

Environmental Mitigation Plan
for
the Empire Wind project
Version 1.0

Prepared Pursuant to

**Section 12.06 of the Offshore Wind Renewable Energy
Certificate Purchase and Sale Agreement by and Between the
New York State Energy Research and Development Authority
and Equinor Wind US LLC**

Albany, NY

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Links to project information:

Project website: www.empirewind.com

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1. Environmental Mitigation Plan Summary

1.1. Overall philosophy and principles

This section should describe the overall philosophy and principles the Developer will follow to avoid, minimize, restore, and off-set potential fisheries impacts.

- Equinor Wind believes that from the outset, measures to avoid or mitigate adverse environmental impacts, while maximizing the positive beneficial environmental impacts of an offshore wind energy project should be:
 - Identified and developed in consultation and coordination with the relevant stakeholders;
 - Based on robust baseline characterization that has been developed in consultation with relevant stakeholders;
 - Evidence based and founded on the latest science;
 - Where data gaps exist or the receptor-effect interactions are unknown, information gaps are satisfied through targeted data collection, monitoring and/or research;
 - Incorporated into spatial planning, for example project siting and design; and
 - Applied to how the project is implemented, for example surveys, construction methods and operations and maintenance activities.
- Equinor Wind recognizes the importance of adaptive management and will continue to evolve its procedures for the evaluation and mitigation of environmental resources.

1.2. Overall approach to incorporating data and stakeholder feedback

This section should describe how the Developer will use research, data, and stakeholder feedback to update the EMP and support decision-making throughout the life cycle of the project (pre-construction, surveys, site design, construction, operations, and decommissioning).

- Equinor Wind believes consultation and coordination with relevant stakeholders is important as a means of identifying potential risks or opportunities for sufficiently avoiding and mitigating environmental impacts.
- Equinor Wind has identified steps to consult with the relevant stakeholder groups to get feedback on plans, data, mitigation, and buy in on decisions in advance of the regulatory process – a “no surprises” approach.
- The EMP provides information on how potential impacts may be mitigated, with further mitigation measures to be developed in further consultation with the relevant stakeholder groups, including New York State Environmental Technical Working Group (“E-TWG”).

1.3. Existing guidance and best practices that will be followed

This section should present a list of existing guidance documents, publications, tools, and/or plans that will be followed to support the EMP. Include links, if available, for all references.

- Equinor Wind will follow the following guidance documents, updating the guidance documents list as appropriate:

- NOAA NMFS. 2018. 2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts, April 1, 2018. Available at: <https://www.fisheries.noaa.gov/resource/document/technical-guidance-assessing-effectsanthropogenic-sound-marine-mammal>
- BOEM. 2013c. Guidelines for Providing Information on Marine Mammals and Sea Turtles for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 C.F.R. Part 585 Subpart F. Available online at: https://www.boem.gov/uploadedFiles/BOEM/Renewable_Energy_Program/Regulatory_Information/BOEM_Renewable_MMandST_Guidelines.pdf . The guidance recommends that the NMFS EFH mapper tool (<http://www.habitat.noaa.gov/protection/efh/habitatmapper.html>) be used for species identification and habitat characteristics at any particular location (BOEM 2013a, page 4).
- BOEM. 2013b. Guidelines for Providing Information on Fisheries for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 C.F.R. Part 585. Fisheries Study Guidelines. Available at <https://www.boem.gov/Fishery-Survey-Guidelines/> .
- BOEM. 2013a. Guidelines for Providing Benthic Habitat Survey Information for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 C.F.R. Part 585. Available at https://www.boem.gov/uploadedFiles/BOEM/Renewable_Energy_Program/Regulatory_Information/Habitat%20Guidelines.pdf .
- BOEM. 2015. Guidelines for Providing Information on Fisheries Social and Economic Conditions for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 C.F.R. Part 585. October 20, 2015. Available at <https://www.boem.gov/Social-and-EconomicConditions-Fishery-Communication-Guidelines/> .
- BOEM 2017a. Guidelines for Providing Avian Survey Information for Renewable Energy Development on the Outer Continental Shelf. United State Department of the Interior – Bureau of Ocean Energy Management, Office of Renewable Energy Programs.

2. Communications and Collaboration Approach

2.1. Overview and communication plan objectives

This section should provide an overview of the communication plan and objectives and its importance in fisheries migration.

- Openness is a core value and cornerstone of Equinor Wind’s approach to engaging with and sharing data with stakeholders.
- Equinor Wind will approach project development towards the COP and other state and federal permits on a “no surprises” basis. This includes sharing project updates, plans, results and information regularly and at all stages of the project so that all relevant interested parties have had sufficient opportunities to input into these processes, while also being sensitive to the potential for stakeholder fatigue.

2.2. Communication officers/positions, responsibilities, and contact information

This section will provide a list of communication officers, their role, and name and contact information. The list should provide stakeholders with an understanding of who should be called for a particular issue or question. It will also include links to the project website so readers know where to find additional information.

Name/Title	Role/Responsibilities	Contact Information
Martin Goff; Head of Environment and Permitting for Equinor Wind US	Primary point of contact for the project on environmental matters. Overview of all Equinor Wind US projects. Lead E-TWG Representative	+1 202 813 7444 mgof@equinor.com
Julia Bovey Head of External Affairs	Point of contact for the project on environmental matters related and relevant to external communications. E-TWG Representative Support	+1 917 283 0198 jbov@equinor.com
Laura Morales Environment and Permitting Manager, Empire Wind	Secondary point of contact for the project on environmental matters. Responsible for Empire Wind specific environmental matters. E-TWG Representative Support	+1 917 476 5106 lmora@equinor.com
Elizabeth Marchetti Fisheries Manager, Equinor Wind US	Primary point of contact between the project and fisheries for fisheries resource and coexistence matters. F-TWG Representative	+1 401 954 2902 emarc@equinor.com

Project website: www.empirewind.com

2.3. Identification of stakeholders

This section should describe the process by which stakeholders will be identified and classified by stakeholder group.

- Equinor Wind will continue to engage with regulatory agencies, Environmental NGOs (“ENGOS”), research institutions and relevant stakeholders either via independent meetings or through environmental round tables in order to maximize opportunities to discuss the project and solicit feedback.
- This process will continue throughout the development of the Empire Wind Project.
- Stakeholders have been identified as part of a Stakeholder Outreach Plan and Empire Wind Permitting Plan developed in support of the Empire Wind project.
- Stakeholder lists, contact details and correspondence are listed on Equinor Wind’s stakeholder tracking tool, which is updated on a regular basis.

2.4. Participation in stakeholder and technical working groups

2.4.1. Communication with E-TWG

This should describe the communication and collaboration approach with members of the E-TWG and consultations.

- Equinor Wind is committed to actively participate in and contribute to the New York State E-TWG as a means to collaborate on best practices and research for offshore wind energy development, balancing environmental concerns with responsible technically and commercially feasible development, while fostering opportunities for future offshore wind energy development in the New York Bight.
- Equinor Wind is currently represented on the E-TWG by Head of Environment and Permitting for Equinor Wind US, Martin Goff, as well as by other support representatives (Julia Bovey and Laura Morales).
- Equinor Wind considers the ENGOS on E-TWG as a proxy “ENGO steering committee” for engagement with the ENGO community on responsible development.
- Equinor Wind will also proactively engage with ENGOS not directly represented on the E-TWG, for example through direct engagement or Environmental Round Tables.

