New England Wind

AVANGRID RENEWABLES

Construction and Operations Plan

Lease Area OCS-A 0534

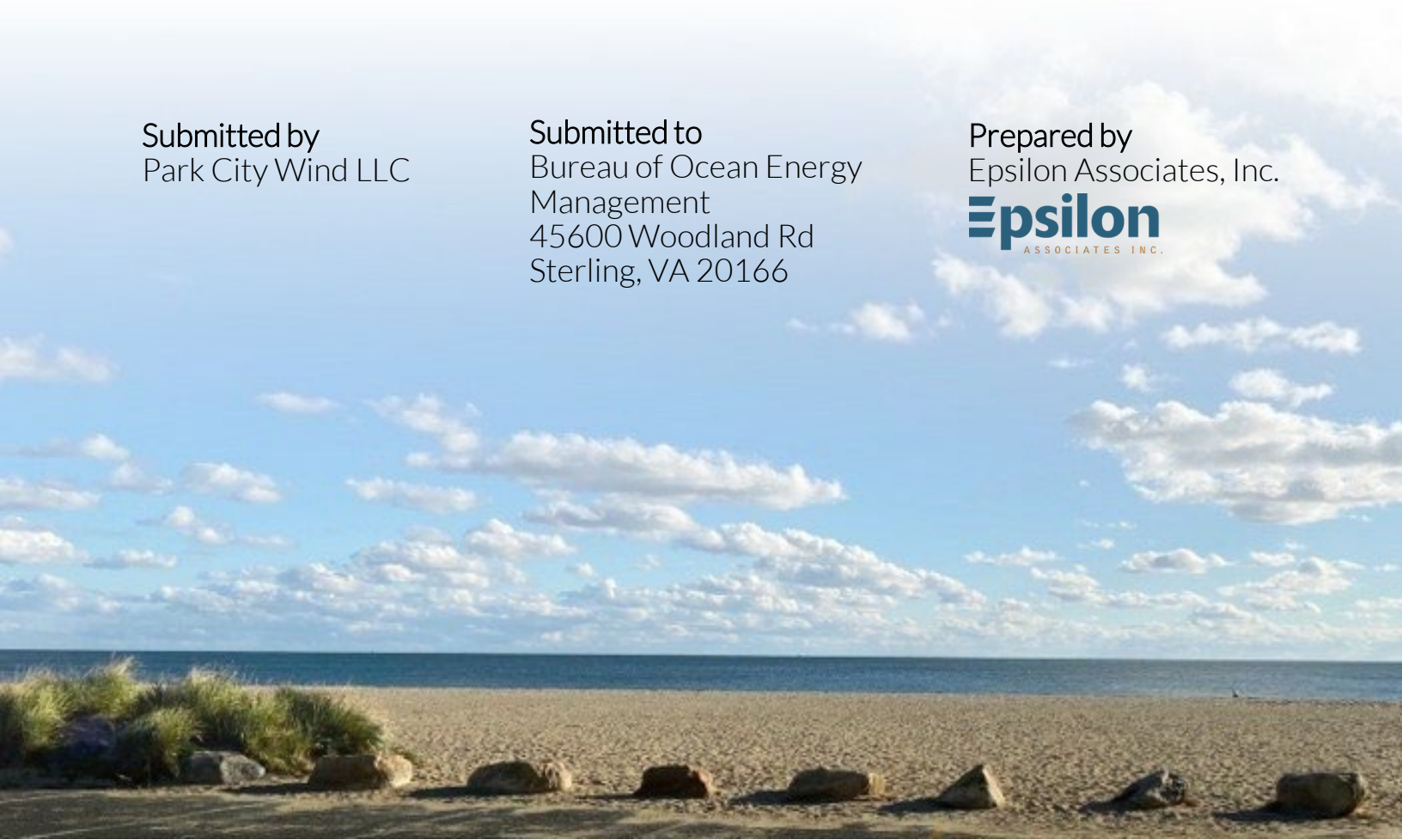
Volume III Appendices

February 2024

Submitted by
Park City Wind LLC

Submitted to
Bureau of Ocean Energy Management
45600 Woodland Rd
Sterling, VA 20166

Prepared by
Epsilon Associates, Inc.



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February 2024

Appendix III-N – Draft Economic Exposure of Commercial Fisheries

The Proponent has also identified two variations of the Phase 2 Offshore Export Cable Corridor (OECC)—the Western Muskeget Variant and the South Coast Variant—in the event that technical, logistical, grid interconnection, or other unforeseen issues arise during the engineering and permitting processes that preclude one or more Phase 2 offshore export cables from being installed within all or a portion of the OECC (see Section 4.1.3 of COP Volume I). This Appendix considers the potential impacts associated with the Western Muskeget Variant; an assessment of the South Coast Variant in federal waters is provided separately in the COP Addendum.

Economic Exposure of Commercial Fisheries to the New England Wind Offshore Wind Energy Development

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August 2023

Table of Contents

List of Appendices

List of Figures

List of Tables

List of Acronyms

AIS	automatic identification system
BEA	U.S. Bureau of Economic Analysis
BOEM	Bureau of Ocean Energy Management
CFSI	Commercial Fishing & Seafood Industry
COP	Construction and Operations Plan
CZMA	Coastal Zone Management Act
EE	economic exposure
EI	economic impacts
ESP	electrical service platform
FAD	fish aggregation device
FE	fishing effort
FRD	fishing revenue density
ft	feet
GDP	gross domestic product
km	kilometers
kts	knots
LMA	Lobster Management Area
m	meters
MA/RI WEA	Massachusetts/Rhode Island Wind Energy Area
MARIPARS	Massachusetts and Rhode Island Port Access Route Study
NM	nautical miles
NOAA	National Oceanic Atmospheric Administration
O&M	operations and maintenance
OCS	Outer Continental Shelf
OECC	offshore export cable corridor
SWDA	Southern Wind Development Area
US	United States
USCG	United States Coast Guard
VMS	vessel monitoring system
VTR	vessel trip report
WEA	Wind Energy Area
WTG	wind turbine generator

EXECUTIVE SUMMARY

Context

New England Wind is the proposed offshore renewable wind energy development in Bureau of Ocean Energy Management (BOEM) Lease Area OCS-A 0534 (Lease Area) along with associated offshore and onshore cabling, onshore substations, and onshore operations and maintenance (O&M) facilities. New England Wind will be developed in two Phases with a maximum of 130 wind turbine generator (WTG) and electrical service platform (ESP) positions, and five offshore export cables installed within an Offshore Export Cable Corridor (OECC) that will transmit electricity generated by the WTGs to onshore transmission systems in the Town of Barnstable, Massachusetts (see Figure 1-1).

This report addresses the "economic exposure" of commercial fisheries to New England Wind based on historical commercial fishing revenues in the Lease Area and the OECC. BOEM states that "economic exposure refers to potential economic impacts, not predicted or expected economic impacts" (Kirkpatrick et al. 2017) and is "a starting point to understanding potential economic impacts of future offshore wind project development if a harvester opts to no longer fish in the area and cannot recapture that income in a different location" (BOEM 2021a). This report focuses on "economic exposure" and does not address potential "economic impacts". Expected economic impacts are likely to be significantly lower than full "economic exposure" because that fishing effort temporarily precluded in the Lease Area and OECC is likely to be diverted to other areas where it will continue generating at least some of the fishing revenues lost in the Lease Area and OECC. Direct sources of economic exposure involve commercial fishing disruptions in the Lease Area and OECC of New England Wind, potential indirect sources of economic exposure include: (1) potential "fishing congestion impacts" outside the Lease Area and OECC caused by fishing effort shifting from the Lease Area or OECC to those other areas; and (2) increased fishing vessel transit times and costs associated with vessels being forced to steam around or alter routes through the Southern Wind Development Area (SWDA).[1]

Additionally, fishing vessels will not be restricted from operating in or transiting through the Lease Area or OECC (including the Western Muskeget Variant) other than where temporary safety zones are established around construction vessels engaged in ongoing construction and/or cable laying activity.

Within the Lease Area some fishing tracks and vessel transit routes will need to be modified to account for the presence of WTGs and ESPs. Within the OECC the target burial depth for offshore export cables will be 1.5 to 2.5 meters (m) (5 to 8 feet [ft]) below the seafloor which the cable burial risk assessment determined is more than twice the burial depth required to prevent cables from interfering with fishing activity or fishing vessel transits. While every effort will be made to achieve sufficient cable burial depth,

[1] New England Wind will occupy all of Lease Area OCS-A 0534 and potentially a portion of Lease Area OCS-A 0501 in the event that Vineyard Wind 1 does not develop "spare" or extra positions included in Lease Area OCS-A 0501 and Vineyard Wind 1 assigns those positions to Lease Area OCS-A 0534. For the purposes of the COP, the SWDA is defined as all of Lease Area OCS-A 0534 and the southwest portion of Lease Area OCS-A 0501, as shown in Figure 1-1.

if a sufficient burial depth cannot be achieved, cable protection will be designed and installed to minimize interfering with bottom fishing gear to the maximum extent practicable and fishermen will be informed of exactly where cable protection exists. After cable installation there will remain a limited possibility that mobile bottom fishing gear could snag on cable protection resulting in gear damage, lost fishing time, and associated economic losses. This is the only potential source of economic exposure in the OECC during the O&M phase of New England Wind. The Proponent is in the process of developing a program that will compensate commercial fishermen for economic losses associated with damaged gear.

Findings

Estimates of Economic Exposure

Economic Exposure in the Lease Area

Based on National Oceanic Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) data, annual commercial fishing revenues in the Lease Area during 2008–2021, adjusted upward to fully account for unreported lobster and Jonah crab revenues, averaged $622,863 (2021 dollars; NOAA Fisheries 2022). This estimate of annual fishing revenues from the Lease Area provides an estimate of full economic exposure, that is lost commercial fishing revenues if all commercial fishing ceased in the entire Lease Area for a full year with none of the resulting losses in fishing revenues recouped as a result of fishing effort being diverted from the Lease Area to other fishing areas.

Economic Exposure in the OECC

Based on NOAA Fisheries data, annual fishing revenue in the OECC during 2008–2021 averaged $2,505 per km^2 (2021 dollars; NOAA Fisheries 2023). This provides a baseline value for estimating economic exposure in parts of the OECC where commercial fishing will be temporarily precluded during cable installation.

Based on USCG guidance, a safety buffer with a radius of 500 m should be established around where cable installation activities are taking place. However, a safety radius of twice that distance, 1 km, is used for the purposes of this economic analysis to account for vessel activity supporting cable installation. This results in the assumption that commercial fishing will be precluded in the OECC in a safety buffer area of approximately 3.14 sq km^2 (776 acres) around where pre-installation and cable installation activities are underway. It is not expected that commercial fishing will be precluded or impaired in other parts of the OECC where cable installation is either planned or has been completed.

Based on the expected duration of cable installation activities in the OECC (1.87 years for Phase 1 and Phase 2), economic exposure in the OECC during both Phases of cable installation is estimated to be $14,748-$16,532. Use of the West Muskeget Variant would result in a very small increase in overall economic exposure estimated for the OECC.

Indirect Sources of Potential Economic Exposure

As described above, New England Wind has potential to generate two indirect types of economic exposure related to commercial fisheries, including:

(1) Potential "fishing congestion" impacts outside the SWDA and OECC

(2) Potential increases in fishing vessel transit times in and around the SWDA and OECC

Lease Area

During construction and decommissioning, commercial fishing will be precluded only in segments of the Lease Area defined by safety buffers around where WTGs and ESPs are being installed or decommissioned. As described in Section 3.1, there is a low level of fishing effort in the SWDA (average of 146 fishing trips annually based on automatic identification system [AIS] data) and most fishing time on fishing tracks that intersect the SWDA is spent outside of the SWDA. These two factors indicate there is no risk that restricting those parts of fishing trips that transect the SWDA will result in enough new fishing effort being generated in other fishing areas to result in fishing congestion impacts outside the SWDA.

Within the Lease Area, WTGs and ESPs will be oriented in fixed east-to-west rows and north-to-south columns with 1 nautical mile (NM) (1.85 km) spacing between WTG/ESP positions. The recent United States Coast Guard (USCG) Massachusetts and Rhode Island Port Access Route Study (MARIPARS) finds that this will allow multiple straight-line options for fishing vessels to transit safely through the SWDA (USCG 2020). As described in Section 3.2, if unusually severe weather causes some fishing vessel operators to decide to reroute around the Lease Area when transiting between fishing ports and fishing areas, the resulting increases in steaming time and costs would also not be significant.

OECC

The analysis described in Section 2.2 indicates that the small areas and limited durations of commercial fishing impacts during cable installation in the OECC, along with the absence of any significant impacts of OECC operations on commercial fishing after cable installation, make additional indirect economic exposure in the OECC highly unlikely.

Potential Impacts on the Abundance and Distribution of Fish

As described in Section 6.6 of COP Volume III, studies related to other proposed wind farms in U.S. waters (and studies of established offshore wind energy farms in Europe) indicate that impacts of offshore wind farms on fish population dynamics are primarily local and short-term. The potential impacts of New England Wind on fish population dynamics is not a source of economic exposure in commercial fisheries.

Concern has also been expressed that WTG and ESP foundations may function as fish aggregation devices (FADs) that will attract fish to locations in the Lease Area where they will become less accessible to some types of commercial fishing. While these FADs may provide advantages and disadvantages to different

types of fishing methods, the available studies indicate that they could have overall positive economic impacts on commercial fisheries (Wilhelmsson, et al. 2006; Riefolo et al. 2016; Raoux et al. 2017; Wilber, et.al, 2022).

Conclusions

As shown in Table 2-2, potential annual economic exposure in the Lease Area is estimated to be $622,863; and as shown in Tables 2-4 and 2-6, economic exposure during cable installation of the OECC is estimated to be $14,748-$16,532. These are estimates of full economic exposure based on the assumption that none of the annual fishing revenues lost in the Lease Area and in impacted segments of the OECC will be recouped as a result of fishing effort being diverted to other fishing areas.

Economic impact estimates based on estimates of economic exposure presented in this report will be determined based on updated BOEM guidance and consultations with the states through the Coastal Zone Management Act (CZMA) review processes.

