Rhode Island Stakeholder Concerns Regarding the New York Wind Energy Area

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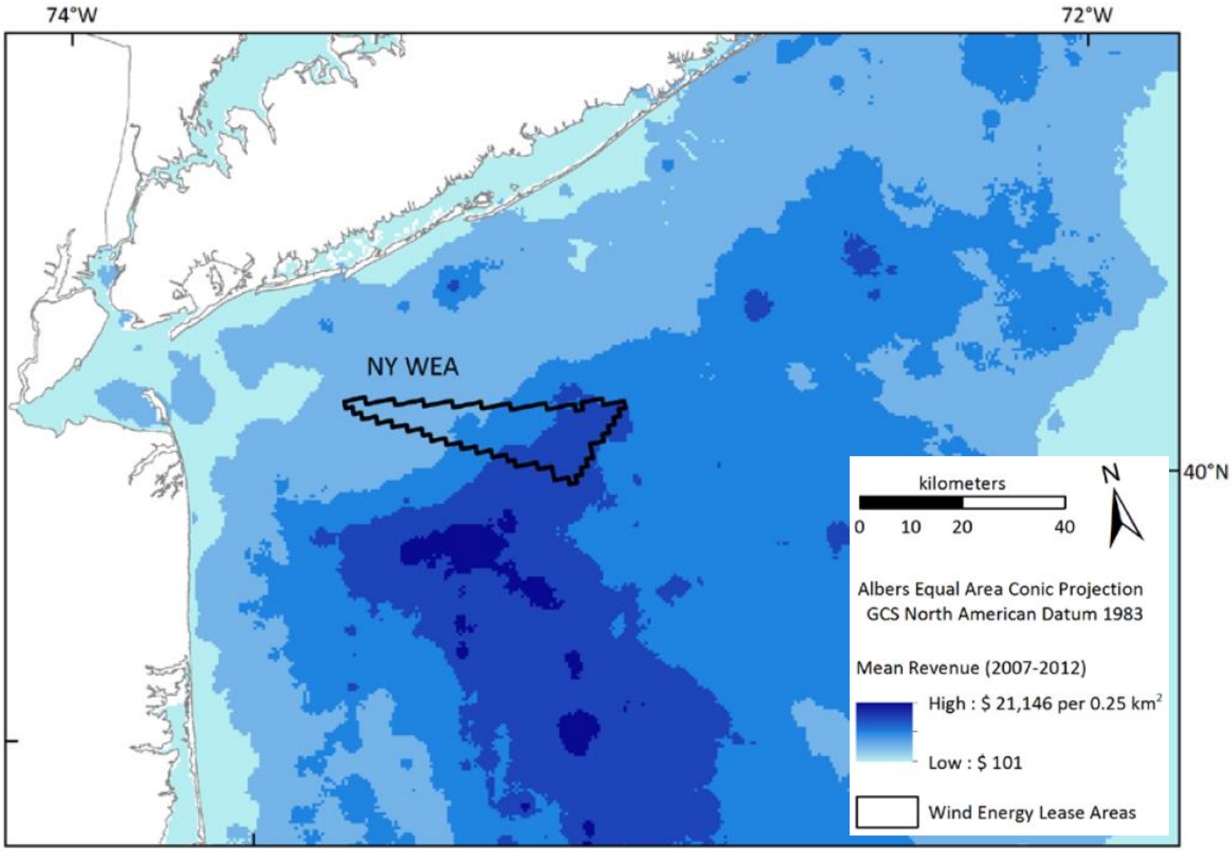

Commercial fishing activity from ports most exposed to the NY WEA, 2007-2012. Figure provided by BOEM and NOAA Fisheries. Revenue-intensity raster built using Vessel Trip Reports.

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LIST OF ACRONYMS

BIWF	Block Island Wind Farm
BOEM	Bureau of Ocean Energy Management
COLREGS	International Regulations for Preventing Collisions at Sea 1972
DHS	Department of Homeland Security
DOD	Department of Defense
DOF	declare out of fishery
EA	environmental assessment
EIS	environmental impact statement
EMF	electromagnetic field
ESRI	Environmental Systems Research Institute
FAA	Federal Aviation Administration
FMP	fishery management plan
FSN	final sale notice
GIS	geographic information system
ICPC	International Cable Protection Committee
MAFMC	Mid-Atlantic Fishery Management Council
MGN	United Kingdom Maritime Guidance Note
MPG	Marine Planning Guidelines
MW	megawatt
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service (synonymous with NOAA Fisheries)
nm	nautical mile
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Service (synonymous with NMFS)
NROC	Northeast Regional Ocean Council
NY WEA	New York Wind Energy Area
NYPA	New York Power Authority
OCS	outer continental shelf
OLE	NOAA Office of Law Enforcement
OWEZ	Offshore Windfarm Egmond aan Zee
PSN	proposed sale notice
RIDEM	Rhode Island Department of Environmental Management
RPB	regional planning body (created under the National Ocean Policy)
SAFIS	Standard Atlantic Fisheries Information System
TSS	transportation separation scheme (i.e. a shipping lane)
UNCLOS	United Nations Convention on the Law of the Sea
USCG	United States Coast Guard
VMS	vessel monitoring system
VTR	vessel trip report
WEA	wind energy area
WSC	World Shipping Council
WTG	wind turbine generator

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1 EXECUTIVE SUMMARY

On March 16th, 2016, the Bureau of Ocean Energy Management (BOEM) identified a Wind Energy Area offshore New York (the New York Wind Energy Area, henceforth the NY WEA) for potential wind energy development (Figure 1). The location was formerly called the New York Call Area after BOEM received an unsolicited request for a commercial lease from the New York Power Authority in 2011. Secretary Jewell of the Department of the Interior issued a press release on March 16th, 2016 announcing a major step in spurring wind energy development in federal waters as part of President Obama's Climate Action Plan.

The location of the NY WEA poses a major problem for Rhode Island squid and sea scallop fishermen, as many travel to federal waters offshore of New York to harvest squid and sea scallops, which are then landed in Rhode Island (Figure 2). In response to an abundance of complaints from commercial fishermen regarding the NY WEA, the Rhode Island Department of Environmental Management (RIDEM), Division of Fish and Wildlife, Marine Fisheries section held a meeting with the public, primarily fishing industry participants, on May 18th, 2016. Industry concerns included: 1) flaws in the BOEM siting process; 2) likely negative impacts to commercially important species; 3) the NY WEA's location presenting a serious risk to navigational safety; and 4) NY WEA project decisions being made for political reasons with stakeholder input not being taken into account. Industry also requested that DEM conduct a literature review on potential biological impacts of possible NY WEA development to commercially important species.

Based on the in depth literature review, fisheries exclusion, safety problems, habitat loss, and negative impacts of anthropogenic noise and sediment dispersal are all possible outcomes of development in the NY WEA. Fishermen may be prohibited from fishing in the NY WEA due to safety zones/closures, or simply due to the wind farm structures making operating certain gear types impossible or unsafe. Wind turbines may also create navigational hazards due to possible radar interference or proximity to shipping lanes. Soft bottom substrate may be eliminated by construction activities; creation of turbine foundations may serve as artificial reefs, but reefs are a different habitat type that will not benefit squid or scallop. Anthropogenic noise produced by construction activities (geophysical surveys and pile driving) or wind farm operation may cause injury to or decrease recruitment of commercially important species including squid and scallops. Electromagnetic fields do not appear to pose a serious threat to commercially important species, though sediment dispersal caused by construction has the potential to smother squid eggs and benthic organisms.

BOEM contracted NOAA to carry out a coast wide socio-economic analysis of economic exposure of East Coast fisheries and ports to WEA development (all WEAs, not just the NY WEA). To allow for comparability among WEA sites, NOAA elected to use vessel trip report (VTR) data, despite the fact that VTR data is unsuitable for characterizing where fishing occurs. Rhode Island fishermen have stated that the landings values presented by NOAA/BOEM are highly inaccurate. RIDEM Marine Fisheries conducted a separate analysis using Vessel Monitoring System (VMS) data in conjunction with VTR data and dealer reports (landings data) to more accurately depict fishing locations and their corresponding value to the Rhode Island economy. The RIDEM analysis has confirmed that the numbers presented by BOEM from their socioeconomic model are very different from the value of landings coming from the NY WEA per RIDEM's more refined analysis. The RIDEM estimates of seafood coming from the NY WEA and landed in Rhode Island are very different from BOEM/NOAA Fisheries' estimates of coast wide landings harvested from within the NY WEA. RIDEM's estimate of the annual value of squid harvested from the NY WEA and landed only in Rhode Island is $525,135.30 (from 2009 – 2015). This is significantly larger than BOEM/NOAA Fisheries' estimate of $123,703[1] for squid landings coming from the NY WEA landed in any state from 2007 - 2012. For the years where the two studies overlap, BOEM/NOAA Fisheries' average annual estimate is $204,365.00 for squid harvested within the NY WEA and landed anywhere, and RIDEM's estimate is $531,795.63 for squid harvested within the NY WEA and landed exclusively in Rhode Island. Rhode Island is not the only state where squid are landed, therefore the BOEM/NOAA Fisheries' model underestimates the value of squid harvested within the NY WEA by a minimum of 60% of the actual landings value, though when accounting for other states landings (not considered here) this underestimate is presumably of a higher magnitude. Mapping of VMS data indicates that the majority of fishing for squid landed in Rhode Island between 2009 and 2014 took place in the most inshore section of the NY WEA, in the northeast corner (Figures 14 and 15).

BOEM announced a Proposed Sale Notice for the NY WEA in the Federal Register on June 6th, 2016. The Environmental Assessment (EA) required under the National Environmental Policy Act (NEPA) for the NY WEA was also published on June 6th. The EA outlines three areal options for the proposed lease: 1) the entire NY WEA with a restriction on structural development within 1 nautical mile (nm) of shipping lanes (Traffic Separation Schemes: TSS); 2) the entire NY WEA with a restriction on structural development within 2 nm of TSS; and 3) no action (i.e. no leasing). The USCG recommended a minimum 2 nm buffer between permanent structures and TSSs and a minimum 5 nm buffer between the entry/exit of a TSS. BOEM opted to drop the 5 nm buffer around entry/exit points and selected only a 1 nm buffer for its preferred alternative. BOEM anticipates that the site will be leased before 2017.

2 INTRODUCTION

The New York Wind Energy Area (NY WEA) is a 127 square mile area identified for possible leasing off the coast of New York (Figure 1). The NY WEA is comprised of 5 outer continental shelf (OCS) blocks and 148 sub-blocks and begins approximately 11 nautical miles south of Long Beach, New York and extends approximately 26 nautical miles southeast.[2]

The area is situated directly between two shipping lanes (Traffic Separation Schemes: TSS) leading into the Port of New York and New Jersey, which is the busiest port on the East Coast (with nearly 30 percent of the total market share). In 2014 alone, the Port handled 3,342,286 cargo containers, valued at $200 billion, indicating that the region has very high levels of shipping vessel traffic.[3]

The NY WEA is also located in highly productive fishing grounds used by Rhode Island fishermen to capture longfin inshore squid (*Doryteuthis pealeii*, formerly *Loligo pealeii*) and Atlantic sea scallops (*Placopecten magellanicus*). Refer to figures 3 and 4 for a demonstration of the relative value of the NY WEA region to commercial squid and scallop fisheries.

2.1 History of the New York Wind Energy Area

The project was initiated in 2011, when the New York Power Authority (NYPA) submitted an unsolicited request for a commercial lease offshore of New York. The NYPA proposal outlined the general location of the current NY WEA.

BOEM issued a Request for Interest in the Federal Register in January 2013 to assess whether other parties were interested in developing commercial wind facilities in the area proposed by the NYPA. In addition to inquiring about competitive interest for leasing the area, BOEM also sought public comment on the NYPA proposal. Since BOEM received multiple indications of interest, they proceeded by issuing a Call for Information and Nominations as part of the competitive leasing process (see Figure 5 for a schematic of BOEM's renewable energy leasing process). At this time, the proposed area became the New York Call Area. The Call sought additional nominations from companies interested in commercial wind energy leases within the Call Area. Public input was also collected regarding site conditions, resources, and existing uses of the area.

BOEM began its required environmental review under the National Environmental Policy Act (NEPA) in May 2014. BOEM published a Notice of Intent to prepare an Environmental Assessment (EA) to determine whether there are significant impacts associated with issuing a lease, conducting site characterization surveys and conducting site assessment activities (e.g., the installation of a meteorological tower and/or buoys) within the proposed Call Area. Public comments on the notice were accepted.

In March 2016, BOEM identified the NY WEA (formerly the Call Area), indicating that a Proposed Sale Notice would be forthcoming. By June 2016, BOEM issued the Proposed Sale Notice in the Federal Register and allowed for a 60-day comment period. Comments will be considered prior to publication of the Final Sale Notice, which will announce the time and date of the lease sale. The EA was also published through a Notice of Availability in June 2016. The public had 37 days to respond with comments.

As part of its renewable energy leasing process, BOEM established Intergovernmental Renewable Energy Task Forces in all states that have expressed interest in development of offshore renewable energy. Task force members represent federal and state agencies, as well as any regional native tribes. Members are appointed by the governor of each state. The role of each task force is to collect and share relevant information that would be useful to BOEM during its decision-making process. No task force members are from surrounding states, even though outer continental shelf wind farms will occur in federal waters whose users come from more than one state, especially in the case of the NY WEA. The New York Intergovernmental Renewable Energy Task Force has met four times: November 2010, April 2012, September 2013, and April 2016.

Rhode Island has no representation on the New York Renewable Energy Intergovernmental Task Force. The Governor of any affected state may request to join the task force and Rhode Island fits the definition of an affected state under the Code of Federal Regulations (30 CFR Ch. V § 585.102 and § 585.112).

