitigate cumulative impacts to bats from offshore wind developments expected across the Atlantic OCS for the reasonably foreseeable future.

1. BOEM Should Incorporate Available Motus Wildlife Tracking System Data into Their Analysis

Although more tracking and acoustic monitoring studies are needed, there is increasing evidence that bats do regularly use the offshore environment. BOEM should leverage new information on bat presence offshore, including data submitted to the Motus Wildlife Tracking System,[305] an international network of researchers using coordinated automated radio-telemetry arrays to study small flying organisms' movements, including bats (this system is also discussed above in Section G, Impacts to Birds). Motus contains data on bat movements, including along the Atlantic coast, which could inform which species need to be considered in BOEM's analyses. Even though there are currently relatively few tagged bats included in Motus, the existing data indicate potential bat use offshore in and around the Empire Wind lease area (Figure 1).

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[303] Solick, D., Pham, D., Nasman, K., Bay, K. (2020). Bat Activity Rates do not Predict Bat Fatality Rates at Wind Energy Facilities. Acta Chiroptera, 22(1); Hein, C. D., Gruver, J., & Arnett, E. B. (2013). Relating pre-construction bat activity and post-construction bat fatality to predict risk at wind energy facilities: a synthesis. A report submitted to the National Renewable Energy Laboratory. https://tethys.pnnl.gov/sites/default/files/publications/Pre- Post-construction Synthesis_FINAL REPORT.pdf.

[304] Corcoran, A.J., Weller, T.J. (2018). Inconspicuous echolocation in hoary bats (*Lasiurus cinereus*). Proceedings of the Royal Society B, 285: 20180441.

[305] Bird Studies Canada. 2018. "Motus Wildlife Tracking System." 2018. https://motus.org/.

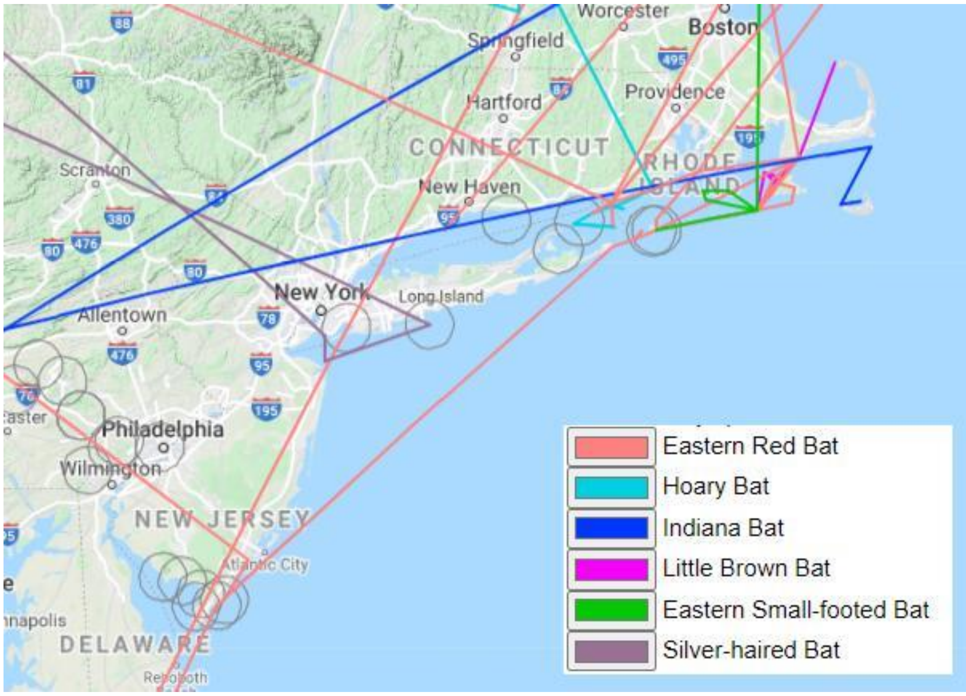

Figure 1: The colored lines indicate paths of tagged bats in Motus, with each color representing a different species. Flight paths are created from at least 3 consecutive tag bursts at a single location. Image is a screen capture from Motus (accessed July 11, 2021).

2. BOEM Should Consult with USFWS About Including the Indiana Bat in Analyses of Affected Biological Resources

The COP does not include the federally endangered Indiana bat (*Myotis sodalis*) in its analysis because it claims that the Indiana bat is not believed to be found near the Project.[306] However, in 2015, a tagged Indiana bat was tracked making a potential cross-water flight over Long Island Sound (*see* flight path in Figure 1).[307] Given the proximity of this detection to Empire Wind and the cross-water movements made by the tagged bat (between Cape Cod and Nantucket and potentially over water on its path between Indiana and Cape Cod), the COP should be revised to consider potential impacts to Indiana bats. BOEM should consult with USFWS about potential impacts to Indiana bats and these impacts should be analyzed in the Draft EIS.

Additionally, Indiana bat calls can be difficult to distinguish from those of certain other *Myotis* species,[308] and *Myotis* calls may be classified as "high frequency, unknown species" during acoustic surveys,[309] so it

[306] EOW COP, Appendix R, p. R-5.

[307] The tagged Indiana bat tracked across Long Island Sound is labeled as "Indiana Bat 2403" in Motus and was detected on September 20, 2015; Bird Studies Canada 2018.