2.4.2. Communication with other New York State agencies

This should describe communication with New York State agencies during each phase of the project.

- Equinor Wind will continue to engage with NY State Agencies throughout the project development process, including project updates and plans, environmental data collection, baseline data, potential mitigation options, terrestrial archaeology, historic architecture, and permitting including presentation of the draft-COP for review and feedback. The NYS agencies include:
 - NY Department of Environmental Conservation (NYSDEC);

- NY Department of State;
- NY Office of Parks, Recreation and Historic Preservation;
- New York Office of General Services; and
- New York State Energy Research and Development Authority
- New York State Department of Public Service

2.4.3. Communication with other stakeholder and working groups

This should describe any relevant participation with other stakeholder groups, such as international fisheries groups that would help inform the EMP.

- Equinor Wind will continue to participate in the Environmental-Technical Working Group (E-TWG) and will be represented on both the F-TWG and E-TWG by the same lead representative, currently Martin Goff, Head of Environment and Permitting.
- Equinor Wind will continue to engage with Tribal Nations, for example the Shinnecock Indian Nation to discuss survey results, including results from the benthic surveys, marine mammals data, results of visual simulations, and archaeological and cultural resources assessments, as well as details of the COP submission.
- Equinor Wind will continue to engage with federal agencies, including:
 - BOEM as the lead agency to ensure a smooth permitting process and soliciting feedback on baseline data requirements;
 - NOAA’s National Marine Fisheries Service (“NMFS”) in relation to development of survey plans, baseline characterization data, for example, benthic and fisheries data sources and providing feedback on Equinor Wind’s data collection efforts, strategic advice on threatened and endangered species, Incidental Harassment Authorizations (“IHAs”) for geophysical surveys and the potential future requirements for IHAs in relation to construction activities.
 - U.S. Fish and Wildlife Service (“FWS”);
 - U.S. Environmental Protection Agency (“EPA”);
 - U.S. Coastguard and U.S. Army Corps of Engineers (“USACE”); and
 - National Park Service (“NPS”)
- Equinor Wind will engage with the general public, which includes open houses and public hearings to address comments and questions.

2.5. Communication methods and tools by phase

This section should describe the communication and outreach methods and tools that will be employed for each stakeholder group during each phase of the project.

Proposed Outreach Methods/Tools	Phase*			
	1	2	3	4
Public meetings, Open houses	X	X	X	X
Stakeholder workgroups	X	X	X	X
Website promotion	X	X	X	X

Proposed Outreach Methods/Tools	Phase*			
	1	2	3	4
Visual simulation tools	X	X	X	X
ENGO Round Tables, in person	X	X	X	X
Federal Agency Meetings, in person, webinars	X	X	X	X
State Agency Meetings, in person, webinars	X	X	X	X
E-TWG and F-TWG Meetings	X	X	X	X
Tribal Meetings; in person, webinars	X	X	X	X
Project Newsletters	X	X	X	X
<i>*Phase: 1: Survey/Design; 2: Construction; 3: Operation; 4: Decommission</i>				

3. Supporting Other Research

3.1. Support of collaborative research

This section should describe how opportunities for developing or investing in collaborative research with environmental and academic entities to collect ecological data will be identified and undertaken. The description must account for the need to coordinate with members of the E-TWG during data gathering and assessment.

- Equinor Wind is committed to collaborate with the scientific community, E-TWG, relevant stakeholders, other offshore wind energy developers and third-party groups to conduct robust and relevant research studies that relate to environmental resources and offshore wind energy developments.
- Specifically, Equinor Wind will:
 - Consider making existing wind farm related vessels, buoys or structures available for research opportunities.
 - Explore appropriate monitoring protocols, for example monitoring of potential behavioral responses or changes in spatial and temporal distribution of biological resources as a direct result of the offshore wind energy development.
- Equinor Wind advocates that technical experts conduct statistical power analyses up front in the planning process before implementing any future studies. In addition, F-TWG and/or E-TWG are appropriate forums in which to discuss the development of such analyses and should be part of this process.

3.2. Handling/processing requests

This section should describe how requests for coordination with third-party supported scientists will be processed - including providing reasonably-requested Project data and access to the Project area for independent scientists examining environmental and fishery sensitivities and/or the impacts of offshore wind energy development on fish, invertebrates and fisheries for the purpose of publication in peer reviewed journals.

- Equinor Wind will make an effort to meet with any interested parties when contacted to discuss prospective research.
- Equinor Wind is willing to consider requests to access Equinor's existing operating offshore wind energy developments in Europe to conduct research and monitoring.

3.3. Data availability

This section should describe how data will be made available in accordance with Section 2.2.5 of the RFP.

- Equinor Wind is committed to make publicly available relevant information or data and supporting metadata that is developed throughout the Empire Wind Project that enhances the understanding of environmental characteristics, or use by wildlife, of any offshore,

nearshore or onshore areas, so long as it is not considered proprietary in nature. This includes the following data/studies:

- Data acquired as a result of monitoring required by NYSDOS, NYSDEC, NYSERDA or other regulatory bodies;
- 2018 benthic survey report covering the “SAP” related survey locations within the lease area (benthic grab samples with grain size and macro fauna analysis, drop down video stills, habitat description). This report will be made publicly available for download from the Empire Wind website at: www.empirewind.com ;
- 2018 benthic survey report covering “COP” related survey locations within the lease area totaling 67 sample locations (benthic grab samples with grain size and macro fauna analysis, drop down video stills, habitat description). This report will be made publicly available for download from the Empire Wind website at: www.empirewind.com ;
- 2019 benthic survey report covering “COP” related survey locations within the proposed export cable corridors (sampling included Sediment Profile Imaging (SPI) and Plan View (PV) imaging at 157 sample stations, with 15 reference stations and sediment grab samples for sediment grain size analysis and macrofaunal analysis for verification). This report will be made publicly available for download from the Empire Wind website at www.empirewind.com ;
- 2017 to 2018 digital aerial survey images, monthly and quarterly reports of avian species, marine mammals, sea turtles and large bony fish assemblages as observed from the 12 x monthly digital aerial surveys carried out from November 2017 to October 2018. These data and reports are all currently available on the ReMOTe webpage https://remote.normandeau.com/ewind_overview.php;
- Oceanographic data, not deemed proprietary, for example seawater temperature and salinity, from the “Metocean Facilities” deployed within the lease area. Requests to be made directly via Julia Bovey at jbov@equinor.com ;
- Non-commercially sensitive data from metocean buoys. Requests to be made directly via Julia Bovey at jbov@equinor.com ;
- Protected Species Observer (PSO) observation reports, as appropriate. Requests to be made directly via Julia Bovey at jbov@equinor.com .
- Equinor Wind is open to sharing the seawater temperature data from the Empire Wind Metocean Facilities to help support the understanding of the “cold pool” effect driving spatial and temporal distribution of marine life in the New York Bight.
- Prior to any disclosure, data made available by Equinor Wind will undergo final quality assurance/quality control (“QA/QC”) to be performed by Equinor Wind.
- Equinor Wind is open to exploring outlets for sharing information (e.g., the E-TWG webpage), however, version control will be important.