1 INTRODUCTION

1.1 New England Wind Overview

New England Wind is the offshore renewable wind energy development proposed for BOEM Lease Area OCS-A 0534 along with associated offshore and onshore cabling, onshore substations, and onshore O&M facilities. New England Wind will be developed in two Phases with a maximum of 130 WTG and ESP positions located in the 453 sq km (175 sq mi) of the SWDA (See Figure 1-1). Five offshore export cables installed along the OECC will transmit electricity generated by the WTGs to onshore transmission systems in the Town of Barnstable, Massachusetts. The OECC is the corridor identified for routing both the Phase 1 and Phase 2 offshore export cables between the SWDA and the landfall sites. Each Phase of New England Wind will be developed using a Project Design Envelope that defines and brackets the characteristics of the facilities and activities for purposes of environmental review while maintaining a reasonable degree of flexibility with respect to the selection of key components, such as the WTGs, foundations, offshore cables, and ESPs.

New England Wind's offshore renewable wind energy facilities are located immediately southwest of Vineyard Wind 1, which is located in Lease Area OCS-A 0501. New England Wind will occupy all of Lease Area OCS-A 0534 and potentially a portion of Lease Area OCS-A 0501 in the event that Vineyard Wind 1 does not develop "spare" or extra positions included in Lease Area OCS-A 0501 and Vineyard Wind 1 assigns those positions to Lease Area OCS-A 0534. For the purposes of the COP, the SWDA is defined as all of Lease Area OCS-A 0534 and the southwest portion of Lease Area OCS-A 0501, as shown in Figure 1-1. The SWDA may be approximately 411–453 sq km (101,590– 111,939 acres) in size depending upon the final footprint of Vineyard Wind 1. At this time, the Proponent does not intend to develop the two positions in the separate aliquots located along the northeastern boundary of Lease Area OCS-A 0501 as part of New England Wind (see Figure 1-1). The SWDA (excluding the two separate aliquots that are closer to shore) is just over 32 km (20 mi) from the southwest corner of Martha's Vineyard and approximately 38 km (24 mi) from Nantucket. The WTGs and ESPs in the SWDA will be oriented in an east-west, north-south grid pattern with one NM (1.85 km) spacing between positions.

While the Proponent intends to install all five New England Wind offshore export cables within the OECC that travels from the SWDA northward through the eastern side of Muskeget Channel towards landfall sites in the Town of Barnstable, the Proponent is reserving the fallback option to install one or two Phase 2 cables along the western side of Muskeget Channel, referred to as the Phase 2 OECC Western Muskeget Variant (see Section 4.1.3.2 of COP Volume I).[2] Throughout this section, unless the Western Muskeget Variant is specified, "the OECC" refers to the OECC that travels along the eastern side of Muskeget Channel. Commercial fishing vessels using fixed and

[2] While the project design envelope allows for one or two offshore export cables to be installed within the Western Muskeget Variant, it is highly unlikely that more than one cable could be installed within the Western Muskeget Variant due to multiple technical reasons related to challenging site conditions.

mobile gear operate in and around the SWDA and OECC, and travel through these areas as they transit between fishing ports and fishing grounds (see Figure 3-1). Fishing vessels will not be precluded from operating in or transiting through the SWDA or the OECC other than where temporary safety buffer zones are established around where construction and installation vessels are operating.

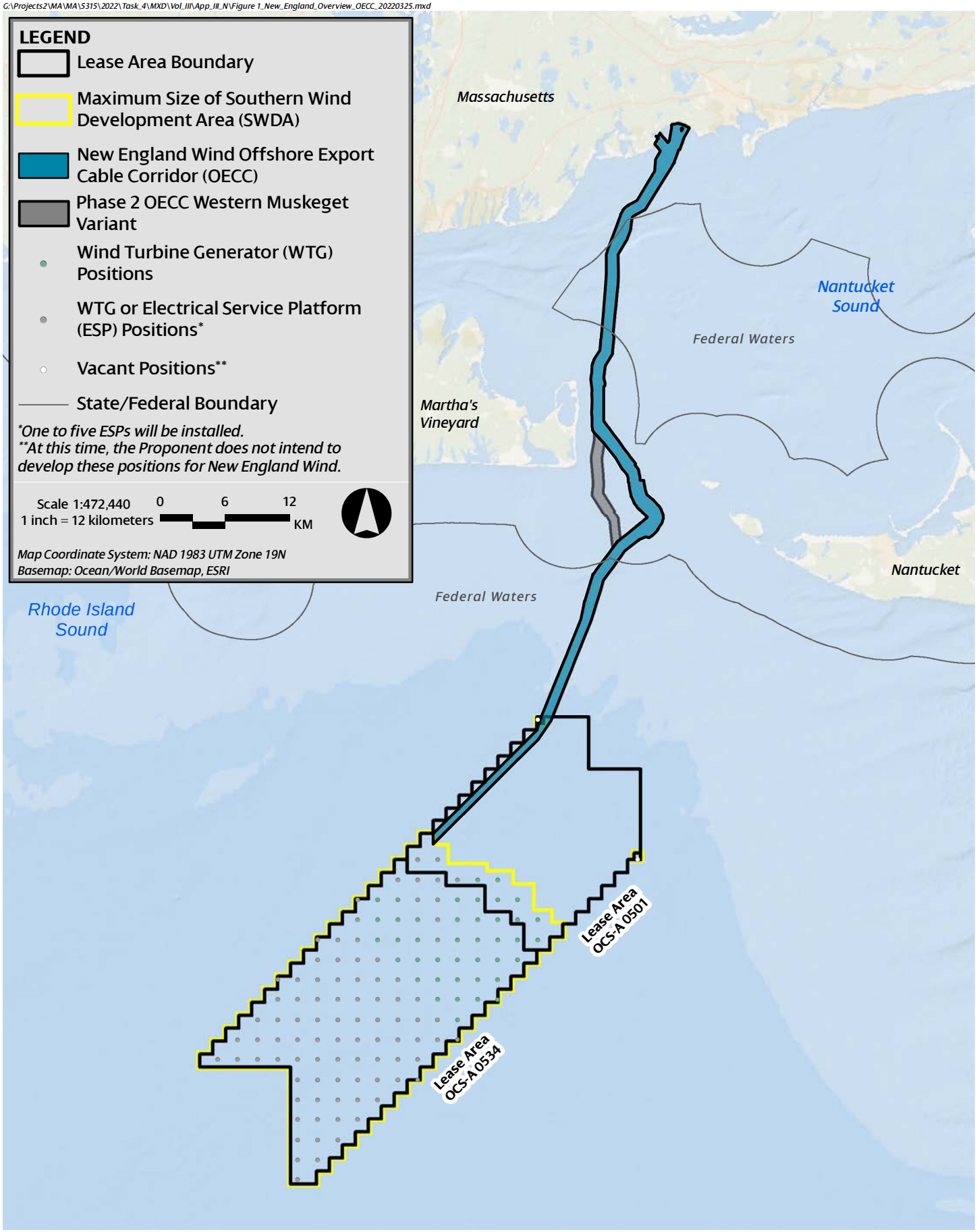
1.2 Focus

This report develops estimates of the "economic exposure" of commercial fisheries to the New England Wind Lease Area and OECC. [3] BOEM states that "economic exposure refers to potential economic impacts, not predicted or expected economic impacts" and refers to it as "a starting point to understanding potential economic impacts of future offshore wind project development if a harvester opts to no longer fish in the area and cannot recapture that income in a different location" (Kirkpatrick et al. 2017). BOEM emphasizes that "if alternative fishing grounds are available nearby and may be fished at no additional cost, the economic impact will be lower than estimated economic exposure" (BOEM 2018).

Following BOEM guidance, estimates of economic exposure are developed in this report based on the assumption that New England Wind will result in the cessation of all fishing activity in the Lease Area and in areas of active construction along the OECC, with none of the resulting losses in fishing revenues recouped as a result of fishing effort shifting from the Lease Area and the OECC to other fishing areas.

As stated above, however, BOEM guidance indicates that expected economic impacts will be less than economic exposure if fishing vessel operators can recoup at least some lost fishing revenues by shifting fishing effort from impacted areas to other nearby areas. In the case of New England Wind, most of the Lease Area and most of the OECC will remain open to fishing during and after construction so fishing vessel operators will have the opportunity to retain at least some fishing revenues by continuing to operate in those areas as well as the opportunity to recoup at least some lost fishing revenues from those areas by diverting fishing effort to other nearby fishing areas.

[3] For the purposes of estimating economic exposure of commercial fisheries, the Lease Area was chosen to define the impact area for this analysis because a portion of the SWDA is included in Lease Area OCS-A 0501 and economic exposure and economic impacts of commercial fisheries in that part of the SWDA were previously analyzed and mitigated for Vineyard Wind 1 (see Section 6.3 in the Vineyard Wind 1 Terms and Conditions of COP Approval Letter; BOEM 2021b).



New England Wind
AVANGRID RENEWABLES

Figure 1-1
New England Wind Overview

This report focuses on measures of economic exposure. The two most significant sources of potential commercial fishery economic exposure from New England Wind addressed in this report are:

- Potential lost fishing revenues in the Lease Area during construction of a total of 130 WTG and ESP positions.
- Potential lost in fishing revenues in the OECC during construction resulting from commercial fishing being precluded from areas around where cable installation activities are underway.

The report also addresses two potential indirect sources of fishery-related economic exposure, including:

- Potential costs associated with increased fishing congestion outside the SWDA and OECC if enough fishing effort is diverted from those areas to other fishing areas to cause "fishing power penalties" that result in lower fishing revenues, higher fishing costs, or both.
- Potential costs and lost fishing time associated with increased fishing vessel transit times if New England Wind results in fishing vessels that typically steam through the SWDA using less direct routes through or around the SWDA as they transit between fishing ports and fishing areas.

1.2.1 Indicators of Economic Exposure in the Lease Area

During 2016–2019, AIS-equipped commercial fishing vessels were recorded fishing in the SWDA during an average of 146 trips annually. It is important to note that only 25% of time spent on fishing tracks during those 146 trips that transect the SWDA took place in the SWDA; the remaining 75% of fishing time on trips that transected the SWDA was spent outside the SWDA.[4] This indicates that the SWDA is a relatively small part of a much larger fishing area that includes adjacent and nearby locations where fishing vessels that occasionally operate in, and more frequently transit through the SWDA spend most of their fishing time.

This relatively low level of commercial fishing effort in the SWDA is consistent with the relatively low fishing revenue density (FRD) in the Lease Area ($1,515 per km^2) and the relatively low value of the expected harvest in the Lease Area (annual average of $622,863 [2021 dollars] between years 2008 and 2021).[5]

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[4] See Baird 2021.

[5] These values of fishing revenues and fishing revenue density in the Lease Area are based on NOAA Fisheries (2022) landings and revenue data for 2008-2021 which are based on VTR records, then adjusted to include fishing revenues associated with lobster and Jonah crab harvests that are not included in VTR records (see Table 2-1 and Table 2-2).

This estimate of annual average fishing revenues in the Lease Area of $622,863 is the best available estimate of full economic exposure in the Lease Area (NOAA Fisheries 2022). It represents the expected reduction in commercial fishing revenues that would result if commercial fishing was precluded in the entire Lease Area for a full year with none of the resulting loss of fishing revenues recouped as a result of fishing effort shifting from those areas to other fishing areas.

Fishing revenue density charts presented in Figure 1-2 through Figure 1-4 indicate that the Lease Area does not contain exceptionally productive fishing grounds and is surrounded by other comparable fishing areas. On an individual permit basis, most fishermen who spend time operating in the Lease Area generate less than 1% of their annual revenue from the SWDA (NOAA Fisheries 2022). This is consistent with the results of the analysis of AIS data for the SWDA mentioned above which indicate that a significant portion of fishing vessel time on trips that involve some fishing in the SWDA is spent fishing in other nearby areas.

During O&M it is expected that some commercial fishing vessels operating in or transiting through the SWDA may need to modify transit routes or fishing tracks to account for the presence of WTGs and ESP(s). It is also possible that some transiting fishing vessels may route around the Lease Area and some fishing effort may shift from the SWDA to other areas. Changes in fishing revenues associated with these potential changes in commercial fishing practices are sources of potential economic exposure. However, the relatively low level of fishing effort in the SWDA and the correspondingly low amount of fishing revenues generated in the SWDA indicate that direct economic exposure in the SWDA associated with these potential modifications in fishing vessel tracks will be relatively small. Records of fishing activity and fishing revenues in the SWDA also indicate that fishing effort diverted from the SWDA to other fishing areas would not involve a significant enough shift in fishing effort to result in "fishing congestion impacts" in those other areas. The 1 x 1 NM layout that will be established between WTG and ESP positions in the SWDA to accommodate continued fishing is also expected to result in fishing vessels transiting through the SWDA experiencing no significant increases in transit times or costs. As described in Section 3.2, even if fishing vessel operators choose to reroute transits between fishing ports and fishing areas that would typically pass through the Lease Area around the Lease Area it would have relatively small impacts on transit times or costs.