[308] Fraser, E. E., Silvis, Alexander., Brigham, M. R., & Czenze, Z. J. (2020). Bat Echolocation Research: A handbook for planning and conducting acoustic studies. *Second Edition*; Britzke, E. R., Murray, K. L., Heywood, J. S., & Robbins, L. W. (2002). Acoustic identification. *The Indiana Bat: Biology and Management of an Endangered Species*, 221–225; *See* also Peterson et al. 2016, where the authors used a single identification ("MYSP" for *Myotis* species) to cover bat calls offshore that could potentially belong to little brown bats, northern long-eared bats, eastern small-footed bats, and Indiana bats

[309] EOW COP, Appendix R, p. R-15.

is inappropriate to dismiss the possibility of Indiana bats occurring in the Empire Wind lease area just because no bat calls were positively identified as belonging to an Indiana bat.[310]

3. Potential Impacts to Cave-hibernating Bats, Including the Federally-listed Northern Long-eared Bat, from Offshore Components of the Project Must Be Assessed

The Empire Wind COP indicates that cave-hibernating *Myotis* bats are not expected to be present in the Lease Area and therefore risk to these bats from project operations is low. The COP makes this determination based on two inaccurate claims, that (1) in the Mid-Atlantic, *Myotis* bat species have never been detected further than 11.5 km offshore,[311] and (2) cave-hibernating bats are rarely observed offshore.[312]

Peterson et al. (2016) detected *Myotis* calls at several Mid-Atlantic sites further offshore than 11.5 km, including at the Chesapeake Light Tower in Virginia, 24.8 km from the mainland.[313] Furthermore, bat calls classified as high frequency, unknown species were detected as far as 130 km offshore. While it is not possible to attribute these unknown calls to species, high frequency, unknown species calls can include *Myotis* species. Notably, 22.8% of all bat passes detected in acoustic surveys conducted for Empire Wind were classified as high frequency, unknown species.[314] Although the COP dismisses these calls as likely eastern red bat (*Lasiurus borealis*) calls, given the paucity of data about how bats use the offshore environment, it is inappropriate to assume that none of these high frequency, unknown species calls belong to *Myotis* bats[315] and that *Myotis* are not present in the Project Area.

Furthermore, cave-hibernating bats may be found offshore more frequently than the COP's assessment implies. Acoustic survey efforts in the Mid-Atlantic identified *Myotis* calls at 63% of sites surveyed and *Myotis* species were present at 89% of sites surveyed across the Gulf of Maine, Mid-Atlantic, and Great Lakes.[316] Motus data also indicate that Indiana bats, little brown bats (*M. lucifugus*), and eastern small-footed bats (*M. leibii*)—all cave-hibernating bat species—have made cross-water flights north of the Project Area (*see* Figure 1).[317]

The presence of the federally threatened northern long-eared bat (*M. septentrionalis*) on both Martha's Vineyard and Nantucket indicates that this species can cross open water and the species has been tracked making long distance flights over water in the Gulf of Maine.[318] Furthermore, a northern long-eared bat was acoustically detected 34 km offshore around South Fork Wind Farm.[319] Although Empire

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[310] *Id.*
[311] EOW COP, p. 5-85.
[312] EOW COP, p. 5-84.
[313] Peterson et al. 2016, Appendix A.
[314] EOW COP, Appendix R, p. R-8.
[315] EOW COP, Appendix R, p. R-15.
[316] Peterson et al. 2016.
[317] Bird Studies Canada 2018; *See also* Dowling, Zara D. 2018. "Not Gone with the Wind: Addressing Effects of Offshore Wind Development on Bat Species in the Northeastern United States. Chapter III: Flight activity and offshore movements of nano-tagged bats on Martha's Vineyard." University of Massachusetts Amherst, PhD Dissertation; Dowling, Z., P. R. Sievert, E. Baldwin, L. Johnson, S. von Oettingen, and J. Reichard (2017). Flight Activity and Offshore Movements of Nano-Tagged Bats on Martha's Vineyard, MA. OCS Study BOEM 2017-054. U.S. Department of the Interior, Bureau of Ocean Energy Management, Sterling, VA. 39 pp.
[318] Bird Studies Canada 2018.
[319] Revolution Wind Farm (RWF) COP at 4.3.7.1, p. 516.

Wind's COP claims that the use of the Lease Area by northern long-eared bats "is unlikely, resulting in very limited risk,"[320] this claim is not justified given the presence of northern long-eared bats offshore on the OCS coupled with the quantity of high frequency, unknown species calls within the Project Area that could, potentially, be from northern long-eared bats. BOEM should consult with USFWS about potential impacts to northern long-eared bats from the offshore components of Empire Wind and the Draft EIS should assess potential impacts of the offshore components of the project on northern long-eared bats and other cave-hibernating bats.

4. Seasonal Use of the Project Area by Migratory Tree Bats Does Not Imply Low Impact

Empire Wind's COP emphasizes the seasonal use of the offshore environment by migratory tree bats,[321] and acknowledges that there is "some risk apparent during fall migration."[322] When preparing the Draft EIS, BOEM should note that the best available science on bats and wind energy interactions from both land-based wind energy in North America and from offshore wind energy in Europe suggest that seasonal-only exposure can still present significant risk to bats.