2.2 BOEM's Stakeholder Engagement

Stakeholder engagement throughout the leasing process has included meetings with fishery participants in New York and New Jersey in November 2015, question and answer sessions at New York Intergovernmental Renewable Energy Task Force meetings, public meetings to discuss the EA, and public comment periods. The RIDEM Marine Fisheries Section held a public meeting regarding the New York Wind Energy Area with fishery participants and other interested stakeholders on Wednesday May 18th, 2016 at the University of Rhode Island Graduate School of Oceanography. A short presentation on the BOEM OCS leasing process and the progress of the NY WEA was delivered prior to an hour of discussion with the public. Twenty-five members of the public attended the meeting to discuss their concerns pertaining to the proposed wind energy development off of New York. While most attendees were from Rhode Island, fishermen from New York (chiefly from Long Island) and Connecticut attended the meeting due to frustration over how the process was occurring in their own states and a general feeling that their voices and concerns were not being heard.

2.3 Offshore Wind Development and the National Ocean Policy

In 2010, President Obama issued Executive Order 13547, which created the National Ocean Policy and formed the nation's Regional Planning Bodies. Each planning body was tasked with creating a regional plan to ensure the protection, maintenance, and restoration of the health of ocean and coastal ecosystems and resources, enhance the sustainability of ocean and coastal economies, preserve maritime heritage, support sustainable uses and access, provide for adaptive management to enhance understanding of and capacity to respond to climate change and ocean acidification, and coordinate with national security and foreign policy interests. The Northeast Regional Planning Body released their draft Northeast Ocean Plan in May 2016. Through this plan BOEM and other federal agencies have made a commitment to consider data provided in the Northeast Ocean Data Portal in order to achieve effective decision-making and compatibility among past, current and future ocean uses.

Northeast Ocean Data Portal information includes detailed VMS maps of each fishery's vessel densities at different locations. This information has been presented at public meetings by BOEM, but does not appear to be used in their decision-making process. Access to the 3,000 maps on the Data Portal is already available. While the Northeast Ocean Plan is not yet finalized, the information is available and should be used in BOEM's renewable energy leasing process, especially regarding decisions that may impact existing ocean uses like commercial fishing. Additionally, the methods by which these data are considered should be clearly outlined and documented for the public. Two of the central principles of the Northeast Ocean Plan and the Northeast Regional Planning Body are to: 1) make government decision-making more transparent and efficient through coordination among agencies and governments based on a common vision and information sources, and 2) reflect the knowledge, perspectives, and needs of ocean stakeholders. As a party to the Northeast Ocean Plan, BOEM should commit to engage with other federal agencies in using information in the Data Portal to guarantee that data are interpreted and used properly for making renewable energy leasing decisions. These engagement efforts should also include the public.

2.4 BOEM's Next Step: WEA Lease Issuance and Action Alternatives

Within the EA published on June 6th, 2016, three alternative actions are proposed for the site to be assessed and characterized during the Site Assessment stage. Alternative A (the preferred alternative) is to offer the entire NY WEA for leasing, with a restriction on situating any site assessment equipment within 1 nm of the TSSs (Figure 6). Lease issuance and approval of site assessment activities could occur in the entire NY WEA; however, no site assessment structures (i.e., meteorological tower and/or buoys) could be placed on the portion of the sub-blocks within 1 nm (1.9 km) of the TSSs. Alternative B is to offer the entire NY WEA for leasing with a restriction on locating site assessment equipment within 2 nm of the TSSs (Figure 7). Under Alternative B, lease issuance and site characterization activities could occur in the entire NY WEA; however, no site assessment structures (i.e., meteorological tower and/or buoys) could be placed within 2 nm (3.7 km) of the TSS. Alternative C is to take no action; under Alternative C, no lease would be issued nor site assessment activities approved in the NY WEA.

Alternatives A and B both propose spatial limits on the proximity of development to TSSs. The restrictions were added in response to input provided by the United States Coast Guard (USCG) in September 2015. After holding a stakeholder meeting with affected maritime industry representatives to discuss navigational concerns regarding the proposed wind energy area (a "call area" at the time of the meeting), and reviewing policies for existing offshore wind farms in Europe and the UK, the USCG recommended that all structures be at least 2 nm from the outer edge of a TSS and 5 nm from the entry/exit of the Hudson Canyon to Ambrose TSS and the Ambrose to Nantuck TSS.[4] The USCG developed Marine Planning Guidelines (MPG) for all future offshore permanent fixed structures based on the United Kingdom Maritime Guidance Note (MGN-371), which states:

- 1 nm is the minimum distance to the parallel boundary of a TSS (high/medium risk of collision).
- 2 nm is the distance where COLREGS become less challenging (medium risk of collision).[I]
- > 2 nm risk becomes low, except near a TSS where risk would be higher.
- 5 nm is the minimum distance from the entry/exit of a TSS (assumed to be a medium risk of collision).[4,5]

It should be noted that the USCG is not a decision-making agency in the case of offshore wind development. The MPG are meant to inform decisions; they are not regulations.[5,6] All decisions regarding development are made the by the Director of BOEM after she has reviewed stakeholder

[I] COLREGS are international navigational rules for avoiding collisions at sea established at the Convention on the International Regulations for Preventing Collisions at Sea in 1972.

input, opinions from other federal agencies on their areas of expertise, and all other relevant information.

3 PRIMARY RHODE ISLAND STAKEHOLDER CONCERNS

The following points summarize the views of the public expressed at the May 18th meeting:

1. The BOEM siting process is flawed.
   a. It does not mandate that stakeholder input be used in making decisions and there is no threshold for determining when the level of impact is too great, nor is there any requirement to provide a formal response to stakeholder input received by the agency.
   b. Ultimately, all decisions are made by the BOEM Director. There is no appeals process after the director makes a decision.[II]
   c. Too much time and money is invested into assessing a potential location whose siting evaluation process was initiated through an unsolicited request. This process makes moving to a separate location unlikely, whether the site is a suitable location or not.
2. Negative impacts to commercially important species are likely.
   a. The socio-economic study conducted by BOEM/NOAA to evaluate fishery impacts and make management decisions is inaccurate and mischaracterizes the extent of the impact.
      i. A single squid boat can catch in one day the annual value of landings attributed to the entire state of Rhode Island by NOAA/BOEM analysis.
      ii. Rhode Island fishermen will be heavily impacted.
   b. Squid spawn and deposit their eggs in and around the NY WEA. If their eggs are damaged, this may disrupt their migration to other areas; this could hurt not only those fishermen that harvest squid near the NY WEA, but also local fishermen in Rhode Island waters.
   c. Wind farm submarine energy transport cables produce electromagnetic fields (EMF).
      i. The effects of EMF on many species are unknown.
   d. Pile driving during construction creates extremely loud anthropogenic noise. Operation of wind turbines also creates noise, though much less intense.
      i. We do not yet know how the introduction of additional anthropogenic noise will affect commercially important species. Most studies have only focused on marine mammals and protected species.

[II] Director Hooper is an experienced lawyer with legal expertise specific to the energy sector. She was appointed as director by the Dept. of the Interior secretary Sally Jewell in 2014. Jewell was nominated by President Obama and her nomination was approved by the United States Senate Committee on Energy and Natural Resources.

        e. Turbine foundations may alter circulation patterns, therefore disrupting fish migration
3. The WEA's location presents a serious risk to navigational safety.
    a. Offshore wind turbines can cause severe line of sight radar interference.
        i. Adding radar interfering turbines to a high traffic area is illogical and dangerous.
        ii. There are questions as to who is accountable if there is an accident in this area caused by the structures.
    b. The area has very high vessel density and many shipping vessel captains do not speak English.
        i. Communicating to avoid a collision can be very challenging, especially considering the nature of squid and scallop fishing gear (midwater trawls and dredges, respectively), which are not easily or quickly retrieved to avoid an emergency situation.
        ii. Placing the wind farm so close to shipping lanes could lead to an oil spill if a tanker collides with a turbine. As a conceivable example, a foggy day coupled with potentially poor communication issues could cause a collision if there are radar interference issues, leading to an oil spill if a tanker were involved.
    c. The WEA could become a full fisheries exclusion zone due to safety concerns.
        i. Even if it is not deemed an official fishery exclusion zone, fishing with mobile gear within a turbine array is not feasible, thus making it a de facto exclusion zone.
4. NY WEA project decisions appear to be made for political reasons.
    a. For this reason, a coordinated response should address the situation politically.

4 LITERATURE REVIEW - POTENTIAL IMPACTS OF WIND ENERGY DEVELOPMENT ON FISHERIES AND COMMERCIALLY IMPORTANT SPECIES

At the Marine Fisheries meeting with the Rhode Island fishing industry on May 18th, the industry requested that a literature review be conducted for the meeting summary report to be prepared for the RIDEM Director. Industry's primary concerns are regarding direct impacts to fisheries through additional spatial and temporal regulations on fishing activity in the proximity of the NY WEA; additional regulations may result from concerns over damaging renewable energy infrastructure or safety concerns regarding the high density of vessels using the NY WEA. Industry also had valid concerns about the potential impacts to commercially important species like squid and sea scallop, which utilize soft bottom and gravel substrates as essential habitat. The NY WEA is primarily soft bottom substrate, which makes it suitable for wind energy development.

Possible negative impacts to marine life may include habitat loss/degradation, submarine animal collision/entanglement,[7] noise pollution,[8,9] electromagnetic field disruption,[10–13] or sediment dispersal.[14] The turbine foundations could act as secondary artificial reefs following the initial construction disruption[7] (Figure 8); the presence of wind turbine foundations will increase the amount of hard substrate in the area[15] and may therefore serve as an artificial reef. However, for the main species of concern discussed in this document, hard bottom habitat is not desirable; in fact, its presence could be detrimental to squid populations in the region, as they prefer soft bottom substrates.[16] Moreover, scallops prefer firm sand and cobble substrates[17] and likely cannot benefit from vertical hard substrate habitat. There are also reasonable misgivings regarding the effects of construction noise on the behavior of fish,[13,18] the influence of electricity generation and electromagnetic field disruption,[10–12,19] and the dispersion of sediment.[14]

4.1 Fisheries Exclusion

Under the United Nations Convention on the Law of the Sea (UNCLOS), a radius of 500 meters from any renewable energy installation is the maximum size for any safety zone during the construction phase; the UK Secretary of State adopted this approach for all safety zones in place as a result of offshore wind development in their federal waters.[20] Additionally, the Petroleum Act of 1987 prevents all vessels from venturing within 500 m of any part of offshore oil and gas installations in UK waters.[21] Based on experience from the Block Island Wind Farm, similar safety zones will exist for federal projects in US waters. The USCG issued a 500 yard safety zone at all Block Island Wind Farm turbines undergoing work for the construction season in 2016.[22] It is unknown at this time how large the safety zone around operational turbines will be, if there is a safety zone at all.

In the case of some existing wind farms in the United Kingdom and Europe, fisheries exclusion zones are set up around wind farms as a safety measure. For example, the Offshore Windfarm Egmond aan Zee (OWEZ), located off the Dutch coast, has a permanent safety zone of 500 m and is closed to all shipping activities. All fishing is prohibited in the wind farm and the safety zone.[23]

Even if safety zones are eliminated after wind farm construction is complete, there may still be other forms of fisheries exclusion. For example, it has been discussed whether co-location of UK crab and lobster fishing with renewable energy development is possible. UK crab and lobster fishers were resistant to the idea due to concerns over safety, potential gear loss, infrastructure damage, and lack of trust between the fishing community and developers.[24] Rhode Island fishermen stated that they will most likely not be able to fish within an operational wind farm due to their gear types and potential crowdedness. NOAA Fisheries even notes that anecdotal evidence suggests that WEAs could prevent any highly mobile fishing gear (e.g. bottom and mid-water trawls) from fully utilizing the developed area.[25] In the case of offshore wind farms in the UK, fishing activity within wind farm boundaries has been extremely limited because fishermen are fearful of gear becoming entangled by seabed obstacles (e.g. cables and rock armoring) and are wary of vessel breakdown and the consequent risk of turbine collision. Wind farm maintenance work has also proven to be problematic for fishermen, as maintenance generally requires temporary closures to fishing, and subsequently increases steaming distances to fishing grounds. Very few fishermen do operate mobile gear within the six assessed UK windfarms, and only in cable-free corridors between turbines.[26]

4.2 Navigational Safety

Meeting attendees expressed concerns over navigational safety around the NY WEA due to possible radar interference caused by large turbines, in combination with extremely high vessel traffic and communication challenges with other vessel captains (e.g. non-English speaking captains on international shipping vessels).

Wind turbines are a very complex source of radar clutter to characterize and have an impact on air traffic control, which is particularly difficult to mitigate. They are electrically enormous structures, able to re-irradiate a significant portion of the radar energy and, because of the blades' motion, give rise to a Doppler effect very similar to that of a flying airplane.[27] Wind development located within the line of sight of radar systems, can cause clutter and interference, which at some radars has resulted in significant performance degradation.[28] Concerns over radar interference have led the Federal Aviation Administration (FAA), the Department of Homeland Security (DHS), and the Department of Defense (DOD) to reject past proposed projects. A federal interagency working group has now been set up to fully address wind turbine radar interference as an impact to critical radar missions, ensure the long-term resilience of radar operations in the presence of wind turbines, and remove radar interference as an impediment to future wind energy development.[29] While efforts are being made to solve this problem, there is no solution to date. The NY WEA is situated in an area of extremely high vessel density, in addition to being very close to three large commercial airports (LaGuardia, JFK, and Newark).