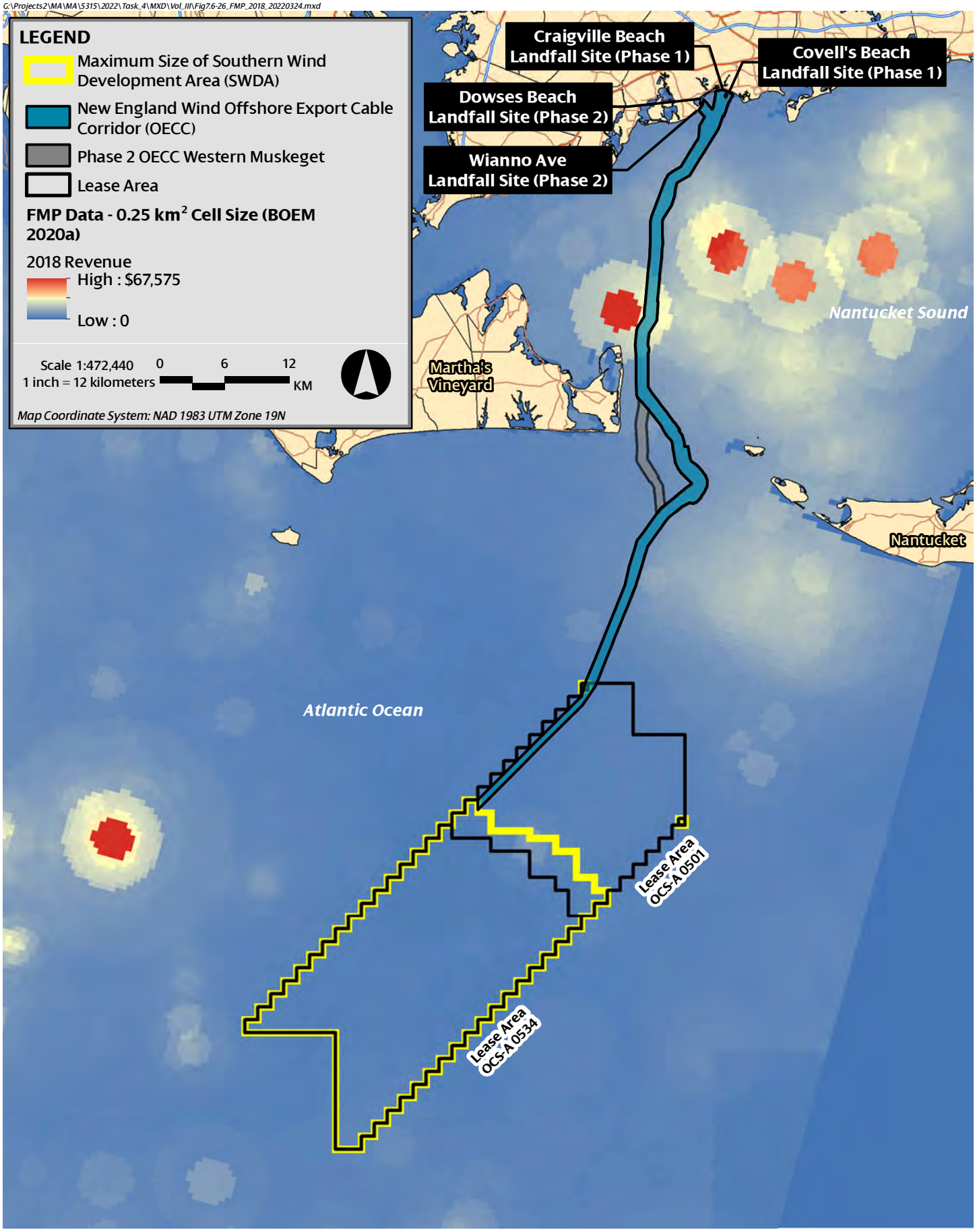


Figure 1-2

Fishing Revenue Density, All Fishery Management Plans, 2018

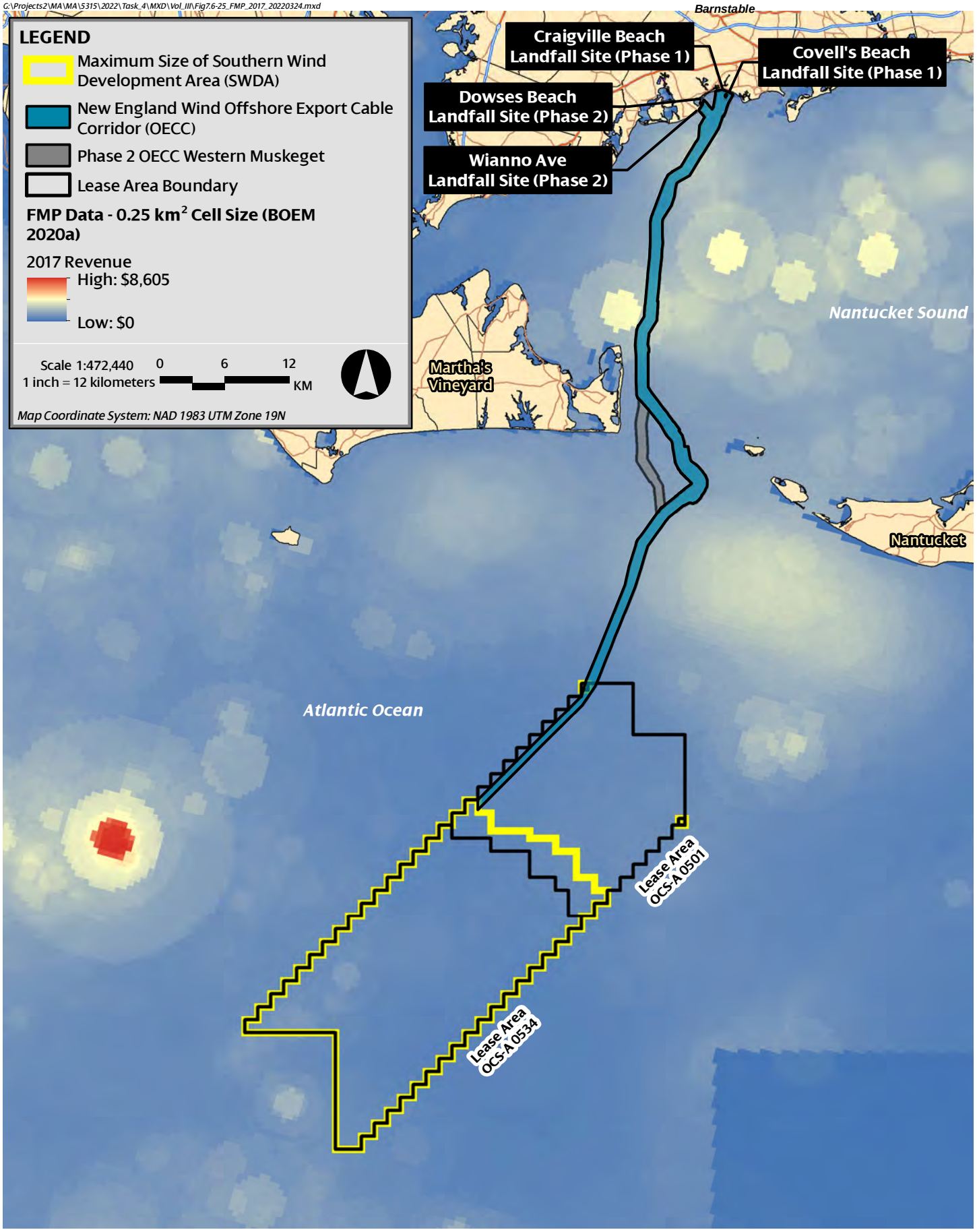


Figure 1-3

Fishing Revenue Density, All Fishery Management Plans, 2017

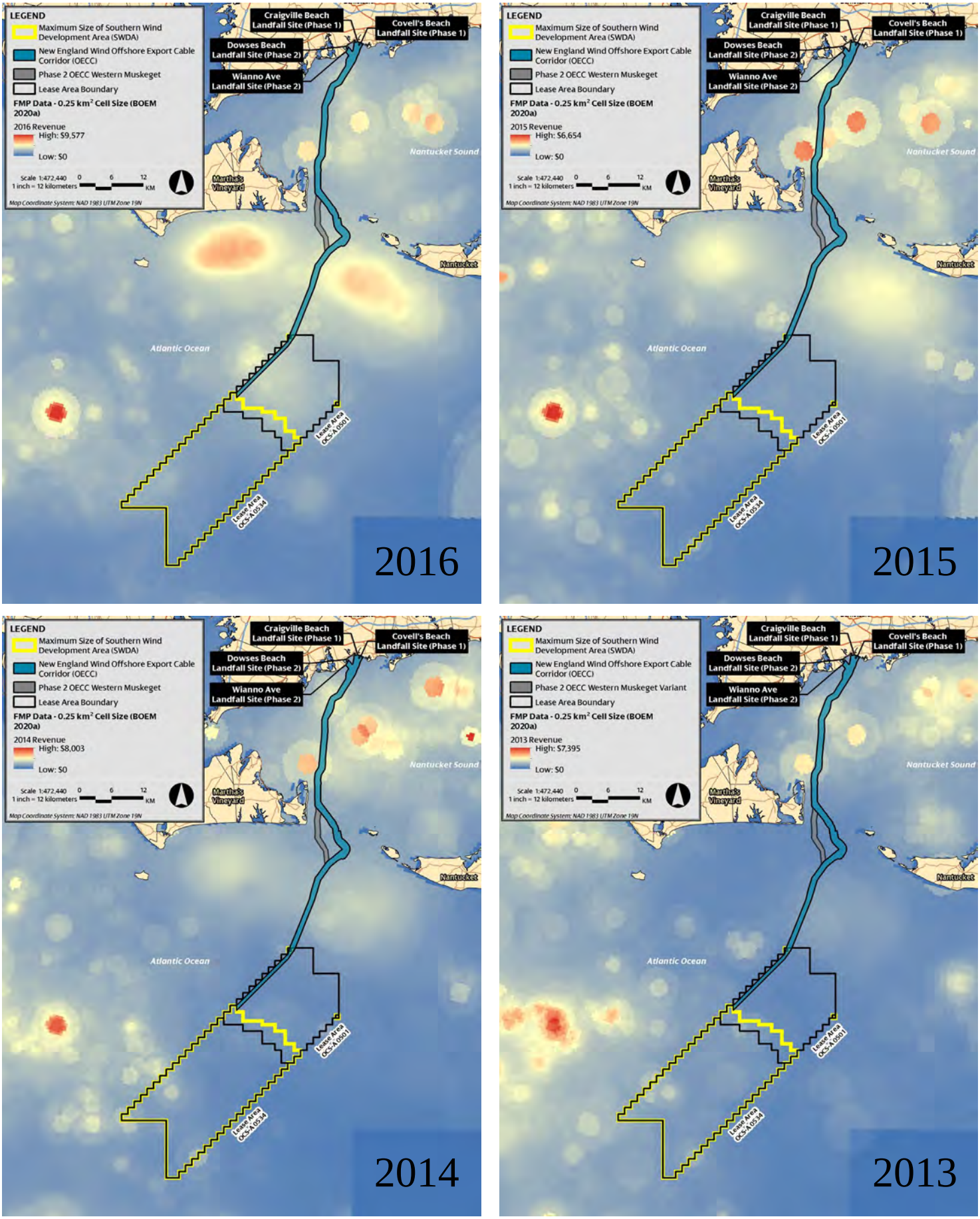


Figure 1-4

Fishing Revenue Density, All Fishery Management Plans, 2013-2016

1.2.2 Indicators of Economic Exposure in the OECC

During OECC Construction

Pre-construction activities and offshore export cable installation are expected to occur in the OECC (approximately 42 NM [78 km]) over a period of approximately nine months during Phase 1 and 13.5 months during Phase 2 (including the Western Muskeget Variant). However, at any given time cable installation activity in the OECC will typically be underway at only one location and fishing in the OECC will be precluded only in the vicinity of that one location while construction activity is underway (Figure 1-5). The USCG is expected to establish temporary 500-meter safety buffers around cable installation activity. However, for the purpose of estimating economic exposure in this report a 1 km safety buffer is assumed, resulting in an estimated fishing preclusion area of 3.14 km^2 (776 acres) around cable installation activity. It is assumed, therefore, that during cable installation commercial fishing will be precluded in the 3% of the OECC where cable installation is underway (1 km in each direction) and not in the remaining 97% of the OECC areas where cable installation has either been completed or is planned. Note that if cable installation activity is occasionally underway at more than one location, the fishing preclusion area during that period will be larger than 3.14 km^2 (776 acres) but there will be an offsetting reduction in the overall duration of cable laying activity which will result in no significant overall change in economic exposure.

After OECC Construction

Offshore export cables will be installed at a target burial depth of 1.5 to 2.5 m (5 to 8 ft) below the seafloor, which the cable burial risk assessment determined is more than twice the burial depth required to prevent them from interfering with commercial fishing operations. While every effort will be made to achieve sufficient cable burial depth, if a sufficient burial depth cannot be achieved, cable protection will be designed and installed to minimize interfering with bottom fishing gear to the maximum extent practicable and fishermen will be informed of exactly where cable protection exists.[6]

Any required cable protection will be designed and installed to minimize interfering with mobile bottom fishing gear to the maximum extent practicable, and fishermen will be fully informed about locations where cable protection has been used. For these reasons, and because there is limited use of trawlers, draggers, and other mobile bottom fishing gear in the OECC, potential fishery-related economic losses associated with bottom fishing gear snagging on cable protection

[6] Potential cable protection methods include rocks, rock bags, concrete mattresses, or half-shell pipes or similar materials.