The majority of migratory tree bats fatalities from land-based wind energy occur during the spring and fall migration period.[323] Despite this predominantly seasonal exposure, demographic modeling for hoary bats (*Lasiurus cinereus*), the bat species most frequently killed by land-based wind turbines in North America, shows that the 2014 land-based wind energy build out is sufficient to cause a 90% decline in hoary bat populations over the next 50 years—population-level declines that could occur during the lifetime of Empire Wind—and these declines are associated with a 22% risk of extinction if widespread mitigation measures are not adopted.[324] Although this research focused on hoary bats, the study authors caution that other migratory tree bats, such as eastern red bats and silver-haired bats (*Lasionycteris noctivagans*) which also experience high levels of fatalities at land-based wind facilities, might also experience population-level declines. This is of particular note as the 2018 acoustic survey for Empire Wind found that 70% of all detected bat passes belonged to eastern red and silver-haired bats.[325]

Although no hoary bats calls were recorded within the Lease Area in the 2018 survey,[326] the COP's suggestion that Empire Wind's operations will be "very low risk to this species"[327] may not be correct. In the 2018 survey, 3.6% of all bat passes were categorized as unidentified, low frequency calls. Although these calls could have originated from big brown bats (*Eptesicus fuscus*) or silver-haired bats, it is possible they could be hoary bat calls. Furthermore, hoary bats have been shown to travel without echolocating, indicating that a lack of recorded hoary bat calls does not necessarily mean hoary bats

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[320] EOW COP, p. 5-91.
[321] EOW COP, p. 5-89 and 5-95.
[322] EOW COP, p. 5-95.
[323] Arnett, E. B., Brown, W. K., Erickson, W. P., Fiedler, J. K., Hamilton, B. L., Henry, T. H., Jain, A., Johnson, G. D., Kerns, J., Koford, R. R., Nicholson, C. P., O'Connell, T. J., Piorkowski, M. D., & Tankersley, R. D. (2008). Patterns of Bat Fatalities at Wind Energy Facilities in North America. *Journal of Wildlife Management*, *72*(1), 61–78. https://doi.org/10.2193/2007-221; Arnett, Edward, Manuela Huso, Michael Schirmacher, and John Hayes. 2011. "Altering Turbine Speed Reduces Bat Mortality at Wind- Energy Facilities." *Frontiers in Ecology and the Environment* 9 (4): 209–14. https://doi.org/10.1890/100103.
[324] Frick et al. 2017.
[325] EOW COP, p. 5-89.
[326] EOW COP, p. 5-95.
[327] *Id.*

are not present.[328] Recent research that documented inconspicuous echolocation in hoary bats only detected normal hoary bat calls on 6 out of 79 flights,[329] whereas other bat species that passed the acoustic detectors were always recorded echolocating.

Limited research does support that migratory tree bats are less prevalent over the OCS than land and their presence seems to decrease with distance from shore,[330] but these species may be more common in Empire Wind's Project Area than the COP implies. In offshore bat surveys of the Great Lakes, Gulf of Maine, and Mid-Atlantic, migratory tree bats were widespread, with eastern red bats detected at 97% of all surveyed sites (and 100% of sites in the Mid- Atlantic), including the most remote fixed site (41.6 km from mainland) and potentially on shipboard surveys over 100 km offshore.[331] Eastern red bats alone accounted for 40% of all detected bat activity offshore. Hoary bats and silver-haired bats had less total activity offshore but were still widespread, found at 95% and 89% of all sites, respectively.[332] Data in Motus also indicate eastern red bats and hoary bats have made cross-water flights near Cape Cod (*see* Figure 1).[333]

Furthermore, seasonal exposure of Nathusius's pipistrelle (*Pipistrellus nathusii*) to expected build out of turbines in the North Sea during their late summer/autumn migration was considered sufficient exposure as to affect Nathusius's pipistrelle populations, triggering operational curtailment measures between August 15 and October 1.[334] This further belies claims that seasonal exposure of bats precludes significant impacts.

With limited research available on bats offshore, BOEM must consider the evidence from land-based wind and assess the potential that seasonal interactions with offshore wind turbines could cause significant impacts on migratory tree bats.

5. BOEM's Risk Analysis Must Account for Likely Attraction by Bats to Offshore Wind Turbines

Bats, especially migratory tree bat species like the eastern red, hoary, and silver-haired bats, are believed to be attracted to land-based wind turbines[335] and have been recorded altering flight paths to

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[328] Corcoran and Weller 2018.

[329] *Id*. Note than for 34 of the 79 hoary bat flights, the authors recorded a previously undocumented type of low energy, "micro" call which require closer distances to microphones to detect.

[330] Peterson et al. 2016.

[331] Calls were identified to the eastern red bat/tri-colored bat/evening bat frequencies on shipboard surveys 129 km offshore in the Mid-Atlantic. Peterson et al. 2016.

[332] *Id.*

[333] Bird Studies Canada 2018.

[334] Boonman, M. (2018). Mitigation measures for bats in offshore wind farms: Evaluation and improvement of curtailment strategies.