The USCG prepared MPG for offshore developers and marine planners to use in preparation for any project involving permanent fixed structures. The guidelines were developed after reviewing the United Kingdom Maritime Guidance Note (MGN-371). The MGN-371 outlines 1 nm as the minimum distance to the parallel boundary of a TSS (high/medium risk), 2 nm as the distance where COLREGS become less challenging (medium risk), >2 nm as where risk becomes low (except near a TSS where risk would be higher), and 5 nm as the minimum distance from the entry/exit of a TSS (assumed to be medium risk). The German Waterways and Shipping Directorate recommended a 2 nm buffer plus a 500 m safety zone between shipping lanes and wind turbine generators (WTGs).[5] The USCG MPG also discuss emergency maneuvering and stopping distances for large vessels, as evaluated by the World Shipping Council (WSC). The WSC itself recommends a minimum of 2 nm buffer distances between wind farms and TSS. According to the WSC, which represent over 28 shipping companies that carry approximately 90% of U.S. international containerized trade, a crash stop (backing the vessel from full speed) takes between 1.75 – 2.4 nm; a complete stop (letting the vessel stop on its own from full speed) takes between 3 – 3.5 nm; emergency anchoring takes between 1.5 – 1.75 nm; and the width of a 180 degree turn (starting at full speed) takes approximately 0.9 nm. Consequently, the USCG recommends a 2 nm buffer between any wind farm and the parallel outer or seaward boundary of a traffic lane and a 5 nm buffer from any entry/exit (terminations) of a TSS (Figure 9). The recommendations are consistent with European guidelines and the 5 nm separation from the entry and exit of a TSS is necessary to enable vessels to detect one another visually and by radar in areas where vessels are converging and diverging from and to multiple directions.[5]

While the MPG and recommendations should be used in planning, they are not regulations and therefore there is no legal obligation for BOEM to follow them. As previously mentioned, the USCG has no decision-making ability in federal wind farm development. BOEM's director makes all final decisions. Note that the proposed alternatives outlined in the NY WEA reference the USCG recommendations, though the preferred alternative only has a 1 nm buffer between TSS and the NY WEA.

4.3 Impacts to Commercially Important Marine Species

4.3.1 Essential Habitat

There is a key knowledge gap with respect to how marine renewable energy developments will impact fish migrations and space usage because no large-scale, long-term 'before-and-after' studies have addressed this question. Wind turbine arrays constructed across migratory routes or in essential habitat may lead to displacement of species into sub-optimal habitats where they may either not be accessible to existing fishing fleets, or into areas that are more heavily exploited.[30]

To complicate matters further, the importance of soft substrate habitat as essential fish habitat is often overlooked. Areas of soft sediment with and without structure are important for a variety of species and life stages, likely due to the greater prevalence of these habitats, which allows more species to use them.[31] The substantial area that soft sediments cover, complemented by their interstitial complexity makes these habitats more productive than is generally appreciated. Unfortunately, these habitats are frequently used for offshore energy developments, partially because it is assumed that the ecological impacts are lower when compared with those in other habitat types.[32] Grabowski *et al.* (2014) suggest that soft sediment habitats have an inherent ability to recover more rapidly from anthropogenic impacts than other substrates,[33] but Link *et al.* (2016) contend that this is not a suitable reason to develop these areas due to the number of affected species and potential consequences of impacts on those species for ecosystem structure and function.[34]

Many scientists believe that offshore wind developments may offer benefits to certain fish species by way of creating artificial reefs. The turbine foundations may serve as artificial reef structures and increase the amount of hard substrate for recruitment following the construction disturbance. Wilson and Elliot (2009) even go so far as to say that the potential for habitat creation may be regarded as compensation for habitat lost.[35] While this may be beneficial to certain species, it would not benefit squid or scallops. The net gain of hard bottom substrate does not equal the loss of highly productive soft bottom substrate, as the species that utilize both habitat types differ. Squid prefer soft-bottom substrates like mud or sand,[16] while scallops cannot take advantage of vertical hard bottom substrate created by turbine foundations due to their benthic nature. Scallop larvae and juveniles are generally found on gravelly sand and shell fragments, while adults are most common in seabed areas with firm sand, gravel, shells and cobble substrate.[17]

4.3.2 Anthropogenic Noise

The majority of research focused on acoustic disturbances created by offshore wind farms (construction and operation phases) has focused on marine mammals due to their acoustic sensitivity and communication methods. The inner ear hearing receptors of fishes are similar to that of marine mammals. Therefore, the effects seen on the hearing receptors of marine mammals may also be found in certain fishes and vice versa. It has been reported that high sound levels can damage the inner ear sensory cells, produce hearing loss (threshold shifts), elicit stress responses, and alter the behavior of fishes. At least in terms of hearing loss, these effects are modulated by exposure sound level and duration. The effects of various types of sound (e.g., impulsive vs. continuous) and long-term impacts of how anthropogenic sounds affect the behavior and ecology of fishes need further exploration.[36]

Limited studies on impacts to fish have been conducted. One study determined that the operational phase of wind farms with turbines ranging from 0.2 – 1.4 mw in power would not permanently damage hearing of fish, but that the sounds were potentially detected up to 25 km away depending on the species. While this noise did not appear to cause alarm reactions or permanent damage, it may mask acoustic communication in some fish species. It is crucial to note that windmill type has a large effect on the sound intensities generated, and therefore also on the range at which fish may be affected. The number of windmills present and transmission-loss properties (which depend on the water depth and bottom type) may cause detection and masking ranges calculated to vary considerably between different windmill parks.[37] Windmills have grown enormously since this study assessed sound impacts in 2005. The largest windmill assessed at the time was 1.4 mw, while the windmills currently being developed are between 6-8 mw. Hence, their acoustic impacts may be very different from past study results and warrant further analysis.

A more recent study found that daily exposure to artificial noise between 100 and 1000 Hz caused broodstock Atlantic cod to produce significantly fewer eggs. The fertilization rate also decreased, reducing the total production of viable embryos by over 50%.[38] The operational phase of wind farm operation is likely to be lower than 100 Hz, though construction and decommissioning phases will produce noises at higher frequencies. The operational phase of earlier wind farms, prior to 2004, produced noise with a maximum frequency of 16 Hz.[39]

While mollusks (including squid and scallops) do not have ‘hearing’ in the same sense as vertebrates due to their nervous system structure, they do experience phonoreception. Squid hear by way of statocysts,[40] the structures responsible for the animals’ sense of balance and position,[41] and have demonstrated responses to sound.[40,42] Little is known of bivalve and gastropod hearing (which includes sea scallops),[40] but it is understood that fish and marine invertebrates hear through particle motion, rather than sound pressure, caused by underwater sound waves.[36,43,44] Unfortunately, instruments to record particle motion have only become available very recently[45] and most past research evaluating acoustic ecology and hearing in marine organisms has presented results in terms of sound pressure (dB re. 1 μPa), rather than particle motion (dB re. 1 ms^{-2}).[45,46] There is essentially no information available on the sound production of active wind turbines, sub-bottom profilers, pile driving, or shipping activity in terms of particle motion. Research on the particle motion of sound created by wind farm construction and operation, as well as other sources of anthropogenic noise, is therefore crucial to understanding potential impacts to invertebrates.

Andre *et al.* (2011) evaluated how noise pollution may impact cephalopods and found that exposure to low-frequency sounds (between 50-400 Hz) resulted in permanent and substantial alterations of the sensory hair cells of the statocysts. In fact, geophysical seismic survey noise has led to mass strandings of giant squid with extensive tissue damage. At the time of the mass strandings, vessels had been conducting seismic geophysical surveys in the vicinity, using ten compressed air guns that produced sound waves of low frequency (below 100 Hz) and high intensity (SL=240 dB re 1 μPa at 1m per airgun).[47] Seismic pulses have also been shown to cause significant developmental delays and body malformations in scallop larvae. According to de Soto *et al.* (2013), the severity of body abnormalities and growth delays from a lab sound exposure level of 161-165 dB RMS 1 $\mu Pa^2 s$ (with a 3-axis root mean square particle acceleration of 3-4 m s^{-2} and a 3-axis RMS particle velocity of 4-6 mm s^{-1}) may indicate that routinely-occurring anthropogenic noise sources already decrease recruitment of wild scallop larvae in wild stocks.[48]

Mooney *et al.* (2010) determined that squid hearing is most sensitive to frequencies between 100 and 400 Hz and that they detect sound similarly to most fish, with the statocyst acting as an accelerometer through which squid detect the particle motion component of a sound field.[49] Since certain fish species have exhibited stress responses and lowered reproductive abilities due to anthropogenic noise falling into that frequency range,[38] it is possible that squid could react similarly. This topic warrants further research specific to commercially important species (squid and scallops) and wind energy development since construction and decommissioning would both produce higher frequency noise.

On a broader scale, exposure to underwater broadband sound fields that resemble offshore shipping and construction activity can alter sediment-dwelling invertebrate contributions to fluid and particle transport - key processes in mediating benthic nutrient cycling. Despite high levels of intra-specific variability in physiological response, changes in the behavior of some functionally important species can be dependent on the class of broadband sound, continuous or impulsive (e.g. operation or construction noise, respectively). Therefore, exposing coastal environments to anthropogenic sound fields is likely to have much wider ecosystem consequences than are presently acknowledged.[50]

4.3.3 Electromagnetic Fields Produced by Submarine Cables

Shielded electric transmission cables should not directly emit electric fields, but are surrounded by magnetic fields that can cause induced electric fields in moving water.[51] The effects of induced electromagnetic fields (EMF) are expected to be greater for cartilaginous fish because they use electromagnetic signals in detecting their prey.[10,11,13] EMF may also disturb fish migration patterns by interfering with their capacity to orientate in relation to the geomagnetic field.[28–30]

With respect to invertebrates including squid and scallops, only a few studies have been conducted and no impacts were detected.[52–54] Anecdotal evidence from commercial fishermen in Rhode Island suggests that there may be an interaction between sea scallops and subsea cables, potentially due to induced EMF. Scallopers have noted that sea scallops seem to aggregate around certain subsea cables in the northeast.[55]

4.3.4 Sediment Dispersal

Wind farm construction activities will cause sediment disruption and unnatural dispersion of sediments, particularly during the cable laying phase of the project. The primary risk of suspended sediment is that it may clog the gills of fish, therefore reducing their oxygen intake.[56] Larval states are more vulnerable due to their larger gills and higher oxygen consumption in proportion to body weight.[57,58] Larval fish are also less mobile and cannot simply avoid areas with high sediment content.[37,59] The same would apply to relatively immobile species like sea scallops.

Additionally, longfin inshore squid are thought by commercial squid fishermen to lay eggs in the NY WEA (as described at the May 18th meeting). While little information is available on squid egg habitat locations and seasonal occurrence,[16] commercial squid fishermen catch adult squid in the NY WEA during summer months, when adult squid swim inshore for one of the seasonal spawning peaks. Eggs are generally found on sandy/muddy bottom like that of the NY WEA; it is therefore likely that squid are laying eggs in the NY WEA as suggested. Sediment dispersal has the ability to smother eggs and suspension feeders (including scallops). Adult scallops are typically abundant in areas with low levels of inorganic suspended particulates (fine clay size particles);[17] consequently, scallops may respond poorly to increased suspended sediments caused by wind farm construction. Smothering by sediment movements will occur.[60] Deposited soil may directly clog the feeding or respiratory apparatus of suspension feeders. For example, one study reported that epifaunal or deep-burrowing siphonate suspension feeders were unable to escape burial by more than 1 cm of sediment.[61] However, many burrowing species will be capable of returning to their preferred depth in the sediment.[60]

The effect of sediment dispersal in relation to the establishment of wind farms are usually short-lived.[62] An increased concentration of sediment in the water column associated with dredging and drilling may primarily affect juvenile fish and larval stages, especially after prolonged exposure. Sediment material is usually only spread over a short period of time, but the distance of spreading in the water column varies depending on the type of sediment and water currents.[62] While sedimentation events are usually short-lived, seabed communities may be greatly altered by smothering events and may take some years to recover.[60]

5 SOCIO-ECONOMIC ANALYSIS OF FISHERY IMPACTS

BOEM commissioned a socio-economic study on the “exposure” of ports and fisheries to WEAs on the East Coast continental shelf.[25] The study was carried out by NOAA Fisheries economists and a GIS analyst. This report has been used to inform BOEM’s decisions about where to hold stakeholder engagement meetings and may be used for making larger decisions moving forward. Based on the findings of the socio-economic study specific to the NY WEA, it was determined that Rhode Island fisheries and/or ports would not be impacted. No initial stakeholder meetings were scheduled in Rhode Island by BOEM. Only after receiving many complaints from Rhode Island commercial fishermen and experiencing pressure from RIDEM did BOEM plan a meeting in the state as part of its EA process.

5.1 Problems with BOEM/NOAA Fisheries' Socio-Economic Study of Fisheries' and Ports' Exposure to OCS WEAs

Prior to discussion of issues with the socio-economic study, the term exposure must be defined. Exposure is not synonymous with potential impacts. NOAA Fisheries explains that exposure identifies the individuals and groups who are likely to be affected by NY WEA development; therefore, the presented exposure measures are not a measure of the economic impact or loss.[25]

The socio-economic report utilized VTR data to characterize the location of fishing activity. VTR data is not accurate in terms of defining where fishing actually occurs. A VTR report must be submitted for each trip and requires that only a single latitude and longitude point be recorded, though several hauls may occur on that trip. The point location recorded may or may not be located on the transect of a haul, as the location may be recorded prior to starting the haul or after completing the haul, when the rest of the report is filled out. Fishermen have to fill out a separate VTR, and therefore record separate coordinates, only if they change statistical area, gear type, or mesh size. Consequently, VTR data are only reliable for characterizing the location of fishing to the level of statistical area, which is much too low a resolution to be useful for analyzing the NY WEA. Refer to Figure 10 for statistical areas in the Northeast.