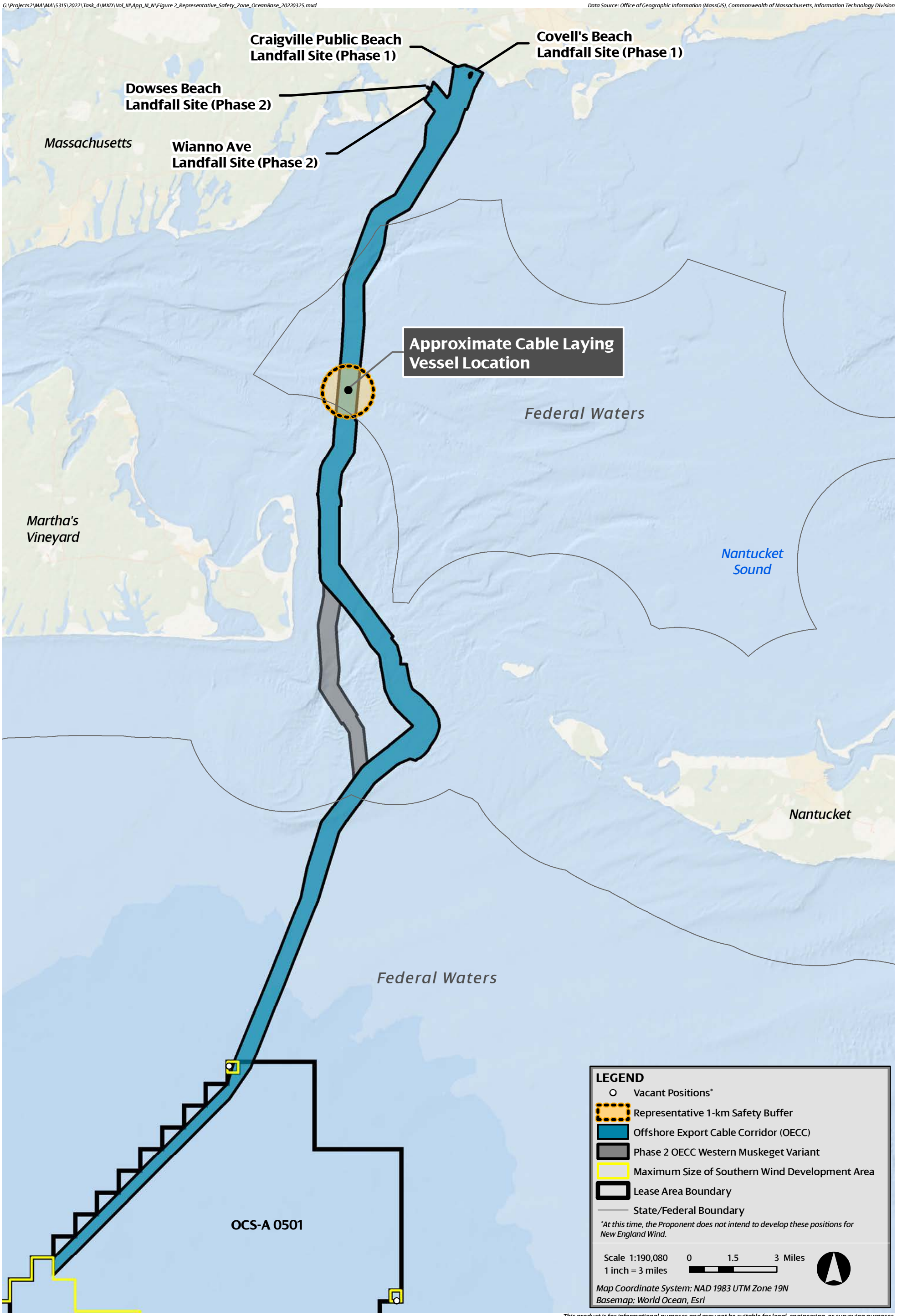


Figure 1-5

Representative Safety Buffer Zone for Cable Installation in the OECC

are expected to be low. The Proponent will also be developing and implementing procedures to compensate fishermen for any unexpected economic losses associated with bottom fishing gear snagging on cable protection. For these reasons, the economic exposure of commercial fishing in the OECC after cable installation is expected to be near zero.

1.3 Data Sources

Reliable sources of fishing revenue data for the Lease Area and OECC or for larger ocean areas that include those areas are described in Table 1-1. One source listed in Table 1-1, *Socioeconomic Impacts of Atlantic Offshore Wind Development* (NOAA Fisheries 2022), is a website that was developed by NOAA Fisheries and includes what are now the most reliable and current estimates of annual fishing revenues in each offshore wind lease area in New England and Mid-Atlantic waters.

Table 1-1 Data Sources

Data Source	Description
Kirkpatrick et al. (2017)	BOEM funded a study prepared by the NOAA Northeast Fisheries Science Center that characterizes commercial fishing from Maine to North Carolina and provides insight into revenue generated by federally permitted fishermen. The report details the average value of fish harvested over the six-year period between 2007 and 2012 and identifies the ports and fishery sectors (e.g., gear, species) supporting that activity. NOAA Fisheries also developed a model to estimate the socioeconomic impact of wind energy development on commercial fishermen. Making use of vessel trip report (VTR) data, spatial data from the Northeast Fisheries Observer Program database, and vessel monitoring system (VMS) data, the study provides information on commercial harvest by location, species caught, gear type, and port group. This study is available at: Volume 1: https://espis.boem.gov/final%20reports/5580.pdf Volume 2: https://espis.boem.gov/final%20reports/5581.pdf
BOEM (2020)	BOEM makes available single-year revenue intensity rasters summarized by Fishery Management Plan. These revenue intensity rasters were developed for Kirkpatrick et al. (2017), described above, and updated by BOEM to account for additional years of data. Revenue intensity rasters can be accessed at: https://www.boem.gov/renewable-energy/mapping-and-data/renewable-energy-gis-data. This data source was used to develop Figure 1-2 through Figure 1-4, which show the fishing revenue density for 2014–2018.

Table 1-1 Data Sources (Continued)

Data Source	Description
NOAA Fisheries (2022)	Socioeconomic Impacts of Atlantic Offshore Wind Development Website NOAA Fisheries developed sets of tables summarizing annual fishing activity within each offshore wind lease or project area and related annual fishing revenues during years 2008–2021. This data is based on modeled results of federal VTR, clam logbook, and queried for spatial overlap and linked to dealer data for value and landings information. These tables highlight annual landings and revenue by species, gear type, and fishery management plan within each wind energy area (WEA), as well as revenue by port and vessel dependence upon operations in each WEA. Landing and revenue data can be accessed at: https://www.greateratlantic.fisheries.noaa.gov/ro/fso/reports/WIND/ALL_WEA_BY_AREA_DATA.html.
NOAA Fisheries (2023)	Upon request from the Proponent, NOAA Fisheries provided landing and revenue data (2008–2021) for the OECC (including the Western Muskeget Variant). This data from NOAA Fisheries is the same data used for revenue estimates for the lease areas in the Socioeconomic Impacts of Atlantic Offshore Wind Development website (see above).

1.3.1 Thresholds of Data Requirements

In order to use fishing revenue data to estimate the economic exposure of commercial fishing to offshore wind energy projects assumptions must be made about thresholds or minimum standards for defining what BOEM refers to as fishing values that "may be impacted" (Kirkpatrick et al. 2017). For the purposes of this report, it is assumed that all fishing revenues in the Lease Area and in areas of cable installation activity in the OECC "may be impacted." It is also assumed that fishing values outside the Lease Area and OECC "may be impacted" if New England Wind can be expected to result in either increased fishing vessel transit times resulting from vessels avoiding those areas or fishing congestion impacts resulting from vessels diverting fishing effort from those areas to other areas that are already being fished.

1.4 Baseline Commercial Fisheries Landings and Values

Data summarizing commercial fishing activity within the Lease Area during years 2008 through 2021 are available from NOAA Fisheries (NOAA Fisheries 2022). These data include annual landings and revenue by species, fishery management plan (FMP), gear type, state, and port and were used in this report to identify the primary commercial fisheries, species, gear types, ports, and states potentially affected by development in the Lease Area (NOAA Fisheries 2022).

The data summarized in Tables 1-2 through 1-7 are based on NOAA Fisheries' analysis of combined data from VTRs and dealer reports submitted by vessels with federal permits. Annual values reported in these tables have all been deflated to 2021 dollars using the U.S. Bureau of Economic Analysis (BEA) Gross Domestic product (GDP) Implicit Price Deflator.[7]

Table 1-2 provides the annual landed weight and value of all species harvested within the Lease Area between 2008 and 2021.

Table 1-2 Annual Landings from the Lease Area, 2008-2021

Year	Landings (lbs)	Value (2021 dollars)
2008	565,180	$519,479
2009	581,476	$437,906
2010	698,373	$575,805
2011	387,260	$403,508
2012	512,867	$559,010
2013	838,105	$741,944
2014	623,448	$685,778
2015	459,595	$564,633
2016	920,341	$958,501
2017	415,918	$425,740
2018	313,375	$331,341
2019	401,696	$423,934
2020	281,835	$294,468
2021	426,745	$562,379
Annual Average	530,444	$534,602

Notes:
1. NOAA Fisheries (2022)
2. Values have been deflated to 2021 dollars.

[7] Both NOAA Fisheries and BOEM recommend making inter-annual fish price adjustments using the GDP Price Deflator rather than Producer Price Indices for seafood products. Descriptions of the annual GDP Price Deflator and how it differs from annual Producer Price indices can be found at the BEA website at: https://www.bea.gov/data/prices-inflation.

The 14-year annual average weight and value of the 15 most exposed species in the Lease Area are shown in Table 1-3. According to NOAA Fisheries' analysis, the five most exposed species in the Lease Area are longfin squid, silver hake, monkfish, Jonah crab, and skates. These 15 species account for approximately 88% of annual average commercial fishing revenues from the Lease Area.

Table 1-3 Landings from the Lease Area by Species, 2008-2021

Species	Annual average Landings (lbs)	Annual average Value (2021 dollars)	Percentage of Annual average Lease Area Value
Longfin Squid	92,658	$127,631	24%
Silver Hake	71,705	$52,515	10%
Monkfish	29,682	$50,020	9%
Jonah Crab	45,100	$41,535	8%
Skates	83,443	$38,972	7%
Summer Flounder	10,413	$33,613	6%
American Lobster	6,455	$33,333	6%
Scup	42,218	$32,175	6%
Sea Scallop	2,425	$26,726	5%
Yellowtail Flounder	4,613	$8,473	2%
Golden Tilefish	1,478	$6,165	1%
Atlantic Herring	41,532	$5,637	1%
Butterfish	7,567	$5,079	1%
Winter Flounder	1,742	$4,930	1%
Black Sea Bass	763	$2,943	1%
All Others	88,650	$64,853	12%
Total	530,444	$534,602	-

Notes:
1. NOAA Fisheries (2022)
2. Values have been deflated to 2021 dollars.

The 14-year annual average weight and value of the ten most exposed FMPs in the Lease Area are shown in Table 1-4. These FMPs account for approximately 89% of annual average commercial fishing revenues from the Lease Area. According to NOAA Fisheries (NOAA 2022), between 2008 and 2021, the three highest value FMPs within the Lease Area were Mackerel, Squid, and Butterfish; the Atlantic States Marine Fisheries Commission (ASMFC) FMP; [8] and Summer Flounder, Scup, and Black Sea Bass.

[8] The ASMFC FMP includes the following species: American lobster, cobia, Atlantic croaker, black drum, red drum, menhaden, NK sea bass, NK seatrout, spot, striped bass, tautog, Jonah crab, and pandalid shrimp.

Table 1-4 Landings from the Lease Area by Fishery Management Plan, 2008-2021

Fishery Management Plan	Annual average Landings (lbs)	Annual average Value (2021 dollars)	Percentage of Annual Average Lease Area Value
Mackerel, Squid, and Butterfish	104,400	$134,318	25%
ASMFC FMP	51,596	$74,963	14%
Summer Flounder, Scup, Black Sea Bass	53,395	$68,732	13%
Small-Mesh Multispecies	80,756	$55,812	10%
Monkfish	29,682	$50,020	9%
Skates	83,443	$38,972	7%
Sea Scallop	2,425	$26,726	5%
Northeast Multispecies	7,254	$14,819	3%
Tilefish	1,480	$6,170	1%
Atlantic Herring	41,532	$5,637	1%
All Others	74,482	$58,432	11%
Total	530,444	$534,602	-

Notes:
1. NOAA Fisheries (2022)
2. Values have been deflated to 2021 dollars.

The 14-year annual average weight and value of landings from specific gear types are shown in Table 1-5. These five gear types account for approximately 93% of annual average commercial fishing revenues from the Lease Area.

Table 1-5 Landings from the Lease Area by Gear Type, 2008-2021

Gear Type	Annual average Landings (lbs)	Annual average Value (2021 dollars)	Percentage of Annual average Lease Area Value
Bottom Trawl	287,050	$286,491	54%
Gillnet (sink)	82,245	$79,275	15%
Lobster Pot	54,560	$76,685	14%
Clam Dredge	41,837	$33,661	6%
Scallop Dredge	1,726	$18,822	4%
All Others	63,049	$39,684	3.5%
Total	530,466	$534,618	-

Notes:
1. NOAA Fisheries (2022)
2. Values have been deflated to 2021 dollars.

The 14-year annual average weight and value of landings in the five most exposed states to fishing revenue losses in the Lease Area are shown in Table 1-6. These states account for approximately 97% of the landed value of the annual average commercial fish harvest from the Lease Area.

Table 1-6 Landings from the Lease Area by State, 2008-2021

State	Annual average Landings (lbs)	Annual average Value (2021 dollars)	Percentage of Annual average Lease Area Value
Massachusetts	247,383	$235,245	44%
Rhode Island	231,487	$224,923	42%
New York	25,408	$34,087	6%
Connecticut	16,238	$17,086	3%
Virginia	3,962	$8,868	2%
All Others	5,313	$13,470	3%
Total	529,791	$533,679	-

Notes:
1. NOAA Fisheries (2022)
2. Values have been deflated to 2021 dollars.

The 14-year annual average weight and value of five most exposed ports in the Lease Area are shown in Table 1-7. These five ports account for approximately 78% of the landed economic value of fish harvested in the Lease Area.

Table 1-7 Landings from the Lease Area by Port, 2008-2021

Port	Annual average Landings (lbs)	Annual average Value (2021 dollars)	Percentage of Annual average Lease Area Value
Point Judith, RI	175,301	$184,904	35%
New Bedford, MA	161,651	$159,551	30%
Montauk, NY	24,873	$33,096	6%
Chatham, MA	20,251	$20,936	4%
Fairhaven, MA	20,306	$20,164	4%
All Others	127,409	$115,027	22%
Total	529,790	$533,678	-

Notes:
1. NOAA Fisheries (2022)
2. Values have been deflated to 2021 dollars.

2 ESTIMATES OF ECONOMIC EXPOSURE

2.1 Economic Exposure in the Lease Area

2.1.1 Unadjusted Estimates of Fishing Values for the Lease Area

Table 2-1 presents the 14-year total and annual average fishing revenues generated in the Lease Area during years 2008–2021, valued in 2021 dollars (NOAA Fisheries 2022). These annual values range from $294,468 to $958,501 and average $534,602 or $1,301 per km^2. They are referred to in this report as "unadjusted" fishing revenues because they do not include the value of lobster and Jonah crab landings harvested in the Lease Area by vessels that fish only for those two species and do not need to file federal VTRs on which NOAA Fisheries fishing revenue estimates are based.