[335] Cryan, Paul M., P. Marcos Gorresen, Cris D. Hein, Michael R. Schirmacher, Robert H. Diehl, Manuela M. Huso, David T. S. Hayman, et al. 2014. "Behavior of Bats at Wind Turbines." *Proceedings of the National Academy of Sciences of the United States of America*. National Academy of Sciences. https://doi.org/10.2307/43189889; Cryan, P. M., & Barclay, R. M. R. (2009). Causes of Bat Fatalities at Wind Turbines: Hypotheses and Predictions. *Journal of Mammalogy*, *90*(6), 1330–1340. http://www.jstor.org/stable/27755139; Arnett et al. 2008; Horn, J. W., Arnett, E. B., & Kunz, T. H. (2008). Behavioral Responses of Bats to Operating Wind Turbines. Source: The Journal of Wildlife Management, 72(1), 123–132. https://doi.org/10.2193/2006-465; Kunz, T. H., Arnett, E. B., Erickson, W. P., Hoar, A. R., Johnson, G. D., Larkin, R. P., Strickland, M. D., Thresher, R. W., & Tuttle, M. D. (2007).

approach turbines.[336] Although no scientific consensus exists on why bats are attracted to onshore wind facilities, theories include that bats may perceive turbines as trees to roost in and bats may seek insect prey that congregate near turbines.[337] This attraction behavior puts bats at increased risk for collision with turbine blades and whether such behavior could occur at offshore wind turbines merits careful consideration.

The COP acknowledges that bats are likely to be attracted to wind farm structures.[338] Further, that bats have been found roosting aboard support vessels during the construction of Block Island Wind Farm is suggestive that presence of artificial roosting structures may prove attractive to bats in the offshore environment.[339] Although more research is needed to characterize how bats are using the Project Area and the OCS, it would be reasonable to assume that bats—particularly migratory tree bat species that seem to be attracted to land-based wind turbines—may experience a similar attraction to turbines offshore and that these turbines might be particularly attractive due to representing sparse resources, which could put bats at increased risk for collision. If offshore wind turbines are attractive to bats, the impact assessment in the COP, which relies heavily on bat surveys in the absence of turbine structures, may dramatically underestimate risk. When preparing the Draft EIS, BOEM should account for bats' potential attraction to, and increased risk of collision with, offshore wind turbines and should not rely on bat avoidance of turbine structures to minimize impacts.

6. BOEM Cannot Assume that Fewer, Larger Turbines Reduce Risks to Bats

In Empire Wind's PDE, the design scenario with higher numbers of smaller capacity turbines (vs. fewer, larger turbines) is considered to have the greatest impacts on bats.[340] Although no research has been done on tower height and bat fatalities in the offshore environment, research onshore has shown that bat mortality may increase with tower height,[341] meaning that development approaches that favor fewer, larger turbines could be detrimental to bats.[342] A study on northwestern European wind facilities

Ecological Impacts of Wind Energy Development on Bats: Questions, Research Needs, and Hypotheses. In Ecology and the Environment (Vol. 5, Issue 6).; Ahlén, I. (2003). Wind turbines and bats-a pilot study.

336 Cryan et al. 2014.

337 *Id.*

338 EOW COP, p. 5-95.

339 RWF COP at 4.3.7.2, p. 420.

340 EOW COP, p. 5-92. Note that this volume of the COP uses 240 x 10 MW turbines as the maximum design scenario, as volume 2 of the COP has yet to be updated to reflect updates to the PDE that used 174 x 12 MW turbines as the maximum design scenario.

341 Barclay, Robert M.R., E.F. Baerwald, and J.C. Gruver. 2007. "Variation in Bat and Bird Fatalities at Wind Energy Facilities: Assessing the Effects of Rotor Size and Tower Height." *Canadian Journal of Zoology* 85 (3): 381–87. https://doi.org/10.1139/Z07-011; Rydell, Jens, Lothar Bach, Marie-Jo Dubourg-Savage, Martin Green, Luisa Rodrigues, and Anders Hedenström. 2010. "Bat Mortality at Wind Turbines in Northwestern Europe." *Acta Chiropterologica* 12 (2). Museum and Institute of Zoology at the Polish Academy of Science: 261–74. https://doi.org/10.3161/150811010X537846.

342 A meta-analysis by Thompson et al. 2017 found no relationship between turbine height and bat fatalities, but cautioned that research was needed to understand how turbines in excess of 140 m in height might affect bat fatalities. Given this, it is inappropriate to rely on this research to support statements that fewer, larger turbines would reduce bat fatalities. Thompson, M., J.A. Beston, M.Etterson, J.E. Diffendorfer, S.R. Loss. 2017. "Factors associated with bat mortality at wind energy facilities in the United States." *Biological Conservation* 215: 241-245.

found that bat fatalities increased with tower height and rotor diameter[343] and a meta-analysis of North American wind facilities found that bat fatalities increased exponentially with tower height (although this study did not find that rotor diameter affected fatalities).[344] Insufficient data exist to determine where (if any) a tradeoff exists between decreasing the number of towers vs. increasing their height, but current research does not support the claim that fewer, larger turbines would have decreased impacts on bats. Therefore, the Draft EIS should note the scientific uncertainty surrounding the degree to which bat mortality may increase with tower height and should adjust the language accordingly regarding bat impacts.

7. Bat Risk Offshore is Likely Greater than Characterized in the COP

For the reasons discussed above, the COP does not adequately reflect the risk to bats offshore. Cave-hibernating bats are found more often and further offshore than described, seasonal exposure to WTGs does not preclude serious impacts, and bats may be attracted to offshore wind facilities, thereby increasing the likelihood of collisions. The measures outlined in the COP are inadequate to monitor and, if necessary, mitigate impacts to bats.