The socio-economic report states that "VTR coverage is the most encompassing in terms of identifying the spatial location of fishing activities." This statement is not true in the Northeast in recent years for particular fisheries. Many fisheries in New England and Southern New England, as well as the mid-Atlantic, now require VMS, or vessel monitoring systems, to track vessels' locations on a constant basis. NOAA Fisheries chose to use VTR data instead because the National Marine Fisheries Service (NMFS; synonymous with NOAA Fisheries) Southeast region does not require VMS yet. While this option allowed them to conduct their socio-economic analysis coast wide, with results that are comparable among East Coast WEAs, VTR data are not the best data available for accurately determining fishing hotspots in the Northeast.

In order to use VTR's, report location accuracy had to be evaluated by complementing reports with data from the NMFS Northeast Region Observer database. Observers are only onboard for a small percentage of trips, the exact percentage varies among fisheries. They record the beginning and end locations of all hauls, as well as detailed accounts of what was caught and discarded. NOAA Fisheries used observer-recorded locations to create confidence intervals on VTR-reported locations, though the method is not clearly described in Volume II of the socio-economic report (i.e. they did not specify whether they used the midpoint of the start and end locations for developing confidence intervals). Observer data showed that 25% of all hauls occurred within 2.82 nm of the reported VTR fishing point for bottom trawlers on 4-6 day trips in the Gulf of Maine.[25] For this reason, NOAA Fisheries developed a spatial layer where each VTR point had four concentric circles around it, with the largest circle defining the fishing area and having a 2.82 nm radius (Figure 11). Then they allocated 25% of the landed value for that point, obtained from commercial fisheries dealer reports, to each concentric circle. The revenue "exposed" for each point location was calculated by multiplying the percentage of overlap of each concentric circle with the WEA by 25% of the revenue for that point, and then adding all overlapping circle values together.

This process introduces unnecessary uncertainty into the analysis for the Northeast. For example, NOAA Fisheries' report uses a 2.82 nm confidence interval around each VTR point for all fisheries coast wide, when only 25% of observer-reported hauls occurred within 2.82 nm of the VTR-recorded location in one specific region (Gulf of Maine) for one gear type (bottom trawlers) for trips between 4-6 days in length. Applying this finding to fisheries coast wide, with many gear types, and varying trip lengths is not valid. Furthermore, the width of the NY WEA is roughly 9.2 nm at its widest point, all of which will likely not be developable due to the edges' proximity to TSS. A 2.82 nm confidence interval around points is approximately 31% of the maximum NY WEA width.

Given the small size of the NY WEA and the high level of uncertainty surrounding VTR-reported locations, using VTR data to describe fishing activity is inappropriate. There is no ambiguity with VMS locations, and therefore, such data should be used to carry out necessary analyses of fisheries' exposure of the NY WEA.

5.2 DEM Analysis of Exposure to Rhode Island Fisheries Using VMS Data

Fishermen have voluntarily provided BOEM with photographs of their plotter tracks near the NY WEA, but BOEM has not demonstrated that this information has been accounted for in any aspect of decision making. As an alternative method to demonstrate the importance of the NY WEA to various fisheries, RIDEM Marine Fisheries conducted independent analyses specific to Rhode Island to more accurately ascertain the value of the seafood harvested within the NY WEA to the Rhode Island commercial fishing industry and economy. Only seafood landed in Rhode Island were included in these analyses, though the methodology may be applied to other surrounding states landings as well.

5.2.1 Methods

5.2.1.1 *Data*

RIDEM Marine Fisheries obtained confidential VMS data from NOAA's Office of Law Enforcement (OLE) on June 13th, 2016. VMS data came from all vessels with operational VMS systems installed that transited within a bounding box with corner coordinates (in the North American Datum of 1983 - NAD83):

Top Left: (-74.07, 40.77)
Top Right: (-72.70, 40.77)
Bottom Right: (-72.70, 39.81)
Bottom Left: (-74.07, 39.81)

This bounding box fully encompassed the NY WEA and surrounding areas (Figure 12). Data for the years of 2007 – 2015 were requested, as the BOEM/NOAA Fisheries socio-economic model used data from 2007 – 2012. The OLE provided VMS data from August 2007 – December 2015. Data were limited for earlier years because many fisheries did not require VMS until more recently. For example, the longfin squid fishery became a VMS-required fishery only two years ago in early 2014. However, any vessel that was required to use VMS and fished for a non-VMS-required species (such as squid before 2014) would have “declared out of fishery” (DOF) and therefore was captured by VMS.

VTR reports for all seafood landed in Rhode Island were pulled from the federal VTR database for the same 2007 – 2015 timeframe.

Dealer reports were pulled from the Standard Atlantic Fisheries Information System (SAFIS) on the same timeframe of 2007 – 2015.

5.2.1.2 *Economic Analysis*

All economic analyses were performed in the statistical software R, ver. 3.3.0.[63]

5.2.1.2.1 Spatial Subsetting

The VMS data set was spatially subset by the bounds of the NY WEA in order to eliminate all data points that did not fall within the wind energy area (refer to Figure 13 for economic analysis workflow). This was done in R using the shapefile of the NY Call Area provided on the BOEM website as the area to subset within. This step drastically reduced the file size of the VMS data set and allowed for more streamlined processing.

5.2.1.2.2 Data Set Merging

Prior to merging the VTR and dealer report data sets, a translation table had to be created to ensure that the two data sets merged correctly with respect to species landed. The species names are recorded differently in the federal VTR database and SAFIS in terms of the order of the words and capitalization. The translate table requires that the names from both data sets be matched and a single version of each name be selected as the replacement in both data sets.

After the species names were matched, the two data sets were merged by matching the Serial Number in the VTR to the Trip ID in dealer reports. These two numbers are the same despite the different naming conventions. The merge also required that the species and the landing dates also be matched to reduce the possibility of errors.

The merged VTR/dealer reports were then merged to the subsetted VMS data by matching the permit in the VMS data to the Vessel Federal Permit in the VTR data. Since a single federal permit number corresponds to all of that fisherman’s corresponding VTRs, merging VMS data to VTRs by federal permit number will create duplicate VMS entries by merging each VMS point to every single VTR with the same federal permit number. The majority of the merged entries are not correct because a single VMS point location entry should correspond to a single VTR. Entries that are correctly matched will have a date recorded in the VMS data that falls during the start and end dates of the trip, recorded in the VTR. In order to isolate the correct entries, the data file of all three merged data sets was queried to remove any entries where the date recorded in the VMS did not occur between the VTR-recorded start and end dates.

Since VMS points are recorded on a 30 – 60 minute basis (depending on the fishery), there are many VMS locations recorded per trip, while only one or occasionally a few dealer reports will be filed for each trip. This problem was resolved by creating a coded variable that allowed for the removal of duplicate dealer report entries created by the VMS to VTR/dealer report merge. The coded variable included a concatenated value of the dealer report-recorded serial number, price, quantity, landing date, and landing year. Once the coded variable was created, only rows of the data file with exclusively unique entries were selected for further analysis.

The final merged data set was then aggregated by species and by year to determine the sum of all landings in Rhode Island coming from the NY WEA. Total ex-vessel value and pounds landed were calculated for each species for each year.

Ex-vessel values were also adjusted to include the effects of landings on the local economy. According to a study on Rhode Island fisheries conducted by Cornell researchers, for every $1.00 of ex-vessel revenue landed in Rhode Island, the actual value to the economy is closer to $1.6230254.[64] The study utilized a seafood industry input/output model developed by NOAA Fisheries to estimate how seafood landed in Rhode Island contributes to the economy. In order to account for these effects on the local economy, a multiplier of 1.6230254 was applied to ex-vessel values to calculate an adjusted value.

Not all final values could be made publicly available, due to confidentiality restrictions. A minimum of three vessels, three fishermen, and three dealers must have harvested or purchased the seafood on any given timeframe for the landings information to be non-confidential. This requirement was met for all species whose landings values are presented.

5.2.1.3 ***Point Density Mapping***

Point density mapping of fishing activity using the VMS data was essential to identify fishing hot spots within or near the NY WEA.

5.2.1.3.1 Spatial Subsetting

Preliminary analysis was similar to the economic analysis portion, except VMS data were not spatially subset by the NY WEA. In mapping point densities, data are smoothed, thus the areas around the NY WEA must also be included to prevent inaccurate results near the edges of the study area (i.e. the NY WEA). VMS data were subset by a smaller bounding box with the following coordinates (in NAD83) as the corners:

Top Left: (-73.70, 40.45)
Top Right: (-73.05, 40.45)
Bottom Right: (-73.05, 40.15)
Bottom Left: (-73.70, 40.15)

5.2.1.3.2 Data Set Merging

Merging of VTR to dealer reports and then to VMS data involved the same steps as the economic analysis. The only difference is that no coded variable was used to eliminate duplicate dealer report entries, as only the spatial data were relevant in the mapping analysis. Removing duplicate dealer reports through the coded variable methodology would remove spatial data points that physically occurred. The merging of VMS data to the VTR and dealer reports is only necessary to eliminate VMS points that did not result in landings in Rhode Island. Therefore, after merging the three data files and removing the entries that did not occur (meaning where the VMS date did not fall between the VTR trip start and end dates), only the VMS coordinates, species landed, landing date, and speed were relevant.

At this point, all points where the speed was greater than four knots were removed. The Northeast Regional Ocean Council (NROC) uses a four knot cutoff for its VMS analysis and mapping as part of the Northeast Regional Planning Body's (RPB) Northeast Ocean Plan, under the National Ocean Policy. The four knot cutoff is an already accepted division of fishing versus transiting speed; therefore, all points where a boat was moving faster than four knots were designated as transiting, and not fishing activity. This cutoff was applied to all species except scallop, for which NROC uses a five knot cutoff. For this reason, RIDEM also used the five knot cutoff for scallops exclusively.

5.2.1.3.3 Density Mapping

The data were then subsetted by species and year and exported to comma separated value (.csv) text files for spatial analysis using ESRI software. Point density calculations and cartography were carried out in ArcMap, ver. 10.2.1.[65] Each .csv file was loaded into ArcMap as point location data and saved as a point feature class. The point density tool (requiring the Spatial Analyst license) was applied to each feature class of point data. The point density tool calculates a magnitude-per-unit area from point features that fall within a neighborhood around each cell, meaning that points that fall within the search area are summed, then divided by the search area size to get each cell's density value. A circular neighborhood around each cell was used. Tool output rasters were mapped for each fishery by year and over the entire timeframe data were available (2009 – 2015).

5.2.2 Results

5.2.2.1 *Economics*

The total annual value of all seafood harvested in the NY WEA and landed in Rhode Island ranged from $34,543.60 - $2,171,562.82 from 2009 – 2015, averaging at $988,248.22 per year (Table 1). After application of the 1.6230254 economic multiplier, the NY WEA value to the Rhode Island economy ranges from $56,065.14 – $3,524,501.61 and averages to $1,603,951.97 annually. The annual pounds of seafood landed on the same timeframe ranged from 34,090.00 – 1,545,259.77 and averaged to 927,230.32 pounds/year (Table 1). The value of the seafood coming from the NY WEA to Rhode Island equated to between 0.06% - 2.7% of all seafood landed in the state (Table 2).

In order from largest to smallest value, *Doryteuthis* squid, scallop, Atlantic mackerel, Atlantic herring, and summer flounder were the top five most valuable species to the state from the NY WEA. In terms of pounds landed, *Doryteuthis* squid, Atlantic mackerel, Atlantic herring, scallop, and scup were the top five species, ordered from largest to smallest. Not all values or pounds landed can be provided due to confidentiality restrictions. Values for some species in some years did not have three or more of each fishermen, vessels, or dealers, and therefore cannot be shared publicly. A letter C designates confidential information in the resulting analysis tables.

Squid caught within the NY WEA accounted for up to $976,573.29 of Rhode Island landings in a single year (2012; Table 3). That same year, squid accounted for the highest landings by weight at

931,150.92 pounds (Table 4). There were 23 boats harvesting squid in the NY WEA and landing their catch in Rhode Island in 2011 alone; this does not include boats harvesting squid and landing elsewhere. The percentage of squid in terms of value of all Rhode Island squid landings coming from the NY WEA ranged from 0.37 – 7.76%; the percentage in terms of poundage ranged from 0.19 – 7.97% (Table 5).

Scallops were the second most valuable species; in 2014 the 111,587 pounds of scallops harvested in the NY WEA and landed in Rhode Island were worth $1,333,184.12 (Tables 3 and 4). The value of the NY WEA to industry in Rhode Island landing seafood under the Mid-Atlantic Fishery Management Council's (MAFMC) squid, mackerel, and butterfish fishery management plan (FMP) reached up to $1,192,843 in 2012 (Table 6); this value was attributed to the 1,342,275.77 pounds of squid, mackerel, and butterfish landed that year.

The RIDEM estimates of seafood coming from the NY WEA and landed in Rhode Island are very different from the estimates of coast wide landings harvested from within the NY WEA presented in the BOEM/NOAA socio-economic report. RIDEM's estimate of the annual value of squid harvested from the NY WEA and landed only in Rhode Island is $525,135.30 (from 2009 – 2015). This is significantly larger than BOEM/NOAA's estimate of $123,703[1] for squid landings coming from the NY WEA landed in any state from 2007 – 2012. For the years where the two studies overlap, BOEM's average annual estimate is $204,365.00 for squid harvested within the NY WEA and landed anywhere, and RIDEM's estimate is $531,795.63 for squid harvested within the NY WEA and landed exclusively in Rhode Island (Table 7). Considering Rhode Island is not the only state where squid are landed, BOEM/NOAA Fisheries' model underestimates the value of squid harvested within the NY WEA by at least 60% of the actual landings value.