3.4. Proposed restrictions

This section should describe any restrictions on data provision or access that may be required to protect trade secrets or maintain site security.

- Equinor Wind will restrict confidential, propriety, and commercially sensitive data (as noted above).

3.5. Financial commitment for third party research

This section should provide a level of financial commitment, if elected, that will be appropriated to leverage third-party environmental research funding related to fish, invertebrates and fisheries, including federal or State-supported research. Or, if elected, provide the level of commitment to a general fund for supporting third-party research into relevant fish and invertebrate communities and associated commercial and recreational fisheries and the effects of offshore wind energy development.

- Equinor Wind entered into a funding agreement related to a grant with the Wildlife Conservation Society (WCS) and Woods Hole Oceanographic Institute (WHOI) over 3-years, which will consist of two more “Blue York” style real-time acoustic whale monitoring buoys spaced appropriately in the lease area to add to the existing buoy on the eastern edge of the lease area.
- Equinor Wind has committed to participate in the Responsible Offshore Science Alliance (ROSA).

3.6. Proposed or existing commitments/collaborations

This section should describe proposed or existing commitments and collaborations with third-party researchers in support of monitoring activities and assessing impacts.

- Equinor Wind has granted SUNY Stony Brook the opportunity to attach four fish tag receiver gates to the Empire Wind Metocean Facilities. The receiver gates, used primarily for detecting Atlantic sturgeon but also capable of detecting other tagged species, were part of a previously BOEM-funded study. Equinor Wind will coordinate with Stony Brook on opportunities to download and service the sensors during scheduled service visits every 6 months.
- As described previously in Section 3.5, Equinor Wind is collaborating with WCS and WHOI on real-time large whale detection and notification buoys in a minimum 2-year monitoring program.
- Equinor has funded and collaborated in the UK Carbon Trust ORJIP One Bird Collision Avoidance Study (ORJIP One), UK Carbon Trust ORJIP Four Acoustic Deterrent Devices (ORJIP Four), and the developer led DEPONS (Disturbance Effect on the Harbour Porpoise in the North Sea, DEPONS, 2015).
- As described in Section 3.5, Equinor Wind is funding ROSA in collaboration with other offshore wind developers.

4. Proposed Mitigation of Impacts to Marine Mammals and Sea Turtles

4.1. Baseline characterization

4.1.1. Available information

Describe existing literature and datasets that are available for baseline characterization.

- Equinor Wind evaluated the extent to which existing and publicly available data sources were suitable for characterizing environmental resources in the relevant area, including evaluation of NYSERDA's Master Plan (2017).
- Equinor Wind will reference the NYSERDA Master Plan Marine Mammals and Sea Turtles Study (2017; Appendix L) to characterize baseline conditions. This study reviewed the available data and has provided summaries of "Best Available Data" in the form of comprehensive lists of datasets for marine mammals and sea turtles and notes that current studies will provide reliable species counts when they are complete.
- Equinor Wind will rely on additional studies to assess the impact of noise on marine mammals and sea turtles, as follows:
 - Popper, A.N., A.D. Hawkins, R.R. Fay, D. Mann, S. Bartol, T. Carlson, S. Coombs, W.T. Ellison, R. Gentry, M.B. Halvorsen, S. Lokkeborg, P. Rogers, B.L. Southall, D.G. Zeddis, and W.N. Tavalga. 2014. ASA S3/SC1.4 TR-2014 Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI, ASA Press. This study found that sea turtles have fairly limited capacity to detect sound, although all results are based on a limited number of individuals and must be interpreted cautiously.
 - Limited research has shown that the upper limit of the hearing range of sea turtles is generally in the range of 1,000 to 1,200 hertz (Hz):
 - Tech Environmental, Inc. 2006. Final EIR Underwater Noise Analysis. Tech Environmental, Inc. (Report 5.3.2-2). Waltham, Massachusetts.
 - Martin, K.J., S.C. Alessi, J.C. Gaspard, A.D. Tucker, G.B. Bauer, and D.A. Mann. 2012. Underwater hearing in the loggerhead turtle (*Caretta caretta*): a comparison of behavioral and auditory evoked potential audiograms. *The Journal of Experimental Biology* 215:3001-3009
 - McCauley, R.D., J. Fewtrell, A.J. Duncan, C. Jenner, M.N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch, and K. McCabe. 2000. Marine seismic surveys: A study of environmental implications. *Appea Journal* 692-706. This study serves as the best available information on the levels of underwater noise that may produce a startle, avoidance, and/or other behavioral or physiological response in sea turtles.
 - Noise injury thresholds established by the Fisheries Hydroacoustic Working Group and adopted by NOAA Fisheries.

- Some data covering several years of timeseries currently exists on the ambient underwater sound levels within or near to the lease area, collected from noise sensors installed by WCS as part of their 'Blue York' real-time whale monitoring buoy.
- NOAA-established guidance for evaluating noise impacts, which defines harassment thresholds for broad categories of marine species.
- Equinor Wind will comply with BOEM's site characterization requirements in 30 C.F.R. § 585.626(3)
- In consultation with federal agencies, Equinor Wind has concluded that there are sufficient data to appropriately characterize and assess impacts to marine mammals and sea turtles in support of project development.

4.1.2. Data being collected

Describe data that is currently being collected or will be collected by other organizations, to support baseline characterization.

- Equinor Wind will rely on ongoing and active data collection efforts of:
 - NYSDEC, Schlesinger and Bonacci 2014, NYSEDA, WCS, and the Atlantic Marine Assessment Program for Protected Species ("AMAAPS") surveys (NOAA NEFSC 2017 and SEFSC 2016).
 - Data collected during NYSDEC's multi-year, monthly aerial survey data collection effort from March 2017 through February 2020.
 - NYSEDA quarterly digital aerial survey program to evaluate the NY Bight area and Empire Wind project area.
 - WCS/WHOI collection of near real-time acoustic observations of whale species, including North Atlantic right whale, sei whale, humpback whale and fin whale. The data buoy is also recording the ambient sound environment at the eastern end of the lease area.
 - Cornell University passive acoustic monitoring survey for 6 large whale species (right, fin, sei, blue, sperm, and humpback) in NY Bight.
 - AMAAPS effort is a collaborative study between NOAA, BOEM, USFWS, and the U.S. Navy, which will provide seasonal, spatially-explicit density estimates for marine mammals and sea turtles (and seabirds) in the western North Atlantic Ocean. Information is currently available from surveys conducted from 2010-2016.
 - Other data collection efforts include the Georgia Department of Natural Resources' focus on tagging right whales and Geographic Information Gateway, CetMap, and other efforts to collect spatial data

4.1.3. Additional data being collected by Equinor Wind to address data gaps

Describe additional data collected that will be collected by the Developer, to support baseline characterization and to address data gaps.