Table 2-1 Estimates of Annual Commercial Fishing Economic Exposure in the Lease Area, Unadjusted for Lobster and Jonah Crab

Total Fishing Revenues (2008–2021)	Annual average Revenues	Annual average Fishing Revenues per km^2
$7,484,427	$534,602	$1,301

2.1.2 Adjustments for Lobster and Jonah Crab

To provide a basis for estimating full economic exposure annual fishing values presented in Table 2-1 were adjusted to account for lobster and Jonah crab landings by vessels that land only these two species and do not file federal VTRs. Federal fishing permit data are available that show how many pots are permitted to fish for lobster and Jonah crab in Lobster Management Area 2 (LMA 2) by vessels that file VTRs and by vessels that do not file VTRs.

Federal lobster fishing permit data for 2022 show that 56,039 pots were permitted to harvest lobster and Jonah crab in LMA 2, and that 34,946 of these pots or 62% of them were permitted to vessels that fish for species other than lobster and Jonah crab and therefore file VTRs. The remaining 21,093 pots, or 38% of all permitting pots in LMA 2, are permitted to vessels that fish only for lobster and Jonah crab and are not required to file VTRs.

NOAA Fisheries (2022) data shows that during the years 2008-2021, the total value of fish harvested in the Lease Area by vessels that filed VTRs included $466,667 worth of lobster, an annual average value of $33,333, and $581,487 worth of Jonah crab, an annual average value of $41,535, resulting in annual average revenues from both species of $74,868. This results in annual average lobster and Jonah crab revenues per pot permitted in LMA 2 to vessels that file VTRs is $2.14.

If the characteristics of lobster and Jonah crab fishing by vessels that do not file VTRs were similar to those of vessels that do file VTRs, the $2.14 in annual lobster and Jonah crab revenues in the Lease Area per pot permitted to vessels that file VTRs could be applied equally to pots permitted

to vessels that do not file VTRs. That would result in lobster and Jonah crab revenues not included in VTR records accounting for 38% of revenues from those two species in the Lease Area and would increase estimated dollar value of lobster and Jonah crab landings in the lease area by $45,139.

However, information received from Massachusetts Division of Marine Fisheries (MADMF) lobster fishery experts indicated that it is not reasonable to assume that revenues per permitted pot are the same for vessels that file and do not file VTRs. They indicated that vessels that fish only for lobster and Jonah crab and do not file VTRs are more dedicated to fishing for those two species than vessels that harvest those two species along with other species and do file VTRs. That feedback indicated that compared with vessels that do file VTRs, vessels that do not file VTRs are likely to: (1) actively fish a higher percentage of permitted pots, (2) deploy a higher percentage of active pots in the wind energy development areas, and (3) achieve higher annual average catch rates and fishing revenues per active pot.

To account for these three factors the annual value of lobster and Jonah crab harvested by non-VTR vessels in the Lease Area is estimated here by assuming that pots permitted to non-VTR vessels are: 25% more active, spend 25% more active fishing time in the Lease Area, and generate 25% more fishing revenues than pots permitted to vessels that file VTRs. In effect, these assumptions result in $4.18 as an estimate of revenues generated in the Lease Area per pot permitted to non-VTR vessels, that is $2.14 x 1.25 x 1.25 x 1.25. That means the 21,093 pots permitted to non-VTR vessels are estimated here to generate approximately $88,261 in annual lobster and Jonah crab revenues from the Lease Area that are not included in fishing revenues reported in NOAA Fisheries data (2022) as shown in Table 2-2.[9]

Table 2-2 Estimates of Annual Commercial Fishing Economic Exposure in the Lease Area, Adjusted for Lobster and Jonah Crab

Total Fishing Revenues (2008–2021)	Annual average Fishing Revenue	Annual average Fishing Revenues per km^2
$8,720,081	$622,863	$1,515

[9] Note this adjustment method is conservative and likely results in a high estimate of the annual lobster and Jonah crab revenues from the Lease Area that are not included in fishing revenues reported in NOAA Fisheries (2022).

2.1.3 Final Estimate of Annual Fishing Revenues (Economic Exposure) in the Lease Area

Table 2-2 shows that annual average fishing revenues generated in the Lease Area during 2008–2021, adjusted to account for unreported lobster and Jonah crab landings, equal $622,863. This represents an estimate of the annual economic exposure of commercial fisheries if all commercial fishing revenues from the Lease Area were lost for a full year and not recouped by fishing effort shifting from the Lease Area to other fishing areas.

Table 2-3 presents estimates of annual economic exposure by state based on each state's shares of fishing revenues in the Lease Area from NOAA Fisheries (2022).[10] Commercial fishing fleets from Massachusetts and Rhode Island face the most economic exposure in the Lease Area, accounting, respectively, for 44% and 42%.

Table 2-3 Estimate of Commercial Fishing Economic Exposure in the Lease Area by State, Adjusted for Lobster and Jonah Crab

State	Annual average Value (2021 dollars)	Percentage of Annual average Lease Area Value
Massachusetts	$274,557	44%
Rhode Island	$262,510	42%
New York	$39,784	6%
Connecticut	$19,941	3%
Virginia	$10,350	2%
North Carolina	$9,814	2%
New Jersey	$5,356	1%
All Others	$550	0.1%

Notes:
1. NOAA Fisheries (2022)
2. Values have been deflated to 2021 dollars.

[10] Note that these state shares of fishing revenues from the Lease Area assume that state shares of unreported lobster and Jonah crab revenues are the same as state shares of all commercially harvested species.

2.2 Economic Exposure in the OECC

2.2.1 Overview

Table 2-4 shows that the annual average FRD in the OECC is $2,505 per km^2 (NOAA Fisheries 2023). This provides a baseline value for estimating economic exposure in the OECC.

As described in Section 1.2.2, this report assumes that a 1 km fishing preclusion buffer will be established around where cable installation is taking place, which will result in a fishing preclusion area of 3.14 km^2 (776 acres). Within the OECC, five offshore export cables, two cables for Phase 1 and three cables for Phase 2, will be installed. Typical cable laying speeds are expected to range from 328 ft to 656 ft (100 to 200 meters) per hour and cable laying is expected to occur 24 hours per day. The duration of cable laying activity in the OECC will be only a few months.

However, cable installation requires several pre-lay activities such as surveys of cable alignments, pre-lay grapnel runs of cable alignments, and boulder relocation, and some "post-lay activities" such as cable splicing and the placement of cable protection. Based on the expected durations of those activities and cable installation, the Proponent's export cable engineers have estimated that overall cable installation activity in the OECC will take place during approximately 22.5 months (1.875 years), with Phase 1 estimated to take nine months and Phase 2 estimated to take 13.5 months.

As Figure 1-2 illustrates the area of fishing impacts will move along the OECC as cable installation activities take place resulting in fishing impacts at any particular time along approximately 2 km (1.2 miles) of the OECC; that is, 1 km forward of and 1 km aft of cable installation vessels. This means that approximately 3% of the overall length of the OECC will be precluded to commercial fishing around where cable installation is underway. At any particular time it is not expected that commercial fishing will be precluded or impaired in the remaining 97% of the OECC where cable installation is either completed or planned.

Possibilities exist that disruptions in the rate of cable installation may increase the duration of cable installation impacts on commercial fishing, but the area of fishing impacts at any particular time is expected to be limited to approximately 3.14 km^2 (776 acres) around where cable installation activities are underway. There may also be circumstances where more than one cable installation activity will take place at a particular time which will result in a proportional increase in the area of fishing impacts during those times. However, overlapping cable installation activities will result in a proportional decrease in the expected duration of overall cable installation activities and so is expected to result in no net change in overall commercial fishing impacts.

2.2.2 Estimating Economic Exposure in the OECC

The estimate of economic exposure in the OECC was generated by estimating three factors, A, B, and C, and multiplying them together.

Where:

A = expected FRD (annual average fishing revenues per km^2) in the OECC ($2,505)

B = area precluded to fishing during ongoing cable installation activities (3.14 km^2)

C = the total duration of cable installation activities

Such that

EE_{OECC} = A x B x C = Annual Economic Exposure in the OECC

Table 2-4 presents estimates of A, B, and C for both Phases and for the entire OECC and resulting estimates of economic exposure during cable installation. The estimated overall economic exposure in the OECC during both Phase 1 and Phase 2 using the annual average FRD is $14,748 (2021 dollars). Table 2-5 shows the estimates of economic exposure for the OECC by state. For the OECC (including the Western Muskeget Variant), Massachusetts and Rhode Island experience the highest percentage of economic exposure.

Table 2-4 Estimate of Commercial Fishing Economic Exposure in the OECC During Construction Using Annual Average Fishing Revenue

OECC	A Annual Average Fishing Revenue per km^2	B Fishing Preclusion Area (km^2)	C Construction Period (years)	EE Economic Exposure During Construction
Phase 1 (2 cables)	$2,505	3.14	0.75	$5,899
Phase 2 (3 cables)	$2,505	3.14	1.125	$8,849
Entire OECC (Phase 1 + Phase 2)	$2,505	3.14	1.875	$14,748

The analysis described above was also conducted for the Western Muskeget Variant. Based on fishing revenue data provided by NOAA Fisheries for years 2008-2021, annual average fishing revenue in the Western Muskeget Variant is $2,524 per km^2 (2021 dollars), which is just $19 higher than the OECC value of $2,505 per km^2. In the unlikely event the Western Muskeget Variant is used to install one cable for Phase 2, economic exposure is estimated to be $8,871 during the 13.5 months when one cable is being installed in the Western Muskeget Variant and two cables are being installed in the OECC. This would result in overall economic exposure of approximately $14,771, just $22 higher than the OECC.

Table 2-5 Estimate of Commercial Fishing Economic Exposure in the OECC by State

State	Percentage of Annual Average OECC Fishing Revenues (2008–2021)
Massachusetts	53.87%
Rhode Island	37.70%
New York	4.73%
Connecticut	1.96%
North Carolina	0.98%
Virginia	0.53%
New Jersey	0.38%
All Others	1.74%

Notes:
1. NOAA Fisheries (2023)

In order to conservatively account for seasonal variability in landings and revenue in the OECC, the Proponent also estimated the economic exposure in the OECC using the monthly average fishing revenue per km^2 from 2008 through 2021, which ranges from \$20 per km^2 (in January) to \$523 per km^2 (in May) (NOAA Fisheries 2023). Table 2-6 presents estimates of A, B, and C for both Phases using the monthly average fishing revenue per km^2 from the nine highest months (\$234 per km^2 for April through December) since the duration of Phase 1 cable installation is estimated to be nine months. The estimated overall economic exposure in the OECC during both Phase 1 and Phase 2 using the conservative monthly average fishing revenue per km^2 from the nine highest months is \$16,532 (2021 dollars).

Table 2-6 Estimate of Commercial Fishing Economic Exposure in the OECC During Construction using Monthly Average Fishing Revenue

OECC	A Highest Nine Months of Average Fishing Revenue per km^2	B Fishing Preclusion Area (km^2)	C Construction Period (months)	EE Economic Exposure During Construction
Phase 1 (2 cables)	\$234	3.14	9	\$6,613
Phase 2 (3 cables)	\$234	3.14	13.5	\$9,919
Entire OECC (Phase 1 + Phase 2)	\$234	3.14	22.5	\$16,532

2.3 Summary of Economic Exposure

Annual economic exposure in the Lease Area is estimated based on the assumption that all fishing will be precluded for a full year with none of the associated losses in fishing revenues recouped as a result of fishing effort being diverted from the Lease Area to other fishing areas. Since annual fishing revenues in the Lease Area are estimated in Section 2.1 to be $622,863 (2021 dollars), this represents full annual economic exposure in the Lease Area during each year of construction. As shown in Tables 2-4 and 2-6, economic exposure related to cable installation in the OECC is estimated to be $14,748-$16,532. Economic impact estimates based on estimates of economic exposure presented in this report will be determined based on updated BOEM guidance and consultations with the states through the CZMA review processes.

3 INDIRECT SOURCES OF ECONOMIC EXPOSURE

3.1 Fishing Congestion Impacts Outside the Lease Area and the OECC

In fishery economics, the term "congestion externalities" refers to increases in vessel-specific or fleetwide fishing costs and/or reductions in fishing revenues that result when so many vessels are operating in a fishing area that they interfere with one another. This is typically the result of some combination of fish being highly concentrated in an area, the fishery being severely overcapitalized, or regulations that limit fishing times or fishing areas in ways that concentrate fishing effort when and where fishing is allowed.

In general, the likelihood that the introduction of new fishing effort in an area will result in fishing congestion impacts depends on the size of the fishing area, the concentration of fish and existing fishing effort in the area, the amount of new fishing effort entering the area, and whether fleetwide fish harvests in the area are limited by fish stock abundance or fishing regulations, or both. It is uncommon for fishing congestion impacts to be significant in open ocean fisheries. Possible exceptions are when fishing regulations involve fishing area or fishing season closures or quota limitations that cause fishing effort to concentrate in particular ocean areas.