5.2.2.2 *Mapping*

The majority of fishing for squid landed in Rhode Island between 2009 and 2014 took place in the most inshore section of the NY WEA, in the northeast corner near Cholera Bank (Figure 14). Fishing activity for squid occurred most heavily in 2011 for the time range addressed (Figure 15); 23 boats making their landings in Rhode Island were present in 2011. Activity extended the most southeast in 2014. Scallop fishing activity was more localized to the easternmost portion of the NY WEA (Figure 16). While fishing activity for scallops that were landed in Rhode Island is less intense than squid, the species is highly valued, and equates to a fair portion of Rhode Island landings value from the NY WEA. Butterfish fishing activity was similar to squid and localized to the inshore portion (Figure 17). This finding is not surprising, as squid, butterfish, and mackerel are all caught together using the same gear types. Hence, they are managed collectively in federal waters under the MAFMC's squid, mackerel, butterfish FMP. Fishing activity for the whole suite of species from the FMP is heaviest in the most inshore section of the NY WEA, primarily due to the density of fishing for squid in the inshore region (Figure 18). Atlantic sea herring activity averaged over the 2009-2015 time period of data available show limited fishing within the NY WEA, with the most effort occurring in the eastern portion (Figure 19).

5.2.2.3 *Discussion*

Industry has stated that the information presented by BOEM at fishery stakeholder meetings is severely inaccurate, especially the economic value of squid harvested within the NY WEA.

RIDEM has confirmed that the numbers presented by BOEM from their socioeconomic model are very different from the value of landings actually coming from the NY WEA. For instance, the BOEM/NOAA Fisheries model predicted that the annual value of squid to the entire squid fishery coming from the NY WEA between 2009 and 2012 is $204,365.00, while RIDEM's estimate of the annual squid value from the NY WEA landed in Rhode Island alone on the same timeframe is $531,795.63; the difference between the two estimates is $327,430.63 and the BOEM/NOAA Fisheries estimate is less than 39% of the RIDEM estimate. Rhode Island is not the only state where longfin squid are landed. Based on NOAA Fisheries annual commercial landing statistics for longfin squid coast wide and SAFIS squid landings in Rhode Island alone, Rhode Island landed between 41.39% - 54.68% of all longfin squid between 2009 and 2012. Hence, BOEM/NOAA Fisheries' model underestimates the value of squid harvested within the NY WEA and landed in Rhode Island by more than 60%, while the value of all squid harvested within the NY WEA is likely much higher, as Rhode Island lands only 48.25% of longfin squid on average.

The inaccuracies of economic exposure estimates produced by the BOEM/NOAA Fisheries model led BOEM to not consider Rhode Island as an impacted state with respect to fisheries. Considering the NY WEA provides up to $2,171,562.82 of seafood annually to the state, Rhode Island will be impacted substantially. RIDEM's analysis shows that the BOEM/NOAA Fisheries analysis underestimates landings amounts and values; this therefore shows that more refined analyses are needed to best characterize impacts to fisheries of wind development in offshore areas.

It should be noted that the direct ex-vessel value of seafood landings in Rhode Island is not the full value of the seafood to the local economy. RIDEM, Marine Fisheries has received information from fishing industry representatives regarding the support businesses that also rely on the steady inflow of seafood products, especially squid. Companies in addition to commercial fishermen and dealers that depend on fresh seafood include: trucking, freighting, packaging, insurance, mailing, cold storage, fuel, trawl/net gear manufacturing, and engine companies, to name a few. The aforementioned Cornell study aimed to address some of these additional values, but determining the full economic utility of seafood landings is challenging. Thus, the true value to the Rhode Island economy of the seafood coming from the NY WEA and landed in Rhode Island cannot fully be encompassed through RIDEM's VMS analysis, even when Cornell's economic multiplier is applied.

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7 APPENDIX

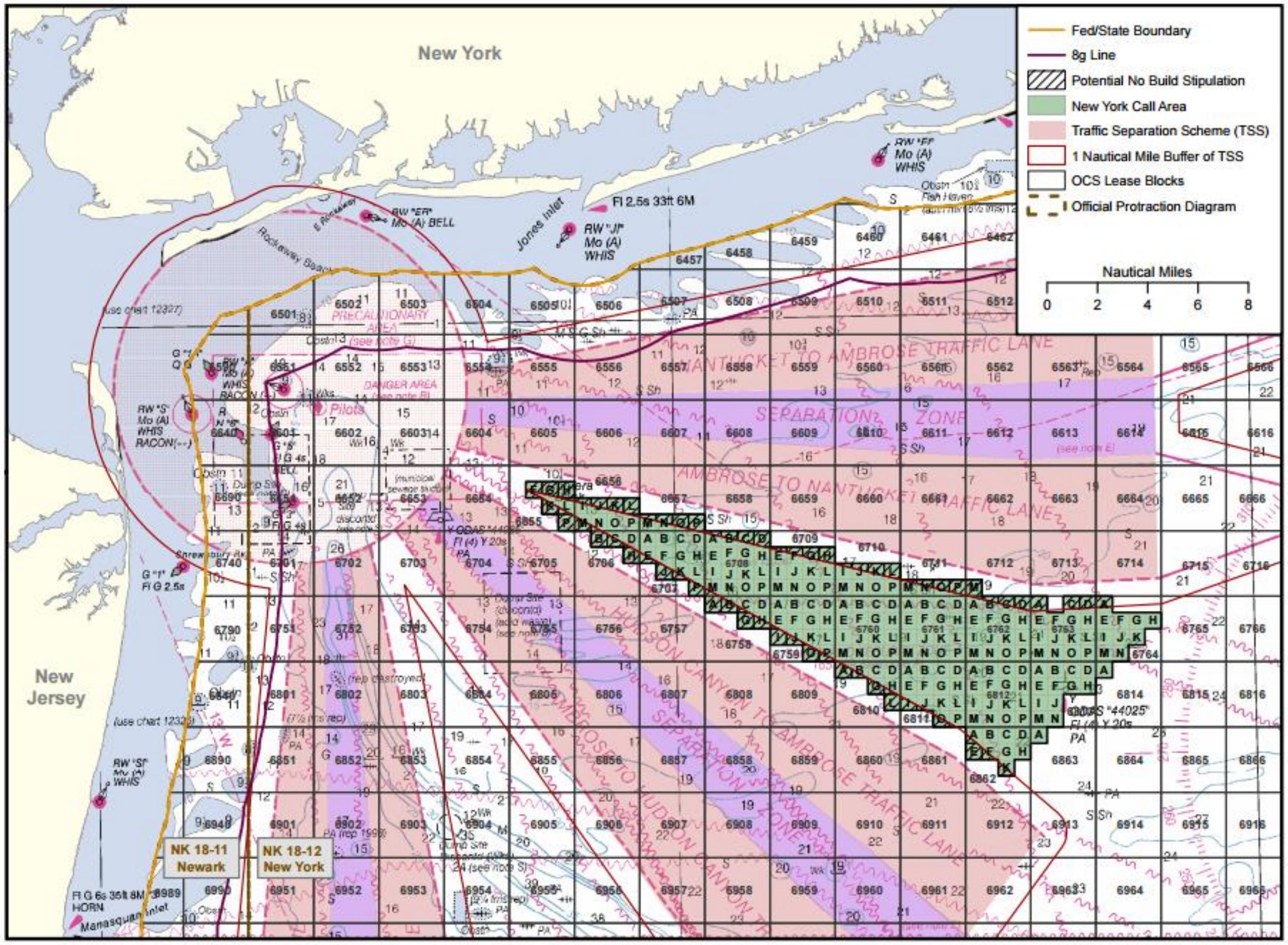

Figure 1. New York Wind Energy Area (NY WEA; Source: http://www.boem.gov/NY-call-area-noaa-letter/)

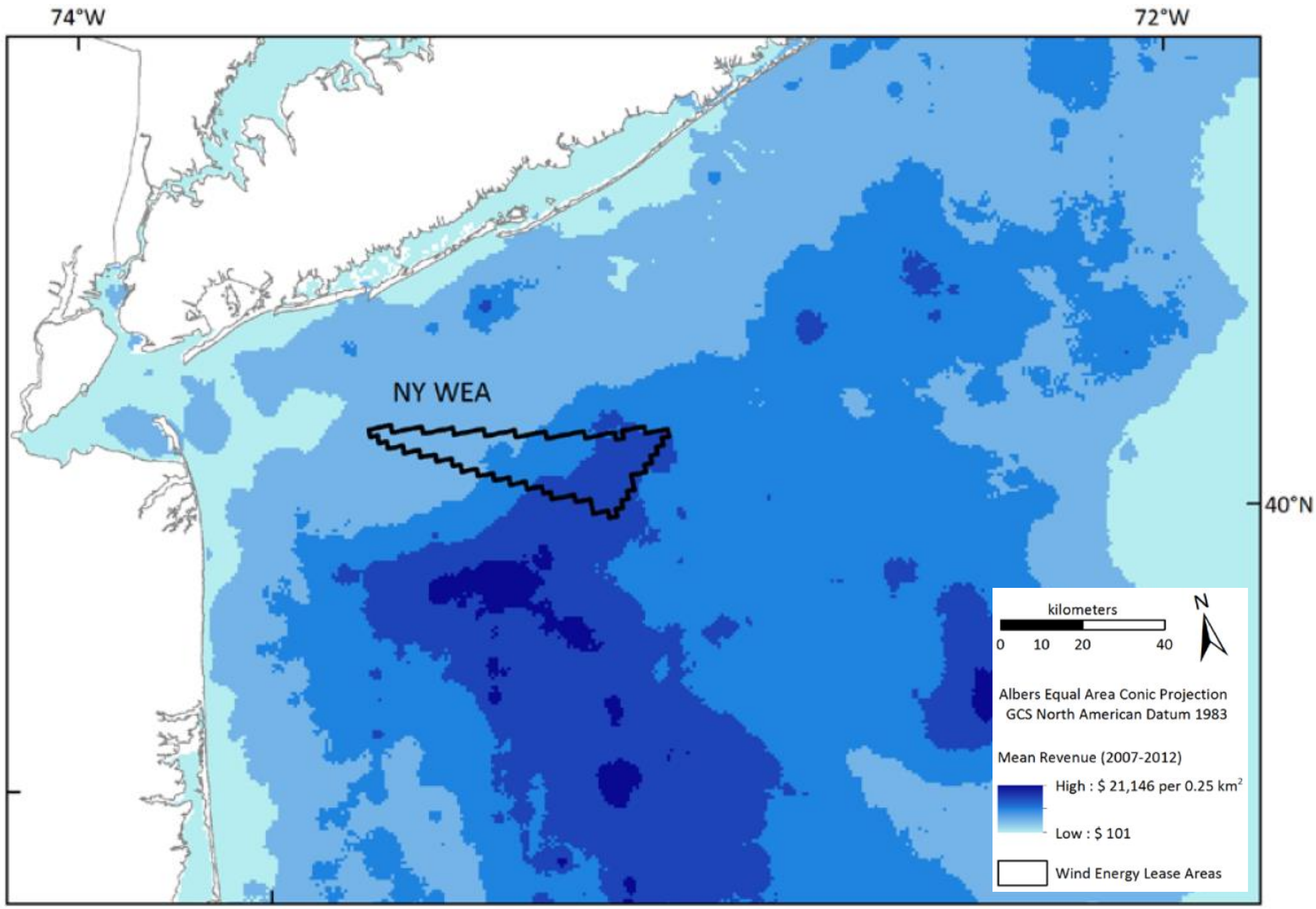

Figure 2. Commercial fishing activity from ports most exposed to the NY WEA, 2007-2012. Figure provided by BOEM and NOAA Fisheries. Revenue-intensity raster built using Vessel Trip Reports.