- The NYSERDA natural resources appendices identify recommendations for future studies; approaches to surveys and studies; and/or best management practices for mitigation. Equinor Wind has taken these recommendations into consideration as it has developed its studies for documenting baseline conditions, and in many cases have incorporated them.
- Equinor Wind is currently collecting baseline data, analyzing data from site specific surveys, conducting assessments and carrying out extensive consultation on baseline data, potential receptors and potential environmental impacts, with the intention to finalize the environmental impact assessments to inform spatial planning and in support of submission of State and Federal permit applications.
- Equinor Wind is in the process of completing the following assessments to support the baseline characterization:
 - Offshore site characterization surveys including, oceanographic and meteorological (metocean) measurements, geophysical and geotechnical investigations, sediment & water quality sampling, and benthic sampling;
 - Underwater acoustic modeling;
 - Sediment transport analysis;
 - Navigation Risk Safety Assessment;
 - Tourism and recreation;
 - Offshore cable burial risk assessments; and
 - Electromagnetic Field (“EMF”) modeling.
- Equinor Wind contracted APEM supported by Normandeau to conduct monthly digital aerial surveys, which captures digital images and of marine mammals and sea turtles in addition to avian species, large fish assemblages and opportunistic vessel sightings.
 - The Avian Survey Protocol”, which included marine mammals and sea turtles, was submitted and approved by BOEM and USFWS
 - Data and reports from past and future surveys will be made available at:
https://remote.normandeau.com/ewind_overview.php
- Equinor Wind will use data and observations from Protected Species Observers (PSOs) onboard project related offshore survey vessels where appropriate. PSOs recorded observations from March 2018 to December 2018, and April 2019 to August 2019.
- Equinor Wind will consider installing additional passive acoustic receivers in addition to those deployed as part of the WCS/WHOI collaboration on the existing Metocean Facilities or standalone moorings should additional spatial and temporal marine mammal data be required to support pile driving assessments.

4.2. Species at risk

Describe which species Equinor Wind believes to be of greatest concern and why.

- Equinor Wind notes that 39 marine mammals and 5 sea turtles are known to occur within the waters of the NY Bight and the lease area. All 39 marine mammals are protected by the MMPA, and some are protected by the ESA or NY State Law.
- Full details of species at risk, likely impact and proposed mitigation will be described in the COP and consulted on with the relevant stakeholders, including in the presentation of this EMP in the E-TWG.

4.3. Potential impacts/risks and mitigation measures by project stage

The table below should list the potential impacts to marine mammals and sea turtles and proposed mitigation measures. To this end, a description of proposed measures to minimize the impacts of sound on marine mammals and sea turtles during all phases of Project development should be included. In addition, provide a description of the minimum size of exclusion zone intended to be monitored during geophysical surveys and construction; planned approaches to understanding marine mammal and sea turtle presence and absence within the development site exclusion zone during site assessment and construction (e.g., a combination of visual monitoring by protected species observers and passive acoustic monitoring, the use of night vision and infra-red cameras during nighttime activities, etc.); proposed temporal constraints on construction activities and geophysical surveys with noise levels that could cause injury or harassment in marine mammals (e.g., seasonal restrictions during periods of heightened vulnerability for priority species; commencing activities during daylight hours and good visibility conditions, dynamic adjustments following the detection of a marine mammal); and proposed equipment and technologies Equinor Wind would use to reduce the amount of sound at the source, if any.

Potential Impacts	Proposed Mitigation Measures	Phase*			
		1	2	3	4
Habitat/seafloor disturbance, resulting in potential loss of habitat or modification of prey resource	<ul style="list-style-type: none"> • See Section 6.2 	X	X	X	X
Sediment suspension and deposition, resulting in potential modification to prey resource	<ul style="list-style-type: none"> • See Section 6.2 	X	X	X	X
Underwater noise, resulting in potential for injury or disturbance of marine mammals and sea turtles	<ul style="list-style-type: none"> • GBS Foundations will be the foundation type to support wind turbines for the Empire Wind project. The use of GBS removes the need for percussive pile driving and is in itself a form of mitigation to reduce construction noise levels. 	X	X	X	X

Potential Impacts	Proposed Mitigation Measures	Phase*			
		1	2	3	4
	<ul style="list-style-type: none"> • NOAA NMFS approved Protected Species Observers (“PSOs”) and Passive Acoustic Monitoring System (“PAMS”) as appropriate for exclusion zone monitoring pre and during survey equipment operation • Use of PSOs and PAMS as appropriate for exclusion zone monitoring for pile driving activities where relevant. • Soft starts to noise emitting survey equipment where technically feasible and appropriate. • Soft starts to percussive pile driving, should discrete foundation locations not be suitable to GBS, requiring alternative pile driven solutions. • Monitoring and applying exclusion zones as appropriate to the noise source and level and receptor, with noise sources and exclusion zones evidence based and determined by infield measurements and/or modeling where feasible and in consultation with relevant agencies and stakeholders. • Consideration of noise mitigating technologies and timing of practices as appropriate to further assessments, in the event that percussive pile driving is required at discrete turbine foundation locations and/or offshore substation foundations. 				
Increased vessel traffic, resulting in potential for increased spills; air emissions and vessel strikes/collisions on mammals and sea turtles	<ul style="list-style-type: none"> • Use of exclusion/safety zones: <ul style="list-style-type: none"> ○ Real-time monitoring systems as appropriate (e.g., visual observations by PSOs, passive acoustic monitoring, use of night vision and infrared during nighttime activities) to facilitate exclusion and monitoring zones for survey and construction vessels; ○ NOAA NMFS approved PSOs and PAMS where appropriate for monitoring during vessel transits • Adopting a Service Operations Vessel (“SOV”) concept for carrying out regular O&M activities (i.e., reduced transits to/from the onshore O&M base to/from the offshore wind energy area); • Equinor Wind empowers all personnel onboard a vessel to raise an alert of potential marine mammals and sea turtle risk via the Lead PSO, with the Lead PSO given full mandate for mitigation decisions. • Equinor Wind’s vessel strike avoidance measures will (and have been) consistent with: (1) NOAA 	X	X	X	X

Potential Impacts	Proposed Mitigation Measures	Phase*			
		1	2	3	4
	<p>NMFS guidance to avoid ship collision with marine mammals and sea turtles; (2) conditions within the lease area; (3) and any Incidental Take Authorizations issued by NOAA NMFS.</p> <ul style="list-style-type: none"> • Vessel collision avoidance mitigation measures including: <ul style="list-style-type: none"> ○ Use of dedicated shipping lanes ○ Vessel operators and crew to maintain vigilant watch for cetaceans and pinnipeds, and slow down or stop their vessel to avoid striking these protected species ○ Vessel speed of 10 knots or less in Seasonal Management Area per NOAA guidance. This applies to all vessels operating from November 1 through April 30 ○ Reduction of speed to 10 knots or less if mammal identified near an vessel (within 330 ft/100 m) ○ Maintain separation distance of 1,640 ft or greater from North Atlantic right whale. If observed, must move away from whale at 10 knots or less until separation distance is achieved. If in vessels path, engines must not be engaged until it has moved outside path and beyond 330 ft/100m. ○ Maintain separation distance of 300 ft or greater from any sighted non-delphinoid cetacean. If sighted – follow similar procedures for siting North Atlantic right whale. ○ Maintain separation distance of 164 ft (50 m) or greater from any sighted delphinoid cetacean. If sighted – follow similar procedures for siting North Atlantic right whale. ○ Maintain a separation distance of 164 ft (50 m) or greater from any sighted pinniped ○ Maintain a separation distance of 164 ft (50 m) or greater from any sighted sea turtle • Will adopt vessel speed restrictions associated with seasonal management areas (“SMA”) and dynamic management areas (“DMA”) relevant to the size of the vessels used and other vessel strike avoidance measures; • Vessel crew members responsible for navigation duties have and will continue to receive site specific training on marine mammal sighting/reporting and vessel strike avoidance measures. 				