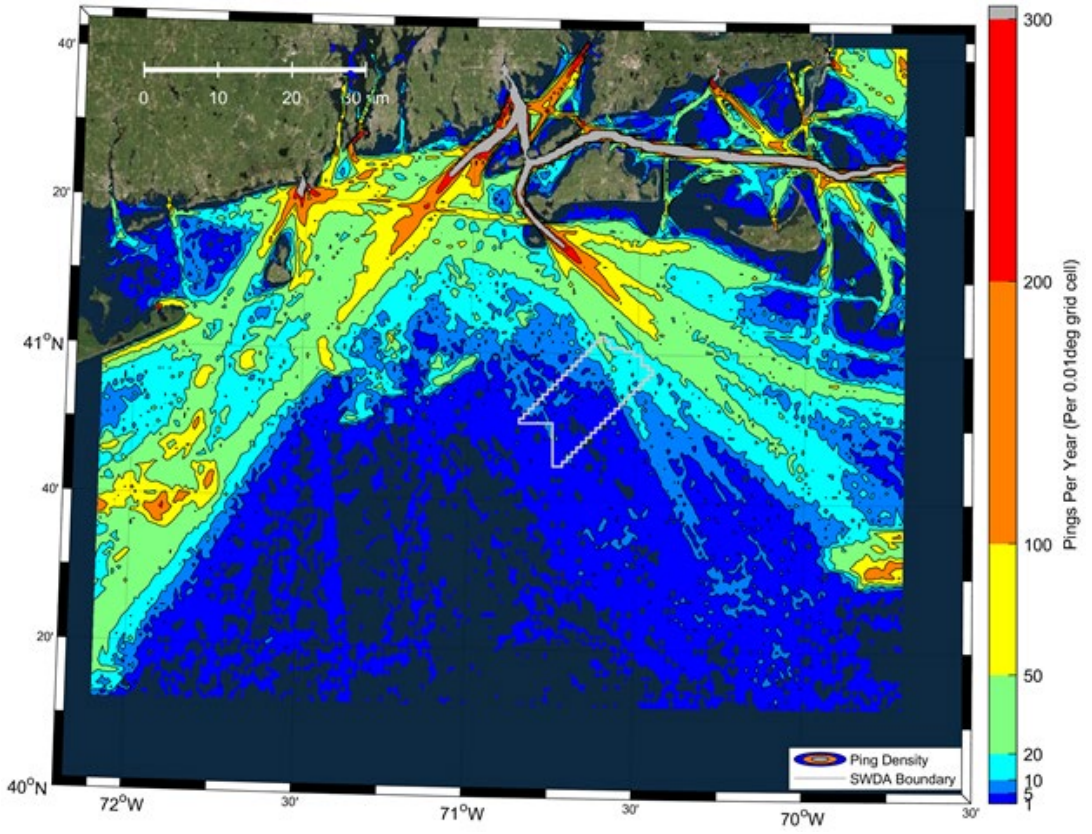
Concentrations of fishing effort and related fishing congestion impacts could result from large offshore wind energy projects. However, the available evidence described below indicates that it is extremely unlikely that the level of potential fishing effort that could be diverted from the SWDA or the OECC to other areas could constitute a significant source of potential fishing congestion impacts. In fact, AIS data indicate that vessels that spend time fishing in the Lease Area and OECC already spend most of their fishing time in adjacent and nearby fishing areas and do not constitute a significant new source of potential fishing effort in those areas.

3.1.1 Potential Fishing Congestion Impacts from the Lease Area

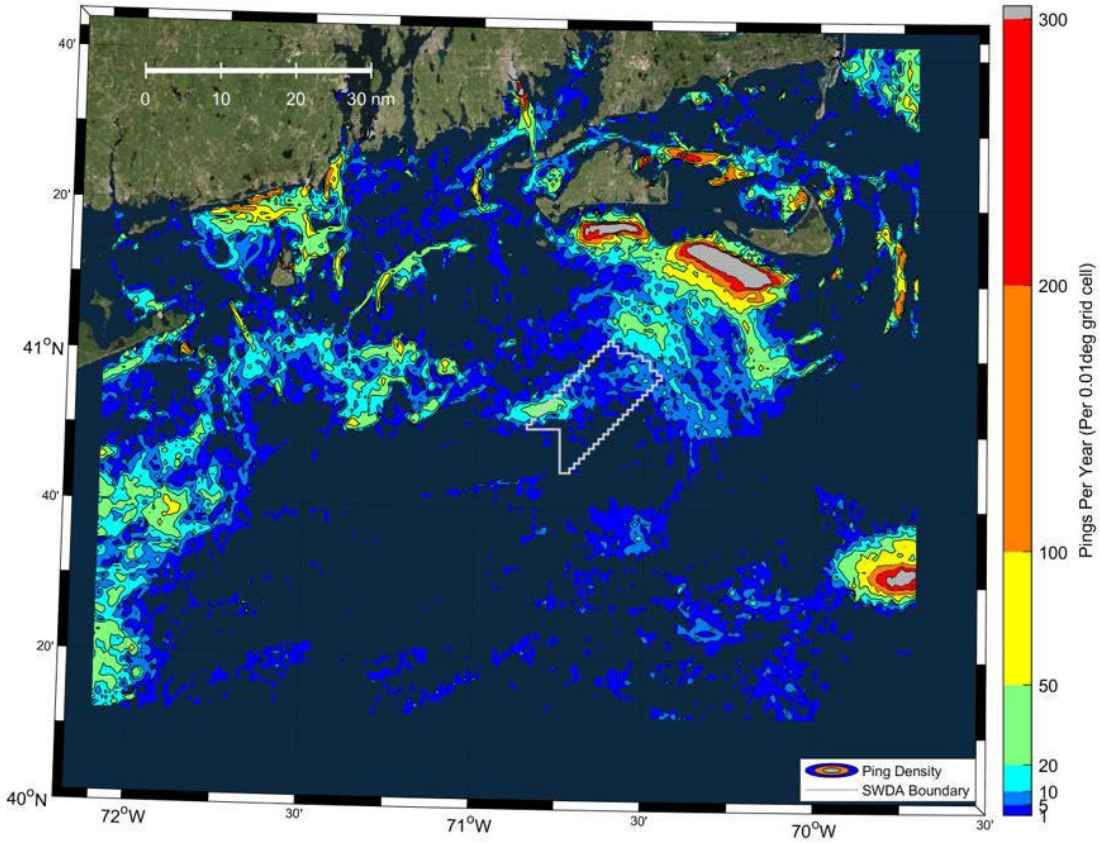
Figure 3-1 and Table 3-1 summarize AIS-equipped fishing vessel traffic in the SWDA. Table 3-1 shows that during 2016–2019 fishing vessels were engaged in fishing in the SWDA on an average of 146 trips per year. During those years the number of fishing trips in the SWDA averaged over ten during only two months (August and September). Based on the analyses of AIS data from 2016 to 2019, Baird (2021) concludes:

"The analyses of AIS data indicated that historical vessel traffic levels within the SWDA are relatively low. The vessel traffic is seasonal in nature with approximately 0.5 vessels every day on average in the winter months to a peak of 6.4 vessels per day on average in the month of August. An evaluation of vessel proximity revealed that two or more vessels are present within the SWDA simultaneously for only 124 hours per year on average (1.4% of the year). There was one short period (a few hours) in September 2016 in which up to 14 vessels were in the SWDA with most of these vessels sailing at speeds less than 4 knots while trawling." (Baird 2021)

This modest level of fishing effort is not a significant enough source of potential new fishing effort entering nearby fishing areas to pose fishing congestion threats in those areas. Also, according to New England Wind's Navigation Safety Risk Assessment (COP Appendix III-I), fishing vessels that operate in the SWDA are already part of the established fishing fleet operating in adjacent and nearby areas and already spend most of their fishing time in those areas. In summary, based on the available data, the development of the SWDA should not be expected to result in fishing congestion impacts in nearby fishing areas.



AIS Vessel Traffic Density Plot for Transiting Fishing Vessels (>4 knots)



AIS Vessel Traffic Density Plot for Trawling Fishing Vessels (<4 knots)

Figure 3-1

Fishing Vessel Activity In and Around the SWDA (2016-2019 AIS Data)

Table 3-1 Average AIS Fishing Vessel Traffic through the SWDA (2016–2019)

Year (2016–2019)	Monthly Average												Annual Average Total (Unique Vessels)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	
Number of Unique Fishing Vessels (fishing)	0	0	0	1	3	3	5	10	19	4	1	1	33
Number of Unique Fishing Vessel Transits (fishing)	0	0	1	1	4	4	9	50	72	6	1	1	146
Number of Unique Fishing Vessels (transiting)	3	5	6	13	26	30	36	39	36	13	6	3	101
Number of Unique Fishing Vessel Transits (transiting)	8	8	10	18	43	63	81	99	71	20	8	5	422

Notes:

1. Data source is Baird 2021.
2. Analysis has been completed to separate transiting fishing vessels and those fishing vessels that are likely to be fishing (≤4 knots (kts) fishing, >4 kts transiting).
3. Transiting and actively fishing tracks can be doubly counted.

3.1.2 Potential Fishing Congestion Impacts from the OECC

As Figure 1-2 through Figure 1-4 indicate, the OECC represents a small portion of the available fishing grounds in the in the areas it passes through in Nantucket Sound and the areas south of Nantucket Sound and Martha's Vineyard, and accounts for a small share of the fishing effort and fishing revenues generated in those areas. As described above in Section 2.2, during New England Wind construction and installation activities in the OECC commercial fishing will only be precluded in temporary safety buffer zones of 3.14 km^2 (776 acres) established around where cable installation activity is underway. The remainder of the OECC, where cable installation is either completed or planned, will remain open to fishing vessels. It is not expected that these small areas of temporary fishing limitations within the OECC during limited cable installation activities will cause significant enough shifts in fishing effort to other fishing areas or result in fishing congestion impacts.

During O&M of New England Wind, the OECC will have no impact on commercial fishing, except, as described in Section 1.2.2, potentially along short segments of the cable route where cable protection may need to be installed on the seafloor and may pose risks of bottom fishing gear snagging. While this may result in some modifications in the precise tracks of mobile bottom fishing gear in the OECC, it is unlikely to result in enough fishing effort by those vessels shifting away from the OECC to cause fishing congestion impacts in other areas.

3.2 SWDA Impacts on Fishing Vessel Transit Costs

Figure 3-2 shows the proximity of the SWDA to major nearby fishing ports and fishing areas, and the most direct (shortest distance) tracks that fishing vessels would normally use to travel between them. As Table 3-1 indicates, during 2016-2019 the annual average number of fishing vessel transits through the SWDA was 422.

After examining options for accommodating fishing and vessel transit lanes in the Massachusetts/Rhode Island Wind Energy Area (MA/RI WEA), the USCG concluded in its recent *Massachusetts and Rhode Island Port Access Route Study* (MARIPARS) that the standard and uniform grid patterns being planned in wind development areas to facilitate safe and efficient fishing are "sufficient to maintain navigational safety and provide vessels with multiple straight-line options to transit safely through the MA/RI WEA" (USCG 2020).

The Proponent has sited the WTG/ESP positions within the SWDA consistent with the recommendations of the MARIPARS with WTG/ESP positions oriented in fixed east-to-west rows and north-to-south columns with 1 nautical mile (1.9 km) spacing between positions. This grid layout provides multiple 1 NM wide corridors in the east-west and north-south directions as well as 0.6 NM (1.1 km) wide corridors in the northwest-southeast and northeast-southwest directions. As the recent MARIPARS study indicates, this will allow multiple straight-line options for fishing vessels to transit safely through the SWDA (USCG 2020). During O&M of New England Wind, there will be no restrictions on fishing vessels operating in or transiting through the SWDA.

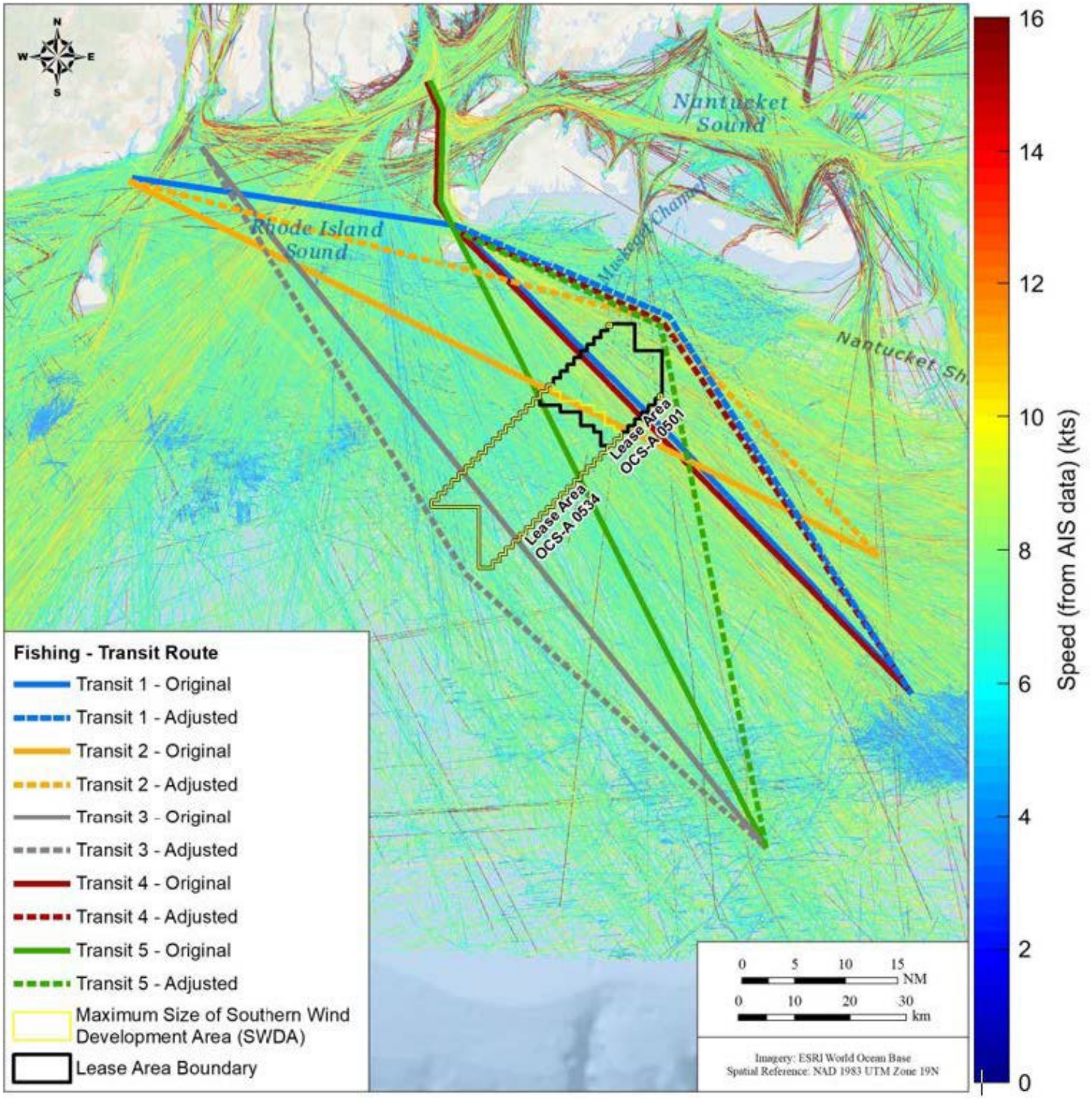


Figure 3-2

Schematic Showing Possible Fishing Vessel Re-Routing Around the SWDA

However, despite the existence of transit/fishing corridors in the SWDA, some fishermen may opt to reroute transits around the SWDA, especially during extreme weather. Figure 3-2 depicts how transiting around, rather than through, the SWDA will affect transit distances by depicting "original" routes through the SWDA (solid lines) and "adjusted" routes (dashed lines) around the SWDA. Table 3-2 presents associated differences in transit distances (NM) and added transit times (minutes) based on the average fishing vessel transit speed through the SWDA of 7.6 knots (Baird 2021).