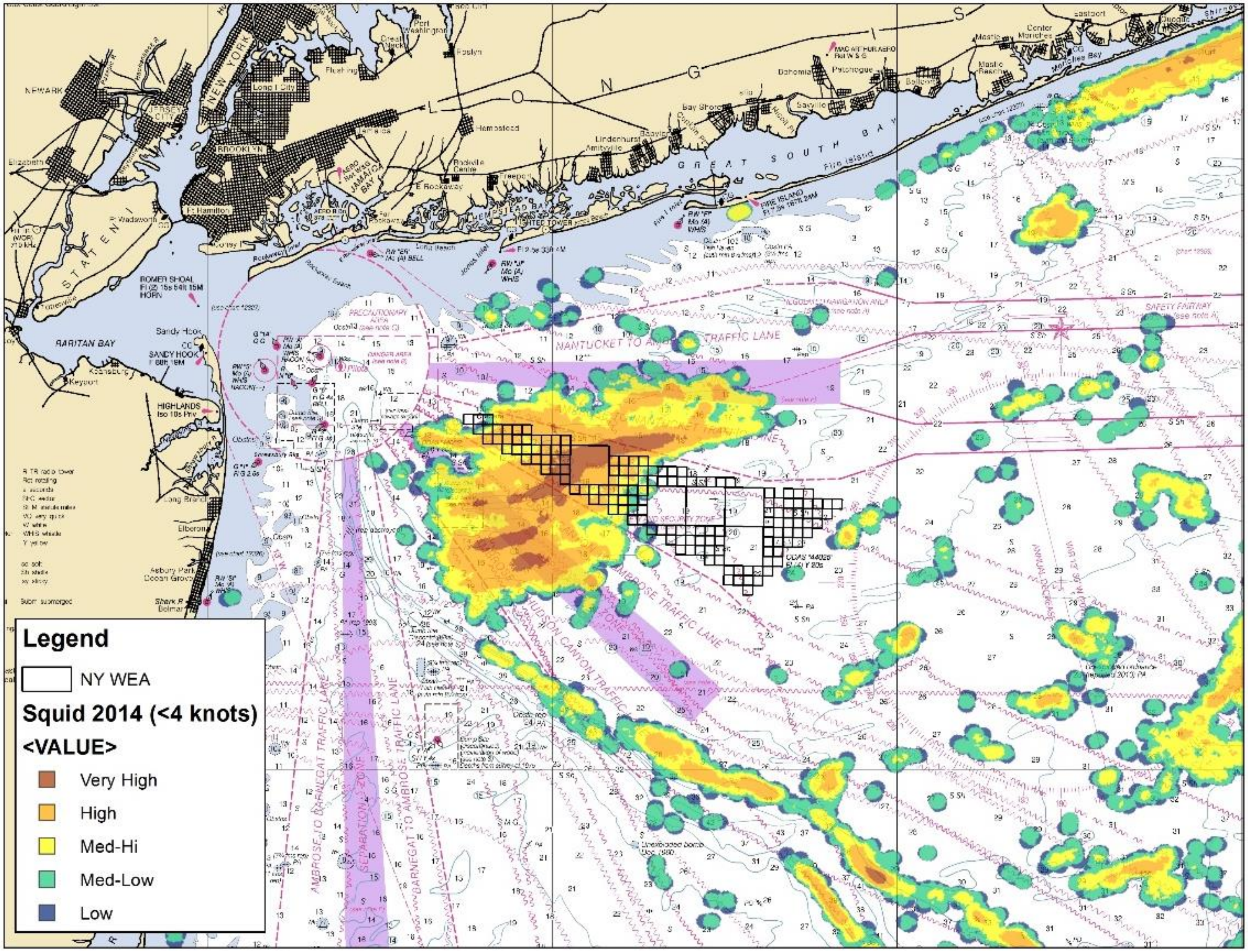

Figure 3. Vessel monitoring system data for the squid fishing fleet in 2014 (Data Source: Northeast Regional Ocean Council)

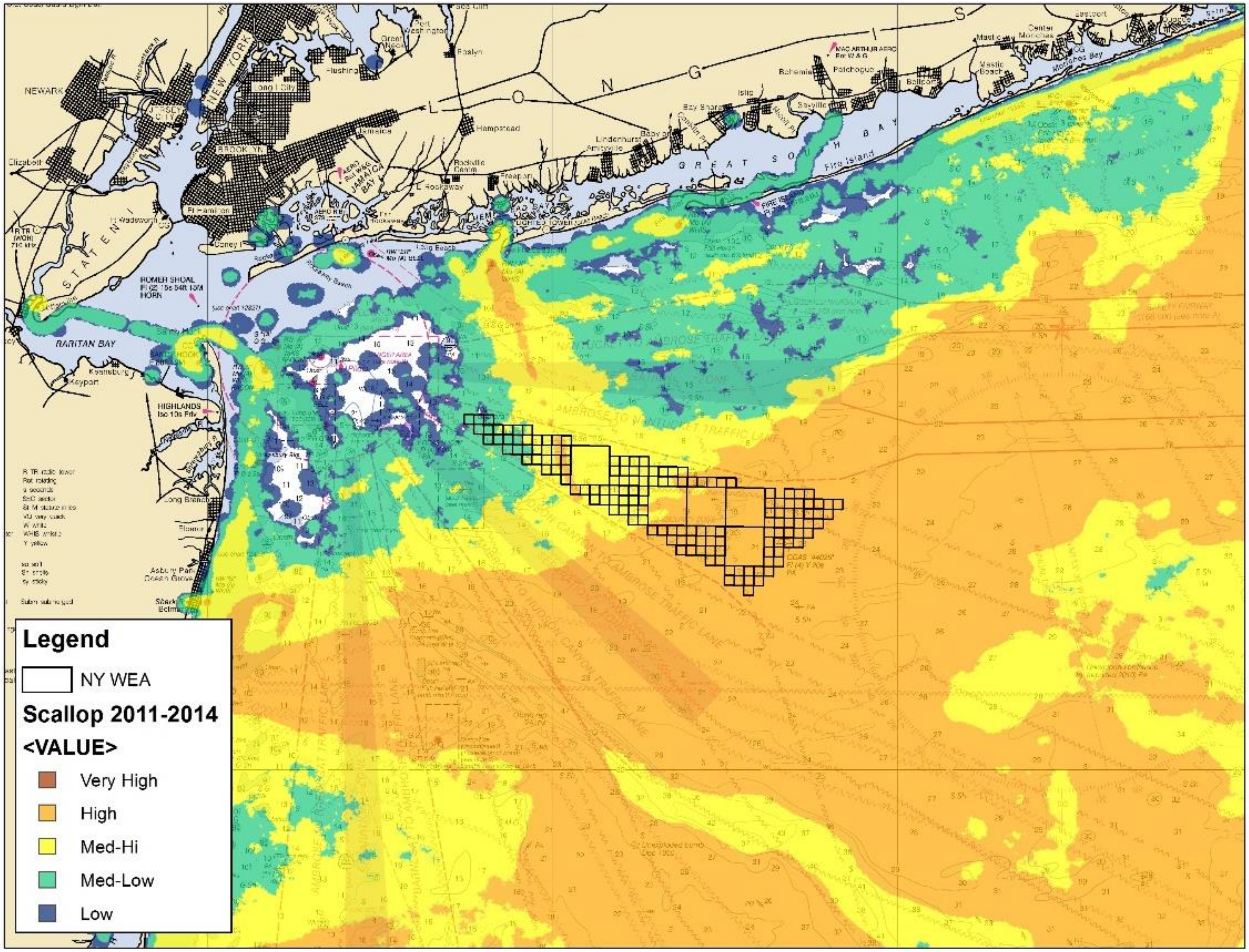

Figure 4. Vessel monitoring system data for the scallop fishing fleet from 2011-2014 (Data Source: Northeast Regional Ocean Council)

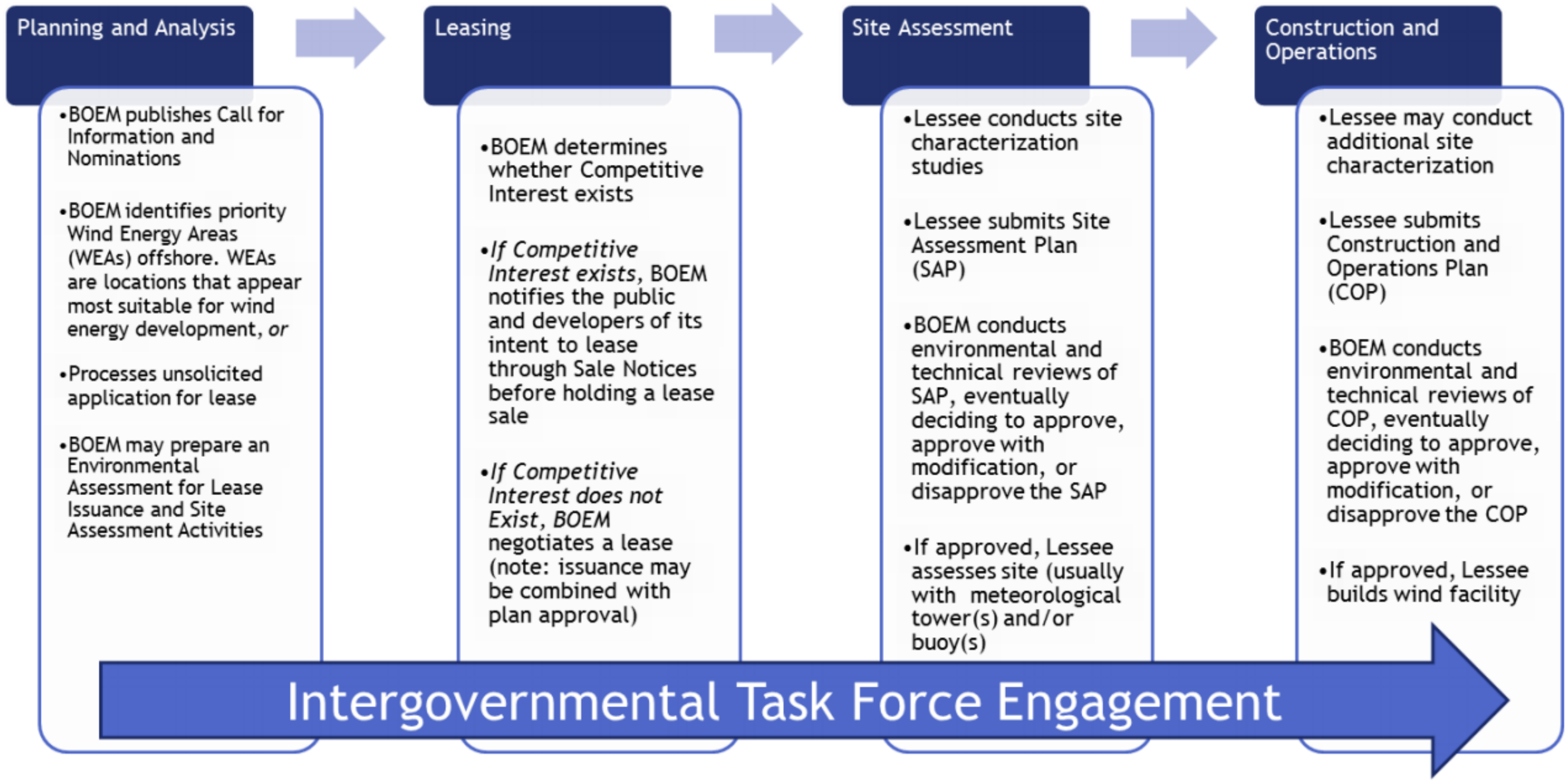

Figure 5. BOEM's wind energy commercial leasing process (Source: Bureau of Ocean Energy Management, Office of Renewable Energy Programs. Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York: Environmental Assessment.)

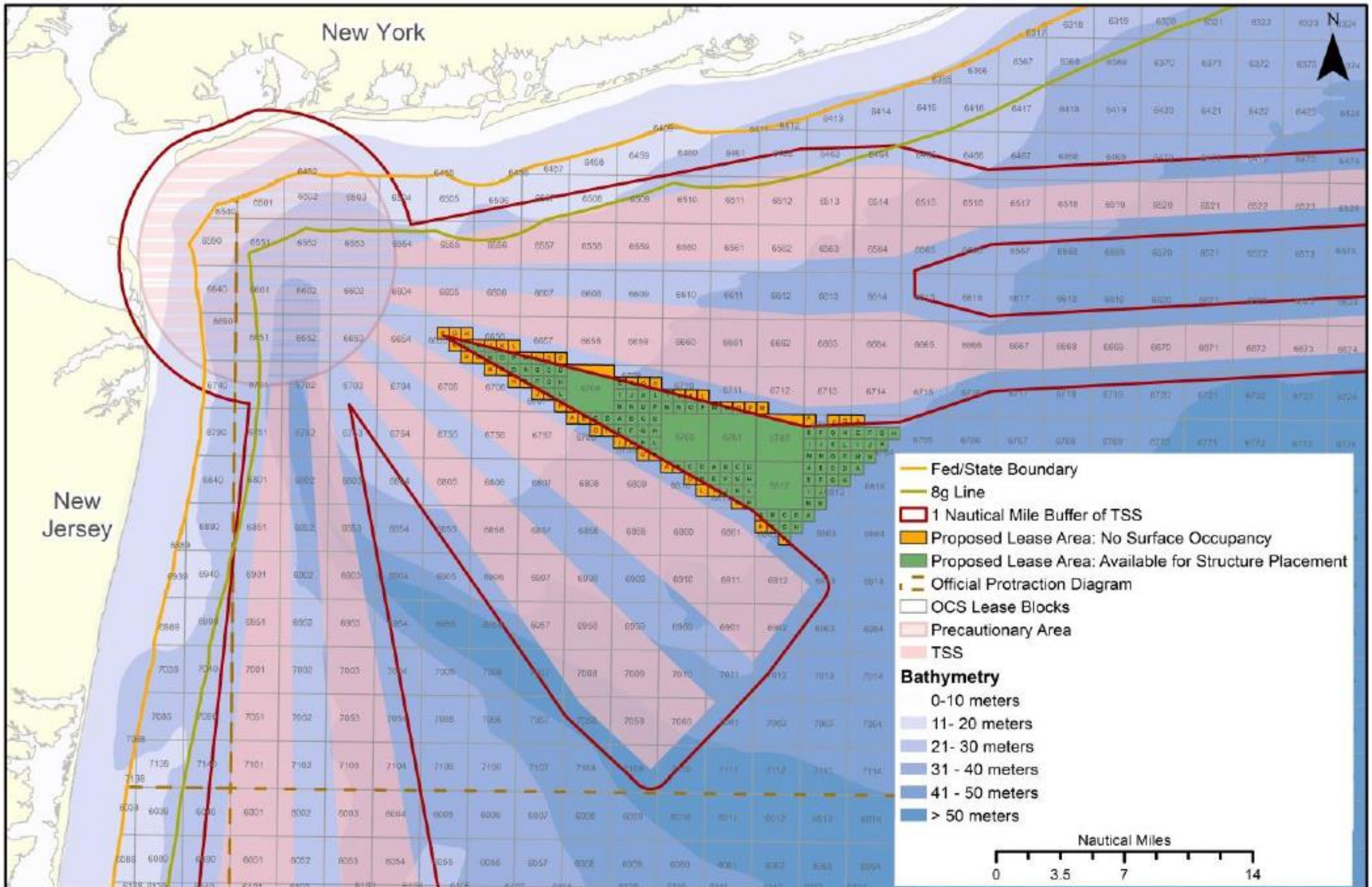

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Figure 6. Alternative A (Preferred Alternative) Lease Area with a 1 nautical mile buffer zone of TSS (Source: Bureau of Ocean Energy Management, Office of Renewable Energy Programs. Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York: Environmental Assessment.)