Potential Impacts	Proposed Mitigation Measures	Phase*			
		1	2	3	4
Electromagnetic Fields (EMF), resulting in potential disturbance to marine mammals/sea turtles and/or their prey resource	<ul style="list-style-type: none"> Electrical cables to be armored and sufficiently buried where feasible to reduce EMF effects. Surface cable protection where sufficient burial is not possible and where appropriate based on the cable Burial Risk Assessment (CBRA) and EMF assessments (acting as a further barrier between EMF and receptor). Prey resource – see Section 6.3. 			X	
<i>*Phase: 1: Survey/Design; 2: Construction; 3: Operation; 4: Decommission</i>					

4.4. Monitor for impacts during each phase

Describe how potential impacts will be monitored on these species during each phase of physical work for the Project (site assessment, construction, operation, and decommissioning) to inform mitigation planning for later phases of the Project as well as for future Projects.

4.4.1. Pre/Post Monitoring to assess and quantify impacts and changes

Describe how changes to environmental resources will be quantified using statistically sound methods.

- Equinor Wind will ideally target monitoring and research towards interactions between offshore wind energy developments and the receptors it is being judged against.
- Equinor Wind, in collaboration with WCS/WHOI will install two monitoring buoys to help to further understand the spatial and temporal distribution of the four large whale species within the Empire Wind project area, including potential for extending deployments to post construction monitoring.
- The WCS/WHOI buoys offer an opportunity for real-time monitoring and detection during survey and installation activities.
- Equinor Wind will explore the use of Habitat and Agent Based Modeling to facilitate a better understanding of the spatial and temporal distribution and fine scale movements of key large whale species within the New York Bight, in particular in relation to changes in environmental conditions (e. g prey resource, seawater temperature).
- Equinor Wind understands that from the outset, any research and monitoring to assess changes and impacts should be statistically robust. However, for some biological monitoring, this level of robustness is not always possible as many outside factors can influence these variations with much greater significance than the factors that can be attributed to causes from offshore wind energy developments (e.g., seawater temperature, nutrient levels, etc.). As such, Equinor Wind is open to sharing or using oceanographic data from the Metocean facilities for a better understanding of these relationships.

4.4.2. Address data gaps

Describe how data gaps will be addressed.

- Equinor Wind believes there is sufficient marine mammal and sea turtle data to inform spatial planning and support assessments in the COP and IHA applications. However, Equinor Wind is willing to collaborate on studies, research and monitoring to supplement what is required under the regulations, to inform mitigation options. For example, the collaboration with WCS/WHOI as described previously or deployment of passive acoustic sensors.
- Equinor Wind will engage with relevant stakeholders, for example through the regulatory process and E-TWG to identify areas where data gaps beyond the COP exist for further monitoring and research and will consider proposals for research on a case by case basis.

4.5. Strategies for developing alternate protocols

Describe the process for determining when mitigation strategies are insufficient and under what conditions they might elect to rehabilitate or restore impacted marine mammals and sea turtles in an alternative location.

- Equinor Wind has not finalized a process for alternative protocols, but is open to exploring this further in consultation with the E-TWG, regulatory agencies and relevant stakeholders.
- Equinor Wind will take additional measures to avoid or reduce potential impacts to marine mammal and sea turtle prey resources in consultation with E-TWG and BOEM and other stakeholders, consistent with the E-MP.
- Equinor Wind will continue to consult with NOAA NMFS and other key stakeholders throughout the project development process in order to determine if any alternative or additional appropriate and proportionate mitigation measures may be necessary.
- All required mitigation and monitoring measures will be compiled into a single document: "Protected Species Mitigation Protocol," which will be updated as Equinor Wind continues its survey development activities in 2019 and forward.

Equinor Wind is open to consulting with relevant agencies, ENGOs and E-TWG on further appropriate and proportionate mitigation options, for example, real-time monitoring or observations of marine mammals when in transit and commitments to monitor daily reports on marine mammal sightings and DMAs.

5. Proposed Mitigation of Impacts to Birds and Bats

5.1. Baseline characterization

Describe how baseline data will be established on the presence of bird and bat assemblages, temporal and spatial use of the site by key species within the area of the proposed Project.

5.1.1. Available information

Describe existing literature and datasets that are available for baseline characterization.

- Equinor Wind will follow BOEM guidelines on the baseline assessment of avian and bat species and potential impacts in support of the COP (30 C.F.R. § 585.626(a)(3)) and associated consultations under Section 7 be conducted with the USFWS.
- Equinor Wind will rely on the following information for its baseline characterization of birds:
- NYSERDA funded digital aerial avian surveys covering the Lease Area over four quarterly surveys and the Offshore planning Area (OPA) over twelve quarterly surveys (data have been combined with Equinor's surveys for species abundance modelling). Data and reports are also publicly available on https://remote.normandeau.com/nyserda_overview.php
- Information on threatened and endangered species and/or their habitat is also available through USFWS IPaC <https://ecos.fws.gov/ipac/>
- NYSDEC Environmental Resource Mapper <https://www.dec.ny.gov/animals/38801.html>
- Kinlan, B.P., Menza, C., & F. Huettmann. 2012. Predictive Modeling of Seabird Distribution Patterns in the New York Bight. Chapter 6 in "A biogeographic assessment of seabirds, deep sea corals and ocean habitats of the New York Bight: science to support offshore spatial planning." NOAA Technical Memorandum NOS NCCOS 141 (2012).
- NYSERDA 2010a. Pre-development of avian species for the proposed Long Island – New York City Offshore Wind Project Area. Final Report prepared for the New York State Energy Research and Development Authority. October 2010.
- Kinlan, B.P., Winship, A.J., White, T.P., & J. Christensen. 2016. Modeling At-Sea Occurrence and Abundance of Marine Birds to Support Atlantic Marine Renewable Energy Planning: Phase I Report. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Sterling, VA. OCS Study BOEM 2016-039. xvii+113 pp. Available at <https://www.data.boem.gov/PI/PDFImages/ESPIS/5/5512.pdf> .
- NYSERDA 2017. New York State Offshore Wind Master Plan, November 2017. <https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/Offshore-Wind-in-NewYork-State-Overview/NYS-Offshore-Wind-Master-Plan>
- Studies funded by BOEM on baseline offshore and nearshore avian studies:

- Paton, P., K. Winiarski, C. Trocki, and C. McWilliams. 2010. Spatial Distribution, Abundance and Flight Ecology of Birds in Nearshore and Offshore Waters in Rhode Island. Chapter 11a in: Rhode Island Ocean Special Area Management Plan (Ocean SAMP) Volume 2. University of Rhode Island, Kingston, RI. 304pp.
- Veit, R.R., T.P. White, S.A. Perkins, and S. Curley. 2016. Abundance and Distribution of Seabirds off Southeastern Massachusetts, 2011-2015. U.S. Department of the Interior, Bureau of Ocean Energy Management, Sterling, Virginia. OCS Study BOEM 2016-067. 82 pp.
- Williams, K.A, I.J. Stenhouse, E.E. Connelly, and S.M. Johnson. 2015. Mid-Atlantic Wildlife Studies: Distribution and Abundance of Wildlife along the Eastern Seaboard 2012-2014. Biodiversity Research Institute. Portland, Maine. Science Communications. Series BRI 2015-19. 32 pp.
- NJDEP 2010a. Ocean/Wind Power Ecological Baseline Studies, Final Report, January 2008/December 2009. New Jersey Department of Environmental Protection Office of Science. <https://www.nj.gov/dep/dsr/ocean-wind/report.htm>
- Cetacean and Seabird Assessment Program (CSAP) database of bird observations from 1980-1988
- Rhode Island Block Island Wind Farm and the Massachusetts Cape Wind Project baseline assessment data
- Carbon Trust ORJIP One Bird Collision Avoidance Study co-funded by Equinor - Skov, H., Heinanen, S. Norman, T., Ward, R.M., Mendez-Roldan, S & Ellis, I. 2018. ORJIP Bird Collision and Avoidance Study. Final Report- April 2018. The Carbon Trust. United Kingdom. 247 pp. https://www.carbontrust.com/media/675793/orjip-bird-collision-avoidance-study_april2018.pdf
- Equinor Wind will rely on the following existing information for its baseline characterization of bats:
 - NYSDEC. 2015a. List of Endangered, Threatened and Special Concern Fish & Wildlife Species of New York State. New York State Department of Environmental Conservation. Available at <http://www.dec.ny.gov/animals/7494.html>. NYSDEC. 2015b. New York State Wildlife Action Plan (SWAP) Species of Greatest Conservation Need. <http://www.dec.ny.gov/animals/7179.html>
 - NYSERDA 2017. New York State Offshore Wind Master Plan, November 2017. <https://www.nysenda.ny.gov/All-Programs/Programs/Offshore-Wind/Offshore-Wind-in-NewYork-State-Overview/NYS-Offshore-Wind-Master-Plan>

5.1.2. Data being collected

Describe data that is currently being collected or will be collected by other organizations, to support baseline characterization.

- Currently there are no third-party surveys for avian and bats underway over the Empire Wind project site. Details of surveys that have been performed are covered in Section 5.1.1 and surveys that have or are currently being performed by Equinor Wind are in Section 5.1.3.

5.1.3. Additional data being collected by Equinor Wind to address data gaps

Describe additional data collected that will be collected by the Developer, to support baseline characterization and to address data gaps.

- Equinor Wind has or is in the process of completing the following assessments, which will consist of both desktop and/or field surveys:
 - Equinor Wind contracted APEM supported by Normandeau to conduct monthly digital aerial surveys from November 2017 to October 2018, with monthly results, monthly reports and quarterly and final reports made publicly available on the following webpage:
https://remote.normandeau.com/ewind_overview.php.

APEM and the methodology chosen was similar to the approach taken by NYSERDA having used APEM and these methods to conduct quarterly digital aerial surveys over the New York Bight and lease area. A summary of the scope of the digital aerial survey is as follows:

- Surveys conducted once per month over a 12-month period;
- Image resolution at sea surface of 1.5 cm ground sampling distance (“GSD”);
- Grid survey design;
- Grid imagery footprint of 310 m by 219 m;
- A 2.5-mi (4 km) buffer around the lease area;
- Minimum of 20% of the lease area and buffer imaged, with 10% of area analyzed;
- Monthly results displayed online; and
- Monthly, quarterly and annual reporting, also provided online.

The assessment approach and methods were designed to supplement the substantial body of existing data and to meet BOEM’s data requirements for site characterization studies to evaluate the potential effects of the proposed project. In addition, the supplemental quarterly digital aerial surveys conducted by APEM Ltd. on behalf of NYSERDA provide an excellent spatial and temporal characterization of the lease area.

- The Empire Wind “Avian Survey Protocol” survey plan, which included marine mammals and sea turtles, was submitted and approved by BOEM and USFWS
- Equinor Wind installed a passive bat detector onboard the survey vessel RV Ocean Researcher to detect passing bats while the vessel was engaged in other survey activity in the lease area from April 2018 through December 2018.
 - Equinor Wind will share the results of the monitoring with the relevant regulatory authorities and stakeholders, and consider whether there is a further need to collect additional site-specific data offshore.

5.2. Species at risk

Describe which species the Empire Wind believes to be of greatest concern and why.

- The lease area provides habitat for approximately 40 waterbird species, including seaducks, loons, gulls, scoters, terns, alcids, gannets, and shorebirds (NYSERDA 2010a, Kinlan et al. 2012, Kinlan et al. 2016, NYSERDA 2017d).
- Full details of avian species at risk, likely impact and proposed mitigation will be described in the COP and consulted on with the relevant stakeholders, including in presentation of this EMP at the E-TWG.
- Equinor Wind identified the following bats with the greatest potential to migrate through the lease area on their way between breeding and wintering grounds in the spring and fall:
 - eastern red bat,
 - hoary bat, and
 - silver-haired bat.
- Equinor Wind will follow BOEM guidelines and use the Mid-Atlantic Ocean Data Portal's data of temporal use, abundance, and species distribution by avian species or groups in the lease area. The modeling data can also be used to potentially identify species that are high risk for collision or displacement, and species that are protected by federal and/or state laws.

5.3. Potential impacts/risks and mitigation measures by project stage

The table below should list the potential impacts and mitigation measures to understand and minimize the Project's risk to birds and bats. At a minimum this should include the steps the Empire Wind will pursue to minimize risk to birds and bats (e.g. lighting); and identification of technological approaches to assess impacts or any Proposals for other research or mitigations relating to birds or bats planned or under consideration at this time.

Potential Impacts	Proposed Mitigation Measures	Phase*			
		1	2	3	4
Collision risk to marine birds and bats	<ul style="list-style-type: none"> • Minimum lower blade tip height above sea surface of 85 ft (26 m) to reduce the risk of seabird collisions within the lower flight height bands. 			X	
Impacts from accidental oil spills from project related vessels or structures	<ul style="list-style-type: none"> • Preparation of an Oil Spill Readiness Plan 		X	X	X
Habitat impacts onshore and offshore, including disturbance and displacement	<ul style="list-style-type: none"> • Sympathetic lighting of onshore and offshore structures, vessels and plant to minimize disturbance and displacement; 		X	X	X

Potential Impacts	Proposed Mitigation Measures	Phase*			
		1	2	3	4
	<ul style="list-style-type: none"> Trenchless cable installation methods for the export cable at landfall and onshore to avoid sensitive areas (for example dune areas, beaches); Consideration of measures for discouraging and/or provision of alternative roosting; Considerate vessel movements in the vicinity of rafting bird; and Limiting onshore land disturbance measures to non-nesting seasons for sensitive species (time-of-year restrictions). 				
Changes to prey resources	<ul style="list-style-type: none"> See Section 6.3 	X	X	X	X

**Phase: 1: Survey/Design; 2: Construction; 3: Operation; 4: Decommission*

5.4. Monitor for impacts during each phase

Describe how potential impacts will be monitored on these species during each phase of physical work for the Project (site assessment, construction, operation, and decommissioning) to inform mitigation planning for later phases of the Project as well as for future Projects.