Determining risk and adaptively managing to minimize impacts relies on monitoring, but traditional fatality monitoring is not feasible offshore. Given the challenges of conducting fatalities assessments at offshore sites,[345] many dead or injured bats would most likely go unrecorded, either falling into the water or becoming prey to marine scavengers or predators.[346] BOEM's assessment of the impacts to bats should, therefore, be conservative, and employ the best available scientific methods, such as autodetection, acoustic monitoring at nacelle height, targeted tagging of bats, and thermal imaging technology. BOEM should also support research into monitoring methods for bats that are better suited to the offshore environment.

8. Cumulative Impact Analysis for Bats

Because there is so little research on bats offshore, impacts to bats are often only given cursory consideration. However, bat species on the east coast are facing stressors on land that may make their populations more vulnerable to additional take offshore. The northern long-eared bat and the Indiana bat are listed as threatened and endangered under the ESA due, in part, to high rates of mortality from white-nose syndrome, a highly pathogenic fungus. USFWS was recently ordered by a federal court to determine whether the northern long-eared bat warrants listing as an endangered species under the ESA by December 2022, after remanding the agency's threatened listing in 2020.[347]

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[343] Rydell et al. 2010.

[344] Barclay et al. 2007.

[345] Kunz, T.H., Arnett, E.B., Cooper, B.M., Erickson, W.P., Larkin, R.P., Mabee, T., Morrison, M.L., Strickland, M.D., and Szewczak, J.D., "Assessing impacts of wind energy development on nocturnally active birds and bats: a guidance document," Journal of Wildlife Management, vol. 71, pp. 2449-2486 (2007); Rydell, J., Bach, L., Dubourg-Savage, M., Green, M., Rodrigues, L., and Hedenstrom, A., "Bat mortality at wind turbines in northwestern Europe." Acta Chiropterologica, vol. 12, pp. 261–274 (2009).

[346] Assessing bat fatalities based on carcasses found on vessels and structures is unlikely to provide a meaningful estimate of bat fatalities, as carcasses can fall far from the wind turbine, based on carcass size, wind speed, turbine height, and other factors. We recommend BOEM consult with Manuela Huso, Research Statistician at United States Geological Survey Forest and Rangeland Ecosystem Science Center prior to making any inferences about total fatalities based on carcasses recovered from structures.

[347] Ctr. for Biological Diversity v. Everson, 435 F. Supp. 3d 69 (D.D.C. 2020).

Similarly, numerous other east coast bat species, such as the Indiana bat, little brown bat, eastern small-footed bat, big brown bat, and tri-colored bat (*Perimyotis subflavus*) are affected by white-nose syndrome. Due to white-nose syndrome mortality, the USFWS recently issued a positive 90-day finding for the petition to list the tri-colored bat[348] and USFWS staff have communicated their intent to assess the little brown bat for potential ESA-listing.[349]

The three migratory bat species on the east coast, the silver-haired, eastern red, and hoary bat, are the bat species most highly impacted by land-based wind energy development, representing almost 80% of all bats killed at wind facilities in North America.[350] Recent research[351] has implicated wind energy as causing potential population-level declines for hoary bats, and hoary bats and eastern red bats are expected to be recommended for listing in Canada in the near future. Other east coast bat species, such as little brown bats, tri-colored bats, big brown bats, northern long-eared bats, Seminole bats (*Lasiurus seminolus*), and Indiana bats have also been documented killed by wind turbines.[352]

Because of these existing stresses on bat species, accurately accounting for how offshore wind could affect their populations is critical. When conducting the cumulative impacts analysis for the Draft EIS, BOEM must include (i) the best available science (such as Motus data), (ii) that cave-hibernating bats are likely more common offshore than the COP represents, (iii) that seasonal use of the offshore environment by migratory bats does not imply low exposure and low impact, (iv) bats are likely attracted to wind turbines, and that (v) larger turbines may kill more bats than smaller turbines.

a) The Geographic Scope for Cumulative Bat Impacts used by BOEM in Previous Analyses Is Inappropriate and Relies on an Unsupported Claim about Bat Movements

In previous NEPA analyses, the Geographic Analysis Area for cumulative impacts to bats was defined as 100 mi offshore and 5 mi inland.[353] The migratory movements of bats, especially migratory tree bats, are poorly understood, and many species of bats—both long-distance migrants like migratory tree bats but also cave-hibernating bats—are capable of flights in excess of 100 km, indicating that bats found offshore in wind development areas could also be found significant distances inland. Hoary bats, which are capable of long-distance flights over water,[354] have been recorded traveling distances over 1,000

[348] Endangered and Threatened Wildlife and Plants; 90-Day Findings for Five Species, 82 Fed. Reg. 60362, December 20, 2017. https://www.federalregister.gov/documents/2017/12/20/2017-27389/endangered-and-threatened-wildlife-and-plants-90- day-findings-for-five-species

[349] *See* National Domestic Listing Workplan Fiscal Years 2021-2025 (https://www.fws.gov/endangered/esa-library/pdf/National-Listing-Workplan-FY21-FY25.pdf) and Robyn Niver, USFWS, *personal communication* (2018).