Table 3-1 displays the average number of unique AIS-equipped fishing vessels that transited the SWDA and the average number of unique fishing vessel transits through the SWDA by month from 2016 to 2019. It shows that during these years, the average monthly number of fishing vessel transits through the SWDA ranged from 5 to 99 vessel transits and annual vessel transits averaged 422 (Baird 2021).

During construction and installation activities in the SWDA, fishing vessels will be allowed to transit through the SWDA but will need to avoid temporary safety buffer zones in the immediate vicinity of construction and installation vessels. This may require at least some of the vessels transiting through the SWDA to implement minor adjustments from the most direct transit route through the SWDA in order to use the transit/fishing corridors created by the WTG/ESP layout in the SWDA.

Table 3-2 Estimated Increase in Fishing Vessel Transit Distances and Times with Re-Routing Around the SWDA and Lease Area OCS-A 0501

Transit Route	Increase in Distance (NM)	Average Increase in Transit Time (minutes)	Percentage Increase in Transit Time
Transit 1 (blue)	1.6	12	2%
Transit 2 (orange)	3	24	4%
Transit 3 (yellow)	0.8	6	1%
Transit 4 (red)	1.5	12	2%
Transit 5 (green)	5.8	46	7%

Notes:

1. Data source is Baird 2021.

It is not possible to predict how many annual transits through the SWDA may be rerouted around the SWDA during and after construction. For purposes of illustrating potential economic exposure, therefore, it is assumed here that 100% of annual fishing vessel transits through the SWDA will reroute around the SWDA.

As shown in Figure 3-2 and Table 3-2, at a typical steaming speed of 7.6 knots, the expected increase in transit time around the SWDA between major fishing ports and important fishing areas ranges from 6 minutes to 46 minutes. If each of the 422 annual transits through the SWDA were

rerouted around the SWDA, and those transits experienced the maximum estimated increase in transit time of 46 minutes, the increase in annual fleetwide transit time would be 324 hours. Assuming the average fishing vessel steaming at 7.6 knots consumes fuel (diesel) at a rate of 25 gallons per hour and purchases diesel fuel at a dockside price of $5.00 per gallon, this additional transit time would add approximately $57.50 to fuel costs per transit and add $24,265 to annual fleet-wide fuel-based transit costs for AIS-equipped vessels.

This estimate of a $24,265 increase in annual fleetwide transit cost if all current annual transits through the SWDA were to detour around the SWDA, is sensitive to assumptions about steaming speeds, fuel consumption rates, and fuel prices, and does not reflect operating costs other than fuel costs or the opportunity cost of any lost fishing time resulting from longer transit times. However, as Table 3-5 illustrates, increases in typical transit times associated with rerouting around the SWDA result in relatively minor increases in overall transit times even if all current transits through the SWDA were to reroute around it. From a fleetwide perspective, therefore, factoring in potential transit cost impacts beyond fuel costs described above will be more than offset by a reduction in estimated costs if the extreme assumption that all fishing vessels that currently transit through the SWDA will be transiting around the SWDA is relaxed. In fact, most vessels that currently transit through the SWDA can be expected to continue transiting through rather than around the SWDA and therefore can be expected to experience little to no increase in transit times or costs.

4 CONCLUSIONS

BOEM refers to economic exposure as "a starting point to understanding potential *economic impacts* … if a harvester opts to no longer fish in the area and cannot recapture that income in a different location" (BOEM 2021a). Section 2 of this report developed $622,863 as an estimate of full annual economic exposure in the Lease Area and $14,748-$16,532 is an estimate of economic exposure during cable installation in the OECC. However, lost fishing revenues would be as high as these estimates of economic exposure only if fishing vessels generate no fishing revenues when they are precluded from fishing in parts of the Lease Area or the OECC. This requires assuming that they will either stay in port or remain idle at sea or will continue fishing while generating no fishing revenues. All of these responses to the areas impacted by New England Wind are highly unlikely because they would require all fishing vessel owner/operators who typically operate in the Lease Area or OECC to act in an economically irrational manner.[11] Economic impact estimates based on estimates of economic exposure presented in this report will be determined based on updated BOEM guidance and consultations with the states through the CZMA review processes.

[11] A basic tenet of economics is that businesses will continue to operate in the short-term as long as revenues (e.g., ex-vessel value of landings) exceed operating costs (e.g., trip expenses), which allows net operating profits to offset at least some fixed costs. It is highly unlikely that the limited areas and durations of fishing preclusions associated with New England Wind would cause fishermen to cease fishing (return to port or remain idle at sea), as opposed to diverting fishing effort away from impact areas. In many meetings related to Vineyard Wind 1, commercial fishermen themselves acknowledged that fishing will likely continue in or at least around offshore wind farms.

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APPENDIX A – ECONOMIC EXPOSURE OF FOR-HIRE RECREATIONAL FISHERIES TO THE NEW ENGLAND WIND LEASE AREA

1 INTRODUCTION

For-hire recreational fishing vessels include both "charter boats" that take small groups of fishers (usually six or fewer) who hire or "charter" the vessel and "headboats" that take multiple individual anglers (usually more than 6) and/or small groups of anglers on a fee per person basis.

Figure 2.1 depicts for-hire fishing areas south of Martha's Vineyard used by recreational fishing vessels based in Massachusetts and Rhode Island, as identified by Woods Hole Oceanographic Institute's (WHOI) 2022 survey of Massachusetts- and Rhode Island-based charter vessel operators (Kite-Powell et al. 2023a, 2023b). The New England Wind Lease Area OCS-A 0534 (Lease Area) is located in this ocean area. Activities within the Lease Area may temporarily prevent for-hire recreational fishing vessels from operating in the Lease Area. If for-hire recreational fishing vessels are temporarily prevented from accessing certain fishing areas and they cannot earn angler fees by redirecting fishing activity to other fishing areas, they could lose vessel revenues resulting from reduced fishing time and lost angler days.

Based on BOEM guidance, "economic exposure refers to potential economic impacts, not predicted or expected economic impacts" and BOEM refers to economic exposure as "a starting point to understanding potential economic impacts of future offshore wind project development if a harvester opts to no longer fish in the area and cannot recapture that income in a different location" (Kirkpatrick et al. 2017). This report develops estimates of the annual economic exposure of for-hire recreational fishing vessels based in Massachusetts and Rhode Island to the Lease Area. These estimates are based on the best available data related to the annual number of for-hire fishing vessel trips within the Lease Area, expected number of anglers on those trips, and expected vessel revenues per angler.

2 DATA SOURCES

There are two potential sources of reliable and current data regarding for-hire fishing activity in and around the Lease Area. The first is a website (*Socioeconomic Impacts of Atlantic Offshore Wind Development*) that was developed by NOAA Fisheries and includes estimates of annual fishing revenues in each offshore wind lease area in New England and Mid-Atlantic waters (NOAA Fisheries 2023). The second is a set of reports prepared in 2023 by WHOI Marine Policy Center that estimate economic exposure from the Revolution Wind Lease Area and the federal waters section of the Revolution Export Cable Route (Kite-Powell et al. 2023a, 2023b). The WHOI reports include figures and data based on a 2022 survey that addressed for-hire fisheries in a broad area between Block Island and Nantucket, which includes the Lease Area.

2.1 NOAA Fisheries' Socioeconomic Impacts of Atlantic Offshore Wind Development Website

NOAA Fisheries' *Socioeconomic Impacts of Atlantic Offshore Wind Development* website includes annual for-hire fishing data from years 2008 through 2021 for wind lease areas in the Northeast and Middle Atlantic region, including the Lease Area. This data is based on vessel trip reports (VTRs), which include data regarding fishing locations, fishing times, catches, number of fish kept, numbers of anglers per trip, and other trip-specific information, and marine angler expenditure surveys (Lovell et al 2020; NOAA Fisheries 2023). The website includes annual data on numbers of vessels operating in each lease area and their annual fishing revenues and state-specific estimates of numbers of anglers, numbers of fish kept, and impacts on small and large businesses. However, the data table on the NOAA Fisheries website that describes for-hire fishing activity in the Lease Area shows "no trips" for seven of the 14 years between 2008 and 2021 and "suppressed" for the other seven years (where "suppressed" means that fewer than three vessels reported trips to the Lease Area which prevents NOAA Fisheries from releasing trip data in order to meet the "rule of three" confidentiality standard). It is significant that NOAA Fisheries data indicates that there was little to no for-hire recreational fishing in the Lease Area over the past 14 years. However, the lack of specific information on the NOAA Fisheries website about for-hire recreational fishing that does take place in the Lease Area results in it providing no basis for assessing economic exposure.

2.2 Woods Hole Oceanographic Institute's 2022 Survey of Massachusetts- and Rhode Island-based Charter Vessel Operators

In 2023 WHOI released two reports that estimate the economic exposure of commercial and for-hire recreational fishing fleets based in Massachusetts and Rhode Island to the Revolution Wind development (Lease Area OCS-A 0486). These reports present the results of a 2022 survey of charter vessel operators based in Massachusetts and Rhode Island regarding their operations during 2017-2022 in the area south of Martha's Vineyard which includes both the Revolution Wind Lease Area and the Lease Area (Figure 2-1; Kite-Powell et al. 2023a, 2023b).

While the analysis presented in these WHOI reports is focused on fishing in and around the Revolution Wind project area, the 2022 survey of Massachusetts- and Rhode Island-based charter vessel operators asked charter vessel operators to provide fishing locations within the waters south of Rhode Island and Massachusetts, which includes the Lease Area. Figure 2-2, for example, is a chart from one of the WHOI reports which shows the locations of fishing areas in the ocean area between Block Island and Nantucket that were identified by for-hire fishing boat owner/operators as part of a 2022 WHOI survey.

Because the NOAA Fisheries for-hire fisheries data for the Lease Area are not useful for purposes of estimating economic exposure, some of the data presented in these WHOI reports are extrapolated in the following section to estimate the economic exposure of for-hire recreational fishing vessels to offshore wind energy development in the Lease Area.