5.4.1. Pre/Post Monitoring to assess and quantify changes

Describe how changes to environmental resources will be quantified using statistically sound methods

- Equinor Wind believes that monitoring of highly mobile species such as birds should focus on behavioral responses rather than pre-, during and post construction monitoring of abundance, which may not always have robust statistical power to identify change as a direct result of the wind farm.
- Should further monitoring of birds be required, for example for Roseate terns, then Equinor Wind is willing to explore monitoring through novel techniques such as GPS tagging exercises, subject to approvals from the relevant regulatory agencies.
- Equinor Wind will continue desktop studies and stakeholder discussions for avian and bat species. During field studies, Equinor Wind will complete appropriate surveys to further characterize the project area and determine presence/absence of habitat within proposed project activities
- Impacts to avian and bat species will be sufficiently examined as part of BOEM’s NEPA process as part of the COP, through state permitting processes and in consultation with USFWS and relevant stakeholders, and that, where appropriate, mitigation will be implemented to reduce impacts to as low as practicable.

5.4.2. Address data gaps

Describe how data gaps will be addressed.

- Equinor Winds notes that further research and monitoring is important where data and knowledge gaps remain that present uncertainties over potential significant adverse impacts attributable to the effects of offshore wind farm development.
- Equinor Wind will engage with relevant stakeholders, for example through the regulatory process and E-TWG to identify areas where data gaps may exist for further monitoring and research and will consider proposals for research on a case by case basis.

5.5. Strategies for developing alternate protocols

Describe the process for determining when mitigation strategies are insufficient and under what conditions they might elect to rehabilitate or restore impacted birds and bats in an alternative location.

- Equinor Wind has yet to finalize a process for alternative protocols, but is open to exploring this further in consultation with the E-TWG, regulatory agencies and relevant stakeholders.

6. Proposed Mitigation of Impacts to Fish, Invertebrates, and their Habitats

6.1. Baseline characterization

Describe what is known about the proposed site in terms fish and invertebrate assemblage, and temporal and spatial variations in fish, invertebrates and their habitats at the proposed site. The use of collaborative monitoring models with the fishing community is encouraged to develop trusted baseline data.

6.1.1. Available information

Describe existing literature and datasets that are available for baseline characterization.

- Public data sources are suitable for characterizing benthic habitat and fisheries resources in the project area, including:
 - The evaluation of NYSERDA’s Master Plan Fish and Fisheries Study (2017; Appendix J).
 - NOAA National Centers for Coastal Ocean Science and BOEM Comprehensive Seafloor Substrate Mapping and Model Validation in the Atlantic (2019).
 - Estuarine Living Marine Resource database (NOAA 2000) provide descriptions of spatial and temporal distributions of species (by life stage) in Hudson River/Raritan Bay and the Great South Bay, however, the database is not updated regularly.
 - Use of commercial and recreational fisheries effort data as a proxy for fish species.

6.1.2. Data being collected

Describe data that is currently being collected or will be collected by other organizations, to support baseline characterization.

- NOAA National Centers for Coastal Ocean Science and BOEM Comprehensive Seafloor Substrate Mapping and Model Validation in the Atlantic research/survey collected sediment grab samples at 400 locations in the lease area, as well as bathymetric data and opportunistic fisheries data.
- BOEM funded studies carried out by Stony Brook University, including arrays of fish tag receiver moorings in the Empire Wind lease area and extending towards Raritan Bay, which will provide more details on the spatial and temporal distribution of Atlantic sturgeon.

6.1.3. Additional collected by the Developer to address data gaps

Describe additional data collected that will be collected by the Developer, to support baseline characterization and to address data gaps.

- Equinor Wind commissioned benthic sampling in 2018 by Gardline Environmental covering the entire Lease Area and building on previous comprehensive benthic surveys carried out by NOAA's National Center for Coastal Ocean Science (NOS). These Equinor Wind surveys were conducted at a total of 67 sample stations, and included grab samples, drop down digital video and stills imagery. Grab samples were analyzed for sediment grain size distribution and macro faunal analysis. This report will be made publicly available for download from the Empire Wind website.
- Equinor Wind commissioned, benthic sampling was conducted in 2019 by Inspire Environmental, covering all of the proposed potential export cable routes for the Lease Area, including the proposed Gowanus export cable route for the Empire Wind project. Sampling included Sediment Profile Imaging (SPI) and Plan View (PV) imaging at 157 sample stations, with 15 reference stations and sediment grab samples for sediment grain size analysis and macrofaunal analysis for verification. This report will be made publicly available for download from the Empire Wind website.
- Geophysical, benthic habitat (through geophysical interpretation), and geotechnical surveys from March 2018 to November 2018 across the entire Lease Area and export cable corridors, with additional geophysical and geotechnical surveys carried out in 2019 to fill in data gaps and cover areas from landfall to the 65 ft (20 m) depth contour.
- With the site specific and existing benthic data, and the existing fisheries data, there is sufficient data for the purpose of the COP impact assessments, spatial planning and/or mitigation. However, Equinor Wind will consult with E-WTG and relevant federal agencies and stakeholders on requirements for further surveys for targeted benthic and fisheries monitoring and research.

6.2. Species at risk

Describe which species the Empire Wind believes to be of greatest concern and why.

- Equinor Wind notes that fish and invertebrate species of interest in the lease area fall into three groups based on regulatory status: (1) species managed under the MSA; (2) species listed under the ESA; and (3) non-game fish and invertebrate species that are considered important prey (or shelter, in the case of biogenic habitats) for fish and wildlife.
- In addition, the role of the benthic habitat as a fisheries resource is fundamental to the identification of essential fishing habitat (EFH), as reflected in the emphasis on EFH in BOEM's benthic survey guidance (BOEM 2013a). 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.
- Three federally-listed endangered fish may occur in the lease area:
 - Atlantic salmon (*Salmo salar*);
 - the Atlantic sturgeon (*Acipenser oxyrinchus*); and

- shortnose sturgeon (*Acipenser brevirostrum*).
- NYSDEC lists a number of other fish species as endangered, most if not all, are associated with fresh water habitat which will be evaluated, as applicable to the export cable route.
- Full details of species at risk, likely impact and proposed mitigation will be described in the COP and consulted on with the relevant stakeholders, including in presentation of this EMP at the E-TWG.