[350] Hoary bats, eastern red bats, and silver-haired bats represent 38%, 22%, and 18% of all bat fatalities at wind turbines in the United States and Canada, respectively. Arnett, Edward B., and Erin F. Baerwald. 2013. "Impacts of Wind Energy Development on Bats: Implications for Conservation." In *Bat Evolution, Ecology, and Conservation*, 435–56. New York, NY: Springer New York. https://doi.org/10.1007/978-1-4614-7397-8_21.

[351] Frick et al. (2017); EPRI (2020).

[352] Arnett and Baerwald (2013).

[353] Vineyard Wind Draft EIS at A-6, Tbl A-1., (June 2020); SFWF DEIS, Table E-1, 86.

[354] Hoary bats have colonized the Hawaiian Islands from the mainland multiple times. Russell, A. L., Pinzari, C. A., Vonhof, M. J., Olival, K. J., & Bonaccorso, F. J. (2015). Two Tickets to Paradise: Multiple Dispersal Events in the Founding of Hoary Bat Populations in Hawai'i. PLOS ONE, 10(6), e0127912. https://doi.org/10.1371/journal.pone.0127912.

km[355] and are thought capable of migrations in excess of 2,000 km.[356] Research from Canada found that 20% of little brown bat movements exceeded 500 km,[357] which is further supported by data from tracked little brown bats, which shows individuals using both coastal areas and making long-distance flights to locations significantly further inland than 5 mi.[358] In addition to little brown bats, data in Motus tracks movements of individual silver-haired bats, eastern red bats, hoary bats, eastern small-footed bats, and Indiana bats from coastal areas on the east coast to areas in excess of 100 mi inland.[359] These movements seem to refute BOEM's assertion in previous NEPA analyses that bats that could be exposed to offshore wind energy projects would not be found far inland (and therefore exposed to land-based wind energy facilities) and instead support that a geographic scope of 100 mi inland is more appropriate.

BOEM should conduct a thorough review of the literature on bat migration and radio- and GPS-tagged bats and select a boundary that better reflects the potential habitat use of exposed bats for use in the Empire Wind Draft EIS (and other NEPA analyses). This revised boundary will likely require the cumulative impacts analysis to reflect that bats exposed to offshore wind projects are potentially exposed to multiple offshore wind facilities and land-based wind energy projects.

b) There Are Inadequate Data to Assess Cumulative Impacts to Bats from 22 GW of Offshore Wind Buildout

For the reasons discussed above, previous cumulative impacts assessments likely seriously underestimate risk to bats. While these comments provide some additional resources on bat movement offshore and bat interactions with wind turbines for BOEM to include in their analysis, there remains insufficient research on bats and offshore wind to accurately assess cumulative risk and impact from the 22 GW buildout scenario used in the Vineyard Wind 1 and South Fork NEPA analyses.

Because of this knowledge gap, it is imperative that BOEM require offshore wind facilities to commit to pre- and post-construction monitoring and to integrate novel technology for monitoring as it becomes available. Monitoring data must be made readily and promptly available to the public.

Although we now know that population-level impacts to bats are possible from land-based wind, these impacts to bats from onshore wind energy were not anticipated and were only discovered because of monitoring for avian impacts.[360] While post-construction monitoring should occur at the project-level, BOEM and their partner agencies should support coordinated and regional surveys of bat use of the OCS and WEAs. Should further monitoring and research efforts reveal that impacts to bats are non-negligible, BOEM and other agencies should support the development and deployment of minimization strategies and deterrent technologies.

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[355] Weller, T. J., Castle, K. T., Liechti, F., Hein, C. D., Schirmacher, M. R., & Cryan, P. M. (2016). First Direct Evidence of Long- distance Seasonal Movements and Hibernation in a Migratory Bat. Scientific Reports, 6(1), 1–7. https://doi.org/10.1038/srep34585.

[356] *Id.*

[357] Norquay, K. J. O., Martinez-Nuñez, F., Dubois, J. E., Monson, K. M., & Willis, C. K. R. (2013). Long-distance movements of little brown bats (Myotis lucifugus). Source: Journal of Mammalogy, 94(2), 506–515. https://doi.org/10.1644/12-MAMM-A-065.1

[358] Bird Studies Canada 2018.

[359] *Id.*

[360] Arnett et al. 2008.

The following is a list of recommendations for BOEM and its partner agencies to support successful understanding of offshore wind's impact on bats, modified and expanded upon from Peterson et al. (2016).[361] BOEM and its partner agencies should:

- Support supplemental field surveys for bats on the OCS, using similar methodology as described in Peterson et al. (2016).[362]
- Require acoustic detectors to be placed at nacelle height on a subset of turbines constructed along the Atlantic OCS and require that the data collected be made publicly available.
- Support research to determine whether it is possible to improve acoustic monitoring to enable better species identifications, such as being able to differentiate calls between the ESA-listed northern long-eared bat and other *Myotis* species.
- Support continued advances in radio telemetry equipment, nanotag transmitters, and GPS tags so that more bats can be tracked offshore (*e.g.*, support the development of smaller GPS tags with longer battery lives).
- Support deploying Motus towers and/or other nanotag receiving towers in the coastal and offshore environment, including on structures in WEAs.
- Support efforts to tag additional individual bats with nanotag transmitters and GPS tags.
- Support the development of bat monitoring technology for offshore WTGs, such as strike detection technology and thermal video.
- Support research on and testing of bat deterrent devices for offshore WTGs, such as ultraviolet lighting or ultrasonic noise emitters.
- Require offshore wind projects to support testing and deployment of best available monitoring and deterrent technologies, once developed.
- Require offshore wind projects to promptly report and make publicly available all monitoring and testing data.