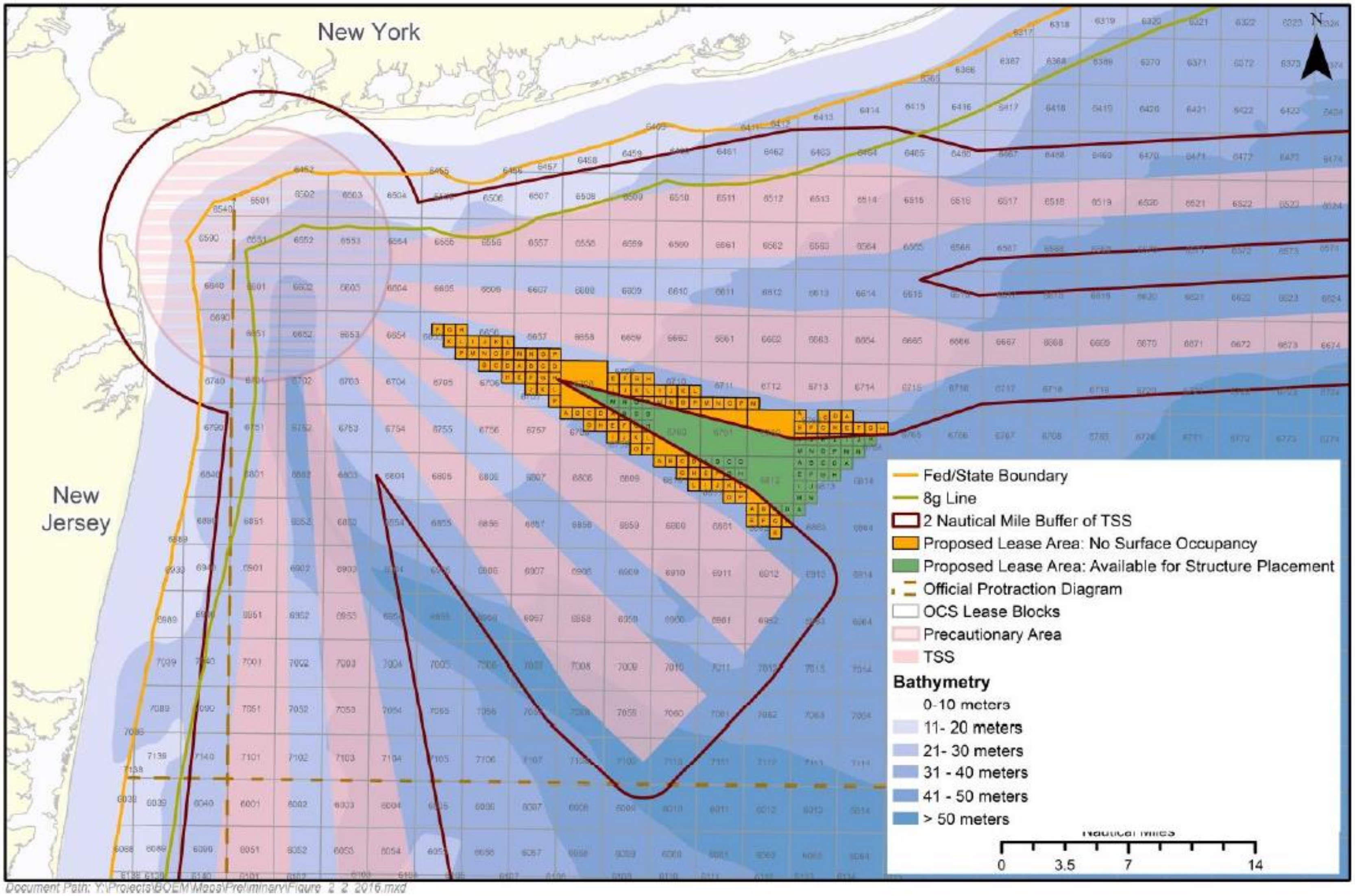

Figure 7. Alternative B Lease Area with a 2 nm buffer zone of TSS with No Surface Occupancy in the buffer zone (Source: Bureau of Ocean Energy Management, Office of Renewable Energy Programs. Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York: Environmental Assessment.)

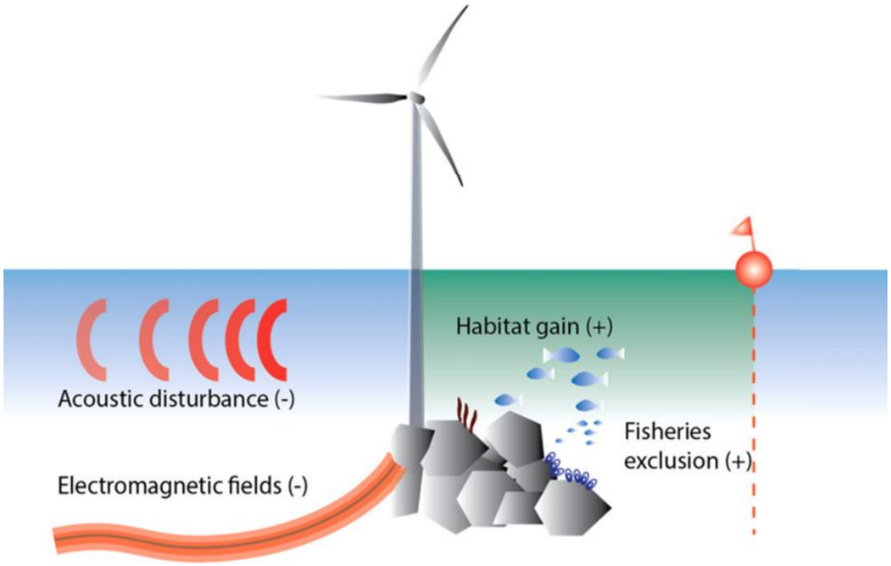

Figure 8. Overview of pressures on ecosystem from offshore wind turbines during the operational phase. Adapted from Bergström et al. 2014

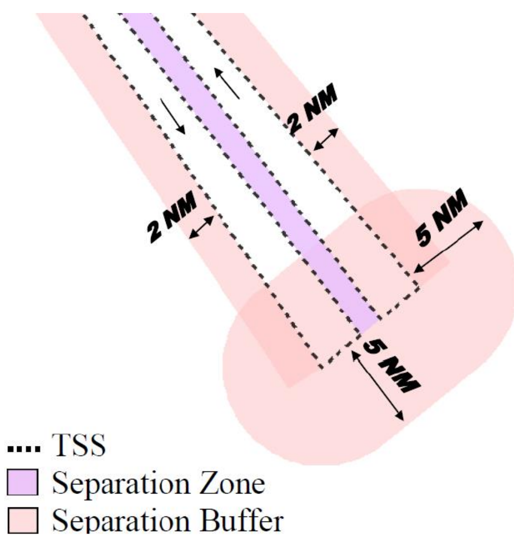

Figure 9. U.S. Coast Guard-recommended minimum separation and buffer zones around Transportation Separation Schemes as outlined in their Marine Planning Guidelines.

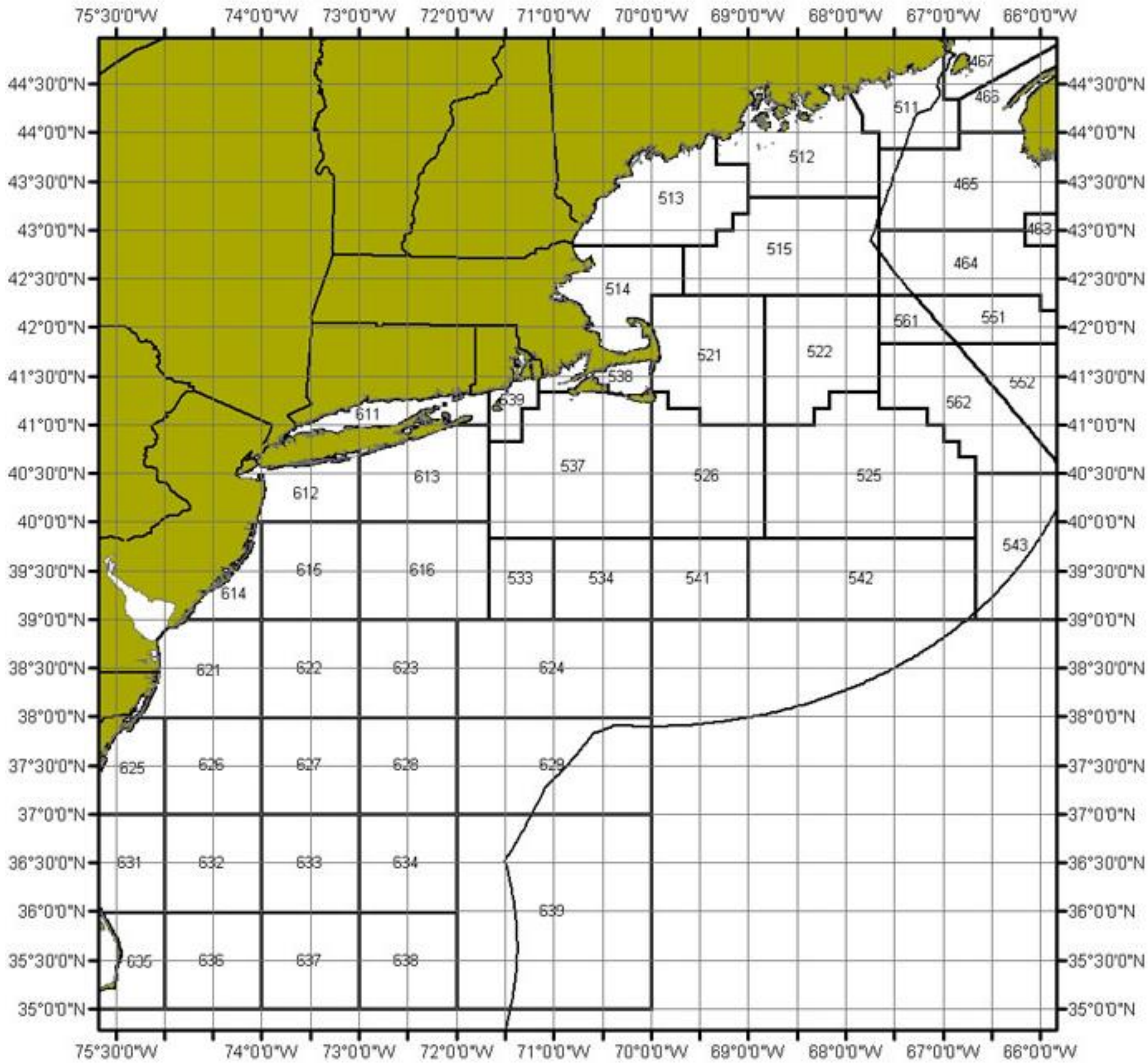

Figure 10. Statistical areas for fishing activity in the Greater Atlantic Region. The NY WEA is located in statistical area 612.

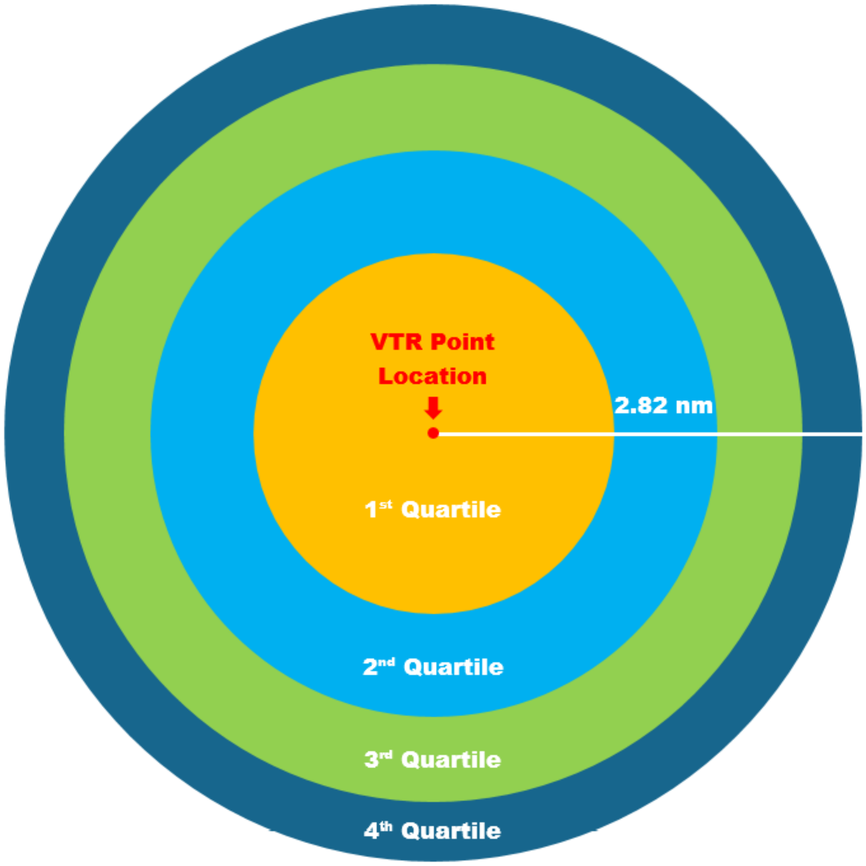

Figure 11. Visual representation of concentric circles around each VTR point location. Each circle represents 25 percent of the area around and revenue earned at each VTR point location.