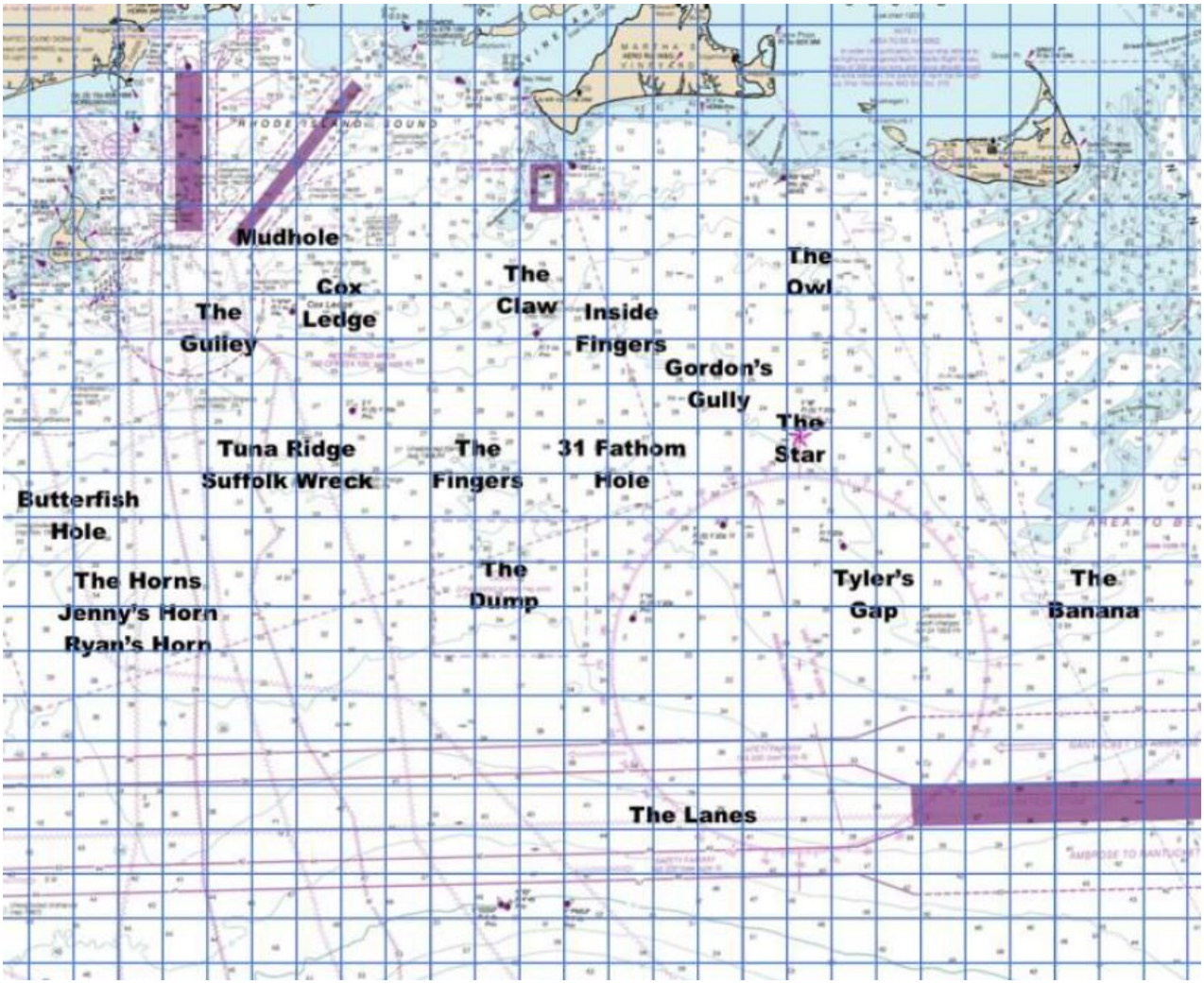

Figure 2-1 2022 WHOI For-Hire Recreational Fisheries Survey Area

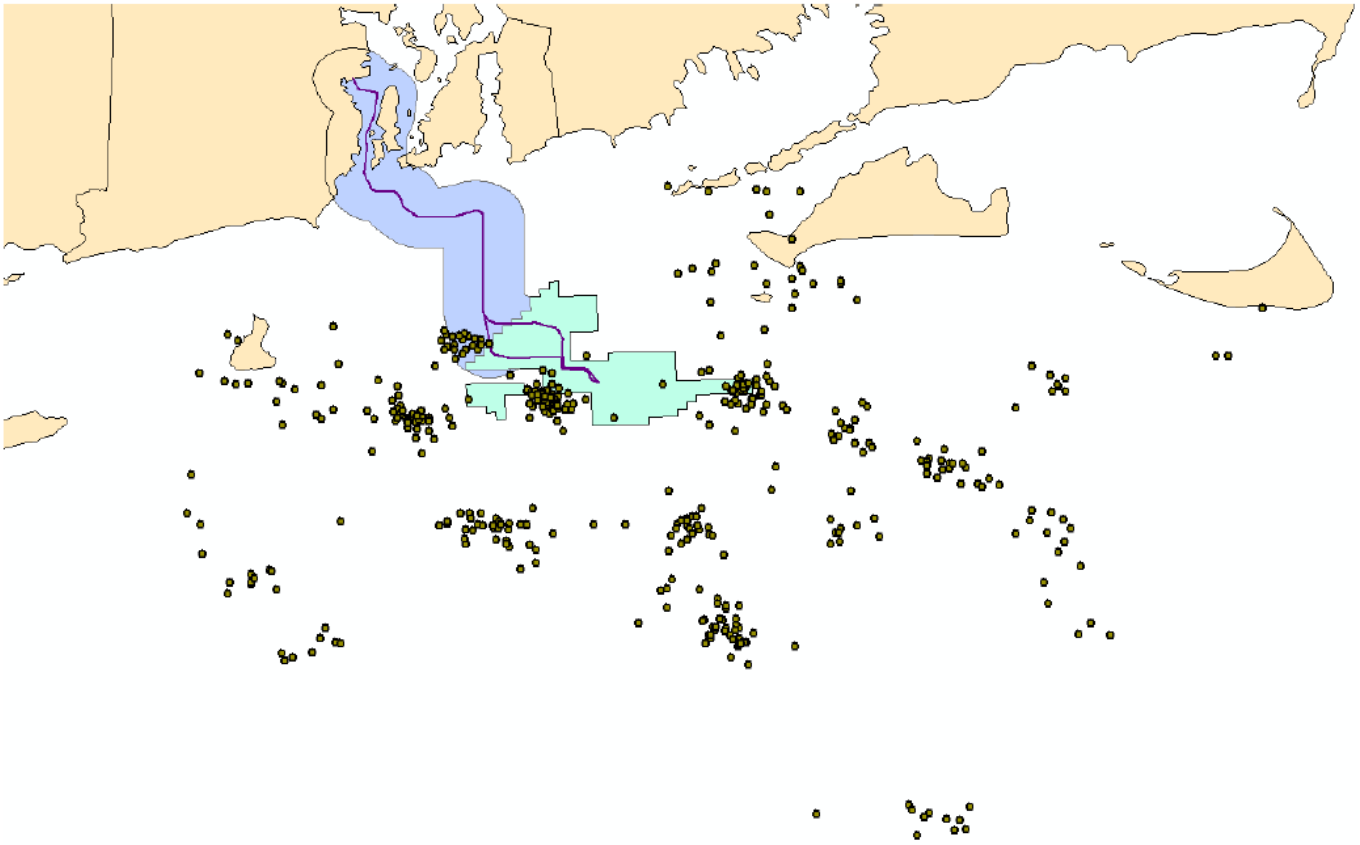

Figure 2-2 Charter Fishing Locations (2017-2022) Identified in the 2022 WHOI Survey Area

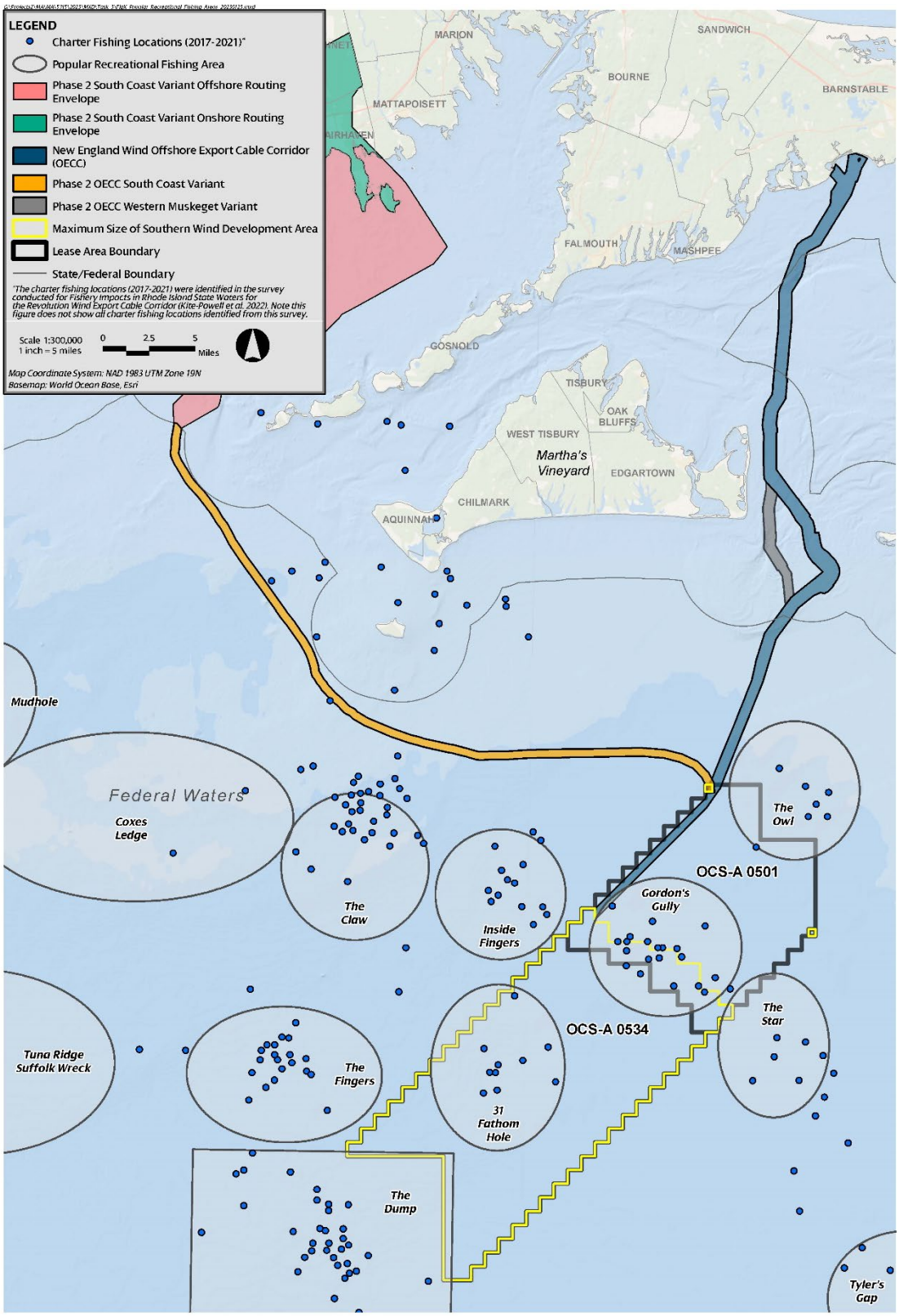

Figure 2-3 Charter Fishing Locations (2017-2022) Identified in the 2022 WHOI Survey Area with the New England Wind Offshore Development Area

3 APPROACH TO ESTIMATING ECONOMIC EXPOSURE IN THE FOR-HIRE FISHERY

The approach used to estimate annual economic exposure of for-hire recreational fishing in the Lease Area can be described as follows:

Let:

EE_{NEW} = Annual Economic Exposure in the New England Wind (NEW) Lease Area

where:
EE_{NEW} = (a) x (b) x (c)
and:
(a) = average annual number of for-hire fishing vessel trips to the Lease Area,
(b)= average number of anglers per for-hire fishing trip, and
(c)= average for-hire vessel revenues per angler.

This simple approach involves developing estimates of (a), (b), and (c) and multiplying them together to arrive at EE_{NEW}. The WHOI reports provide a reasonable basis for estimating (a) and (b) for the Lease Area and a 2013 NOAA Fisheries reference document provides a basis for estimating (c).[12]

Based on interviews with for-hire fishing vessel captains WHOI researchers estimated that approximately 100 for-hire vessels operate in the waters depicted in Figures 2-1. The 2022 WHOI survey of for-hire vessel owner/operators resulted in 66 vessels reporting that they fish in the survey area shown in Figure 2-1. Sixty-two of these vessels or 62% of the 100 vessels estimated to be operating in this area provided vessel names, including 37.5 vessels based in Massachusetts and 24.5 vessels based in Rhode Island. Assuming a fairly uniform survey response rate for the two states, the 100 vessels estimated to be operating in the area depicted in Figure 2-1 include 60.5 vessels based in Massachusetts and 39.5 vessels based in Rhode Island.

As part of the WHOI survey, for-hire fishing vessel operators identified approximately 381 specific fishing areas in the survey area as shown in Figure 2-2 and reported that the average number of annual fishing trips per for-hire vessel is 47.3 and the average number of anglers per trip is 5.41. These figures indicate that 4,730 is a reasonable estimate of the average number of annual vessel trips to the survey area and 25,589 is a reasonable estimate of the average number of annual angler trips to the survey area.

Figure 2-3 shows the New England Wind Offshore Development Area superimposed on Figure 2-2, which shows the fishing areas identified in the WHOI survey. Of the 381 specific fishing areas identified in the WHOI survey area, 14 fishing areas or approximately 3.7% are shown in Figure 2-3 to be located within the Lease Area. If for-hire fishing activity is distributed fairly uniformly across the fishing areas identified

[12] The WHOI reports used average vessel revenues per angler of $106.22 (2019$) based on average VTR data for charter and headboats in the Revolution Wind Lease Area (Kite-Powell et al. 2023a, 2023b). However, based on feedback from Massachusetts Division of Marine Fisheries staff, the average vessel revenues per angler used in this analysis is $184.74 (2021$) which is the per-person share of a typical full day charter trip as estimated by NOAA in Steinback and Brinson (2013).

in the WHOI survey, this implies that approximately 3.7% of that fishing activity takes place in the Lease Area. That results in 175 average annual for-hire fishing vessel trips and 947 annual angler trips to the Lease Area.

4 ESTIMATES OF ECONOMIC EXPOSURE

Table 4-1 develops estimates of the annual economic exposure of for-hire recreational fishing vessels in the Lease Area based on the analysis described in Section 3. Based on that analysis, the average annual number of for-hire recreational fishing vessels operating in the Lease Area is 175 (a= 175), the average number of anglers per vessel is 5.41 (b=5.41), and average vessel revenues per angler is $184.37 (c=$184.37), which results in annual economic exposure in the Lease Area, that is (a x b x c), of $174,552. Assuming uniform Rhode Island and Massachusetts response rates to the WHOI survey, approximately 60.5% of the for-hire vessels that fish in the survey area are based in Massachusetts and 39.5% are based in Rhode Island which means the economic exposure of for hire recreational fishing vessels in the Lease Area is approximately $105,729 for vessels based in Massachusetts and $68,823 for vessels based in Rhode Island.

Table 4-1 Estimates of the Annual Economic Exposure of For-hire Recreational Fishing Vessels in the Lease Area

State	For-hire Vessels Operating Annually in Survey Area[1]	Average Annual Trips per Vessel[2]	Total Annual Trips by For-hire Vessels in Survey Area	Total Annual Trips by For-hire Vessels in Lease Area[3]	Average Number of Anglers Per Trip[2]	Revenue per Angler ($2021)[4]	Total Annual For-hire Fishing Revenue in Lease Area
Massachusetts	60.5	47.3	2,862	106	5.41	$184.37	$105,729
Rhode Island	39.5	47.3	1,868	69	5.41	$184.37	$68,823
Total	100	47.3	4,730	175	5.41	$184.37	$174,552

Notes:

1. The WHOI survey report indicated that approximately 100 vessels actively engage in for-hire fishing in the waters depicted in in the survey area (Figure 2-1; Kite-Powell et al. 2023a, 2023b). The WHOI reports indicate that the for-hire survey covered 62 for-hire vessels that fish in the survey area, which would be 62% of the 100 vessels in the for-hire fleet that fish in the survey area. The 62 vessels surveyed included 37.5 vessels based in Massachusetts and 24.5 vessels based in Rhode Island (Kite-Powell et al. 2023a, 2023b). If the 37.5 Massachusetts-based for-hire vessels surveyed and the 24.5 Rhode Island-based for-hire vessels surveyed account for 62% of the for-hire fleets from those two states that operate in the waters depicted in the survey area (Figure 2-1), 60.5 of those vessels are based in Massachusetts and 39.5 are based in Rhode Island.
2. Values are from Kite-Powell et al. 2023a, 2023b.
3. Approximately 14 fishing locations, or 3.7% of the total 381 fishing locations identified in the WHOI survey, were identified as being located within the Lease Area (See Figure 2-3).
4. Revenue per angler estimate is based on the per angler revenue earned on a typical full day charter trip as reported in Steinback & Brinson 2013.
5. All values have been deflated to 2021 dollars.

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