The Draft EIS for Empire Wind should specifically include the adoption of monitoring technologies when they are verified and commercially available as part of the Project's monitoring framework and protocol. BOEM should further support, fund, and encourage their development and testing at Empire Wind. The shared cost of development, testing, and implementation of these technologies across all lessees and with BOEM, if standardized, would avoid an undue economic burden on individual projects.

Many of the above listed recommendations are aimed at filling in knowledge gaps about bats' use of the offshore environment. These survey efforts will likely provide critical information about bats' use of the Project Area which will be necessary for effective mitigation. However, bat activity in the Project Area prior to turbine installation may not accurately predict bat fatalities during turbine operation. At land-based wind facilities, pre-construction bat activity surveys are poorly correlated with post-construction fatalities.[363] Because of this, the commitment to post-construction monitoring is critical to

[361] *See* Peterson et al. 2016, §5.
[362] Peterson et al. 2016.
[363] Solick, D., Pham, D., Nasman, K., Bay, K. (2020). Bat Activity Rates do not Predict Bat Fatality Rates at Wind Energy Facilities. Acta Chiroptera, 22(1); Hein, C. D., Gruver, J., & Arnett, E. B. (2013). Relating pre-construction bat activity and post-construction bat fatality to predict risk at wind energy facilities: a synthesis. A report

yielding a better understanding about how bats interact with offshore wind turbines. An important component to this will be programmatically supporting the tagging of individual bats, such as through Motus, requiring receiving towers in the WEA, and requiring installation of acoustic detectors, preferably at nacelle height.

Data on bat activity and calls within the rotor-swept zone of offshore WTGs would allow better understanding of which bat species are at risk and during what environmental conditions, which could inform mitigation measures. Because bat activity offshore seems to be predominantly restricted to warm, slow wind speed nights and is highly seasonal,[364] if bat minimization measures are needed and targeted curtailment is shown to be effective in the offshore environment, periods of operational curtailment could be restricted to these highest risk times to decrease loss in energy generation.

In addition to operational curtailment, it is possible that deterrent technologies to prevent bats from approaching wind turbines could be useful in minimizing bat fatalities offshore. Deterrent technologies are being developed for land-based turbines, including turbine coatings (to counteract any attraction to smooth surfaces which might be perceived as water),[365] ultraviolet lighting (which many bat species can see),[366] and ultrasonic noise emitters (to possibly 'jam' bats' radars and make wind facilities unappealing to bats).[367] One of the ultrasonic deterrent technologies, NRG Systems, has been commercially deployed at land-based wind facilities.[368] None of these technologies have been assessed yet in the offshore environment nor on turbines with such large swept areas, which may present a challenge for effective deterrent use offshore.

I. Impacts from Cable Landing Routes

1. BOEM Must Consider the Environmental Impacts from the Empire Wind 2 Cable Landing Routes Proposed Through Sensitive Habitat

The Project's proposed cable landing on Island Park will impact the globally important West Hempstead Bay/Jones Beach IBA on Long Island. The COP incorrectly claims that Long Beach is not included in the

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submitted to the National Renewable Energy Laboratory. https://tethys.pnnl.gov/sites/default/files/publications/Pre- Post-construction Synthesis_FINAL REPORT.pdf.

364 EOW COP, p. 5-89, 5-95; RWF COP Appendix AA, 2.3.1, p. 27; Peterson et al. (2016). In their study, the majority of bat activity in the Gulf of Maine and the Mid-Atlantic occurred below 10 m/s average nightly wind speed and above ~7°C.

365 Texturizing Wind Turbine Towers to Reduce Bat Mortality DE-EE0007033, https://www.energy.gov/sites/prod/files/2019/05/f63/TCU%20-%20M17%20-%20Hale-Bennett.pdf (last visited Feb. 20, 2021).

366 NREL Wind Research, Technology Development and Innovation Research Projects https://www.nrel.gov/wind/technology-development-innovation-projects.html (last visited Feb. 20, 2021)

367 https://www.osti.gov/biblio/1484770; Weaver, S. P., Hein, C. D., Simpson, T. R., Evans, J. W., & Castro-Arellano, I. (2020). Ultrasonic acoustic deterrents significantly reduce bat fatalities at wind turbines. Global Ecology and Conservation, e01099. https://doi.org/10.1016/j.gecco.2020.e01099; Arnett, E. B., Hein, C. D., Schirmacher, M. R., Huso, M. M. P., & Szewczak, J. M. (2013). Evaluating the Effectiveness of an Ultrasonic Acoustic Deterrent for Reducing Bat Fatalities at Wind Turbines. PLoS ONE, 8(6), e65794. https://doi.org/10.1371/journal.pone.0065794.