6.3. Potential impacts/risks and mitigation measures by project stage

The table below should list the potential impacts to fish, invertebrates, and their habitats and proposed mitigation measures. To this end, this section should describe how the Developer will minimize risk to fish, invertebrates and their habitats (e.g., foundation type, scour protection, cable shielding for electromagnetic fields, construction windows, siltation/turbidity controls, use of dynamic-positioning vessels and jet plow embedment).

Potential Impacts	Proposed Mitigation Measures	Phase*			
		1	2	3	4
Physical disturbance and habitat loss, including sensitive habitats	<ul style="list-style-type: none"> ● Avoid, to the extent possible, siting structures (e.g. offshore wind turbine foundations) in areas of sensitive benthic habitat. ● Include NOAA NMFS in survey plan review in coordination with BOEM to address potential impacts to threatened or endangered species ● Avoid, to the extent possible, sensitive benthic habitats through the planning of routing export cable corridors. ● Bury wind farm electrical cables to sufficient depth to minimize surface protection requirements that modify the existing conditions. ● Apply real time measures to avoid intrusive sampling of sensitive habitats, using drop down cameras. ● Appropriate and reasonable use of foundation scour protection where needed as identified in modelling. ● Will calculate extent of potential habitat loss as part of COP assessments and share results with E-TWG and other working groups 	X	X	X	X
Exposure to underwater noise	<ul style="list-style-type: none"> ● Selection of gravity-based substructure (GBS) foundations as the primary foundation type, which do not require percussive pile driving during foundation installation ● If pile driving is used, then a “soft start” will be applied at the startup of piling. ● If pile driving is used then potential use of noise reducing technologies if deemed 	X	X		X

Potential Impacts	Proposed Mitigation Measures	Phase*			
		1	2	3	4
	required by regulators as appropriate to the impacts, and subject to being commercially and technically available.				
Increased suspended sediment concentration and impacts to water quality	<ul style="list-style-type: none"> Apply best management practices and timing during cable installation to minimize sediment suspension and dispersal during sensitive periods (e.g. certain spawning events). Will undertake sediment transport modeling to quantify sediment concentrations and affected areas for COP assessments, which will be shared with E-TWG and F-TWG. Use of scour protection around wind turbine foundations as appropriate to reduce sediment resuspension. Avoid routing the export cable corridor through existing and historic dumping grounds. 		X	X	X
Exposure to accidental spills, pollution, or trash from project related vessels	<ul style="list-style-type: none"> Using industry Best Practices for vessel operation, and implementing an Oil Spill Response Plan (“OSRP”). 	X	X	X	X
Potential exposure to Electromagnetic Fields (EMF)	<ul style="list-style-type: none"> Cables will be armored. Cables will be buried to sufficient depths (for a variety of reasons), to the extent possible. If sufficient burial is not feasible, potential for further barriers through surface cable protection. Conduct EMF modeling and assessments to identify potential mitigation requirements. Post construction surveys at an appropriate interval to monitor for exposed cables. 			X	

**Phase: 1: Survey/Design; 2: Construction; 3: Operation; 4: Decommission*

6.4. Monitor for impacts during each phase

Describe how potential impacts will be monitored on these types of fish and invertebrates during each phase of physical work for the Project (site assessment, construction, operation, and decommissioning) to inform mitigation planning for later phases of the Project as well as for future Projects.

6.4.1. Pre/Post Monitoring to assess and quantify changes

Describe how changes to environmental resources will be quantified using statistically sound methods.

- Equinor Wind understands that from the outset, any research and monitoring to assess changes and impacts should be statistically robust. However, for some biological monitoring, this level of robustness to adequately detect change as a direct result of an offshore wind farm is not always possible as many outside factors can influence these variations with much greater significance than the factors that can be attributed to causes from offshore wind energy developments (e.g., seawater temperature, nutrient levels, etc.).
- As such, Equinor Wind is open to monitoring that explore other approaches to detect and quantify change, where further monitoring is appropriate, for example behavioral responses. Equinor Wind will work with the regulatory agencies, E-TWG and relevant stakeholders to identify research and monitoring needs and agree on methodology.

6.4.2. Address data gaps

Describe how data gaps will be addressed.

- Equinor Wind will conduct further research and monitoring where data and knowledge gaps remain that present uncertainties over potential significant adverse impacts attributable to the effects of offshore wind farm development.
- Equinor Wind is open to discussing further monitoring and research to fill data gaps as appropriate through regulatory agencies, E-TWG and relevant stakeholders.

6.5. Strategies for developing alternate protocols

Describe the process for determining when mitigation strategies are insufficient and under what conditions they might elect to rehabilitate or restore impacted fisheries in an alternative location or when the provision of compensation of some form may be appropriate.

- Equinor Wind has yet to finalize a process for alternative protocols, but is open to exploring this further in consultation with the E-TWG, regulatory agencies and relevant stakeholders.

7. Project Decommissioning

7.1. Potential impacts on marine wildlife, birds, bats, and fisheries

This section should describe potential impacts to marine mammals, sea turtles, birds, bats, and fisheries and habitats from decommissioning the project, based on available information and relevant experience (if any).

- Equinor Wind does not expect impacts from decommissioning to exceed impacts resulting from the worst-case scenarios associated with construction.
- As monitoring during operations provides a better understanding of the spatial and temporal presence of marine mammals, sea turtles, birds, bats, and fish habitats within the lease area, mitigation measures can be more tailored and effective at further reducing the likelihood and level of impacts.
- Equinor Wind will collaborate on further research into the effects and potential impacts associated with decommissioning, including coordination with the E-TWG and F-TWG, using the experiences in Europe to help inform that process as well as experiences from decommissioning of oil and gas installations and other offshore wind developments on the eastern seaboard of the United States.

7.2. Approach for developing a decommissioning plan and coordination with stakeholders

This section should describe how a decommissioning plan will be developed to identify and mitigate potential impacts, including coordination with stakeholders, and any elements of its contemplated decommissioning plan that can be identified at this stage.

- Equinor Wind has and will continuously evaluate and evolve this EMP so that all the components of the EMP are complete and sufficient, including the decommissioning plan.
- Equinor Wind expects that additional guidance and information will become available throughout the planning and regulatory process and as such will continue to consider its relevance to the EMP at the appropriate intervals.

8. Additional Considerations

8.1. Additional mitigation strategies and EMP refinement

This section should describe any additional mitigation strategies not otherwise described herein that would improve the Plan and reduce impacts on the environment. In addition, describe how the EMP will be updated and refined based on additional information and stakeholder feedback.

- Equinor Wind will continue to monitor new and novel approaches to mitigation in the offshore wind industry both in the US and from Equinor’s existing offshore wind farms and developments elsewhere in the world, including the forums and networks Equinor Wind is present.
- Equinor Wind is open to collaborative research on potential mitigation strategies, with other developers, agencies and stakeholders.

8.2. Process for updating the EMP

This section should describe how feedback from the fishing industry stakeholders, F-TWG, and other agencies and working groups will be incorporated and updated in the EMP.

- Equinor Wind has and will continuously evaluate and evolve this EMP so that all the components of the EMP are complete and sufficient.
- Equinor Wind expects that additional guidance and information will become available throughout the planning and regulatory process and as such will continue to consider its relevance to the EMP at the appropriate intervals.