368 https://news.duke-energy.com/releases/duke-energy-renewables-to-use-new-technology-to-help-protect-bats-at-its-wind-sites

IBA.[369] In reality, the IBA is characterized, in large part, by the barrier island beach (Long Beach and Lido Beach included) and surrounding saltmarsh. Despite being a heavily trafficked beach in the summer months, the IBA continues to provide essential habitat for nesting Piping Plover and American Oystercatcher. Saltmarsh and Seaside Sparrows rely on the saltmarsh for nesting. This IBA is the site for the most recent record of breeding Black Rail within the state of New York[370] and will likely provide critical habitat to restore this species' historic range. The saltmarsh provides important wintering and breeding habitat for American Black Duck and Brandt, both species in decline and under heavy management by the Atlantic Flyway Council. American Black Duck are also a High Priority Species of Greatest Conservation Need within the state of New York.[371] The IBA also serves as valuable habitat for wintering waterfowl and stopover and staging habitat for a variety of migratory songbirds and shorebirds.

In addition to sensitive avian species, the developer's consultation with USFWS reveals potential for the project to impact ESA-listed plants seabeach amaranth and sandplain gerardia. Seabeach amaranth provide important shade structure and camouflage for beach-nesting shorebirds, like Piping Plover, including their eggs and chicks. The plant also provides dune stability and is associated with habitat for other taxa, including tiger beetles and sea turtles. New York's remaining seabeach amaranth occurs only along the barrier island beaches of Long Island. Sandplain gerardia is associated with the nutrient poor, sandy soils of Hempstead Plain that may intersect with the Project's cable route beyond Long Beach. Only four populations remain in the state--all on Long Island. Given the limited range of both of these species, it is critical that the developer survey for the species prior to construction and avoid areas where the species are present. Neither seabeach amaranth or sandplain gerardia are easily propagated and transplanted. While propagation of sandplain gerardia is more commonly used as a recovery tool, the population within New York and across the species range are so limited that avoidance should be prioritized. In the case avoidance is impossible, we ask BOEM to require the developer to publish and fund long-term plans to propagate, establish, and manage these species in accordance with their USFWS species recovery management plans.

The Project study area also provides valuable intertidal and benthic habitat for various spawning fish and shellfish. Point Lookout and Hemstead provides an important site for horseshoe crabs to breed and lay eggs. The tidal flats of the salt marsh provide important habitat for sand lance and other forage fish, and beds for mussels, clams, oysters, and blue crab—all important sources of food for a variety of birds and other wildlife and valuable for maintaining water quality.

While the preferred route for the Island Park cable landing will likely avoid major impacts to this ecosystem, the developer has also proposed alternate routes which would have serious long-term impacts on Lido Beach and through the saltmarsh of the IBA.[372] The alternate routes are still under consideration by the developer. We ask that BOEM evaluate the environmental impacts of these routes as distinctly separate alternatives in the Draft EIS, and we encourage BOEM to use the developer's "preferred route" in the Preferred Alternative of the Draft EIS for this Project.

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[369] EOW COP, p. 5-63.

[370] McGowan, K. J., and K. Corwin, eds. 2008. The Second Atlas of Breeding Birds in New York State. Cornell University Press.

[371] New York State Department of Environmental Conservation. 2015. State Wildlife Action Plan. Accessed at https://www.dec.ny.gov/animals/7179.html. Updated 2015.

[372] EOW COP Fig. 2.1-7, p. 2-28.

2. BOEM Must Address Environmental Justice Issues Associated with the Cable Landing Routes

The areas proposed to be impacted by the cable landing routes are not only areas of ecological importance, but also densely developed areas and the environmental justice impacts of the cable landing must be addressed. BOEM should require Empire Wind to communicate with members of impacted communities on project planning. Encouraging local input from community members, stakeholders, and other potentially impacted groups will help to ensure the impacts on these communities are considered and mitigated.

To provide for greater engagement, BOEM should foster an open exchange with impacted communities and relevant federal and state officials beyond formal public meetings, including meetings where specific topics, data, and information can be discussed in greater detail. Meetings should occur at times and places that are convenient for affected parties, and next steps and opportunities to provide input should be clearly communicated. Translation needs should be assessed and provided as necessary. BOEM should continue to urge early participation and data sharing from all relevant and state agencies to improve coordination during all phases of planning, leasing, and development, including pre-planning discussions, to resolve potential conflicts upfront. We further recommend that BOEM consider providing a source of funds for local communities, as needed, to allow groups that may be stretched thin in terms of time and capacity to engage more deeply.

V. The Economic Impacts Associated with the Project and Future Growth in the Offshore Wind Industry Must Be Adequately Considered

BOEM must accurately estimate the economic impacts associated with the Project. A March 2020 study by the American Wind Energy Association, which analyzed the economic impacts from offshore wind, found that the industry is expected to invest $57 billion in offshore wind energy development, which is expected to contribute $25.4 billion in annual economic output and approximately 82,500 jobs by 2030 based on a high estimate of a 30 GW offshore wind build out.[373] We urge BOEM to closely examine the cumulative impact on demographics, employment, and economics to ensure that it properly reflects the vast potential of offshore wind to create jobs and economic opportunity while generating clean, renewable energy.

VI. Conclusion

We urge BOEM to move forward and prepare the Draft EIS for the Project, incorporating our recommendations in these comments. We also urge BOEM to undertake the broader suite of actions outlined in these comments to ensure that the United States' offshore wind industry as a whole advances in a responsible and sustainable manner.

[373] American Wind Energy Ass'n, *U.S. Offshore Wind Power Economic Impact Assessment* (March 2020) at 1, https://supportoffshorewind.org/wp-content/uploads/sites/6/2020/03/AWEA_Offshore-Wind-Economic-ImpactsV3.pdf.

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