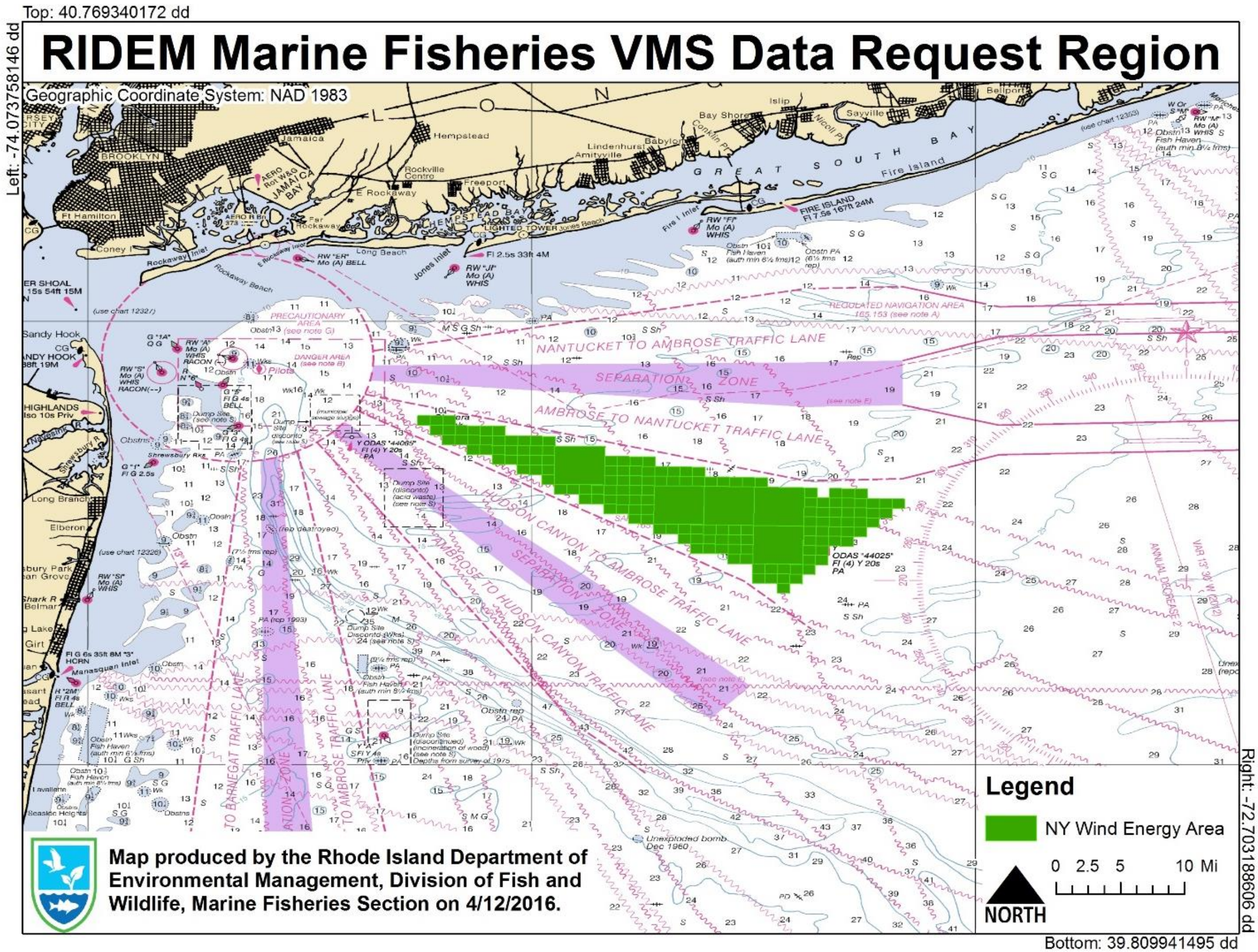

Figure 12. Bounding box for formal request of VMS data through NOAA OLE.

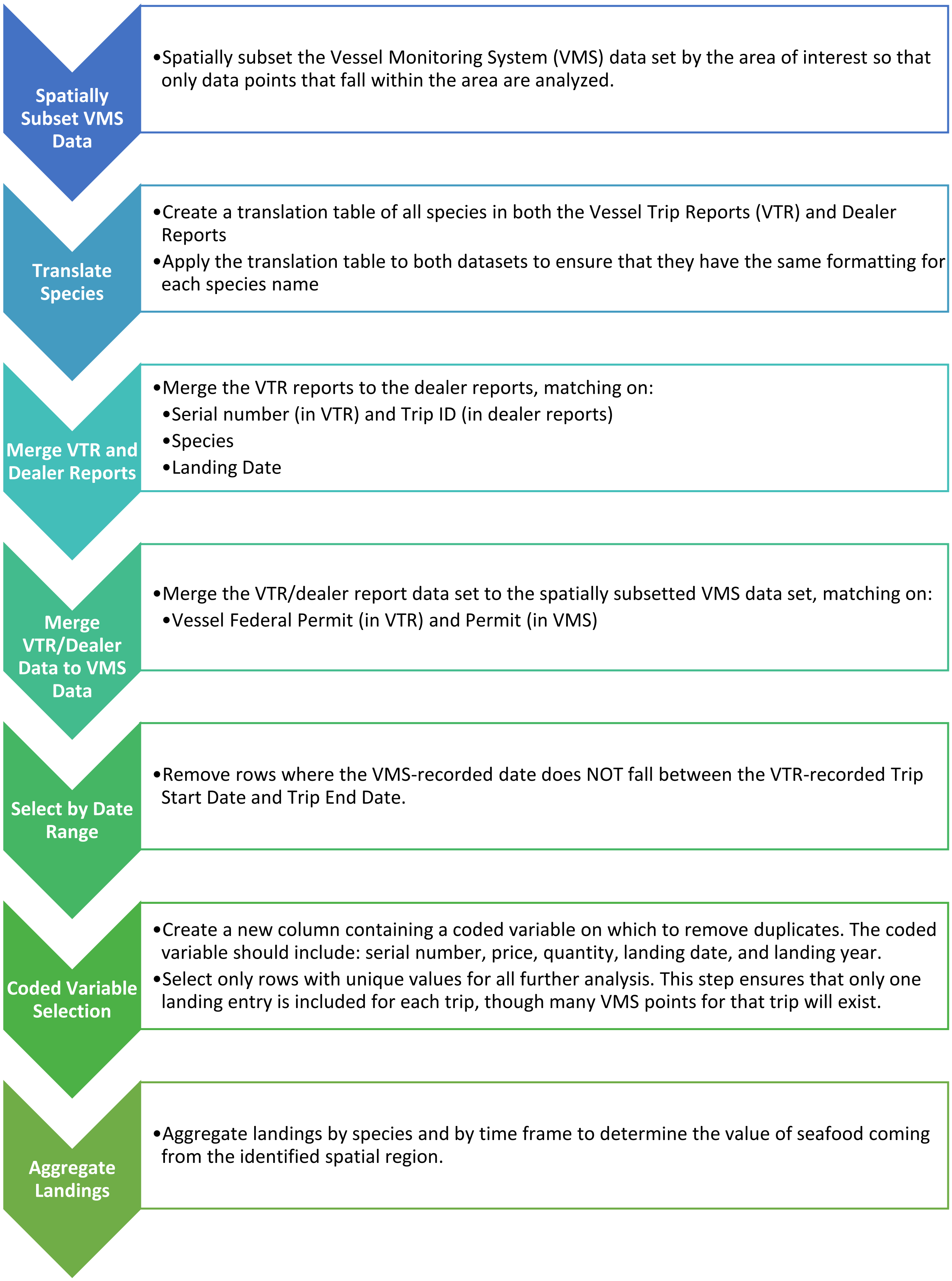

Figure 13. VMS and VTR economic analysis workflow

Table 1. Annual values, economic values, and pounds landed of all species harvested from the NY WEA landed in Rhode Island. The economic multiplier has been used to determine the value of the seafood to the Rhode Island economy.

Year	Value	Economic Value	Pounds Landed
2009	$808,699.80	$1,312,540.32	1,477,488.38
2010	$34,543.60	$56,065.14	477,814.00
2011	$831,771.96	$1,349,987.02	680,194.40
2012	$1,677,064.94	$2,721,919.00	1,545,259.77
2013	$1,347,316.77	$2,186,729.34	1,324,048.00
2014	$2,171,562.82	$3,524,501.61	951,717.70
2015	$46,777.66	$75,921.33	34,090.00

Table 2. Annual proportion, in terms of value, of all Rhode Island landings coming from the NY WEA.

Year	Value of landings harvested from the NY WEA	Total value of all seafood landed in RI	Percentage of RI landings value from the NY WEA
2009	$808,699.80	$57,050,317.74	1.42%
2010	$34,543.60	$54,466,494.82	0.06%
2011	$831,771.96	$69,670,309.59	1.19%
2012	$1,677,064.94	$77,302,099.98	2.17%
2013	$1,347,316.77	$81,441,826.31	1.65%
2014	$2,171,562.82	$80,338,272.96	2.70%
2015	$46,777.66	$75,680,310.68	0.06%

Table 3. Annual values of squid, scallop, herring, summer flounder (fluke), and butterfish harvested within the NY WEA and landed in Rhode Island. C = Confidential. The total value of all five species combined from 2009-2015, including the confidential values, is $6,283,990.84.

Year	Squid (*D. pealeii*)	Atlantic Sea Scallop	Atlantic Herring	Summer Flounder	Butterfish
2009	$304,737.50	C	$11,931.75	C	$347.89
2010	$26,597.25	$0.00	$3,420.00	C	C
2011	$819,274.47	$0.00	$0.00	C	C
2012	$976,573.29	C	C	C	C
2013	$689,694.90	$480,320.40	C	$6,764.15	$1,327.93
2014	$820,565.92	$1,333,184.12	$0.00	$3,765.97	$1,651.35
2015	$38,503.40	C	$0.00	$646.11	$0.00
Non-Confidential Total	$3,675,946.73	$1,813,504.52	$15,351.75	$11,176.23	$3,327.17

Table 4. Annual pounds of squid, scallop, herring, summer flounder (fluke), and butterfish harvested within the NY WEA and landed in Rhode Island. C = Confidential. The total pounds landed of all five species combined from 2009-2015, including the confidential values, is 4,782,995.25 lbs.

Year	Squid (*D. pealeii*)	Atlantic Sea Scallop	Atlantic Herring	Summer Flounder	Butterfish
2009	335,674.38	C	82,287.00	C	429.00
2010	26,544.00	0.00	232,381.00	C	C
2011	662,930.40	0.00	0.00	C	C
2012	931,150.92	C	C	C	C
2013	651,254.00	39,502.00	C	2,815.00	2,714.00
2014	826,004.70	111,587.00	0.00	1,165.00	2,314.00
2015	30,868.00	C	0.00	229.00	0.00
Non-Confidential Total	3,464,426.40 lbs.	151,089.00 lbs.	314,668.00 lbs.	4,209.00 lbs.	5,457.00 lbs.

Table 5. Percent of squid value and pounds landed of all Rhode Island squid landings harvested from within the NY WEA

Year	All RI Value	All RI Pounds	NY WEA Value	NY WEA Pounds	% Value from NY WEA	% Pounds Landed from NY WEA
2009	$9,578,134.00	11,141,939	$304,737.50	335,674.38	3.18%	3.01%
2010	$7,141,413.00	7,367,738	$26,597.25	26,544.00	0.37%	0.36%
2011	$10,663,012.00	9,917,955	$819,274.47	662,930.40	7.68%	6.68%
2012	$12,590,317.00	11,688,670	$976,573.29	931,150.92	7.76%	7.97%
2013	$13,186,742.00	12,594,856	$689,694.90	651,254.00	5.23%	5.17%
2014	$13,973,581.00	14,665,729	$820,565.92	826,004.70	5.87%	5.63%
2015	$10,442,172.00	16,063,145	$38,503.40	30,868.00	0.37%	0.19%

Table 6. Combined annual values and pounds landed of squid, mackerel, and butterfish harvested within the NY WEA and landed in Rhode Island under the squid, mackerel, butterfish fishery management plan.

Year	Annual Value	Annual Pounds Landed
2009	$686,415.87	1,372,181.38
2010	$27,428.85	243,330.00
2011	$820,081.22	663,780.40
2012	$1,192,843.03	1,342,275.77
2013	$692,848.12	658,605.00
2014	$822,266.47	828,480.70
2015	$38,503.40	30,868.00
7 YR Total	$4,280,386.96	5,139,521.25 lbs.

Table 7. Comparison between BOEM's socioeconomic model output and RIDEM's VMS/VTR/Dealer report analysis of annual squid values harvested from within the NY WEA. BOEM's numbers were provided by Brian Hooker (fisheries biologist at BOEM) on June 7, 2016.

Year	**BOEM/NOAA Estimate using VTR data (value from NY WEA landed anywhere on the coast)**	**RIDEM Estimate using VMS data (value from NY WEA landed ONLY in Rhode Island)**
2007	$255,574.00	Not available
2008	$71,673.00	Not available
2009	$182,057.00	$304,737.50
2010	$87,430.00	$26,597.25
2011	$228,287.00	$819,274.47
2012	$319,686.00	$976,573.29
2013	Not assessed	$689,694.90
2014	Not assessed	$820,565.92
2015	Not assessed	$38,503.40

Not assessed = data for these years were not obtained

Not available = data for these years do not exist (i.e. VMS was not yet required for these fisheries)

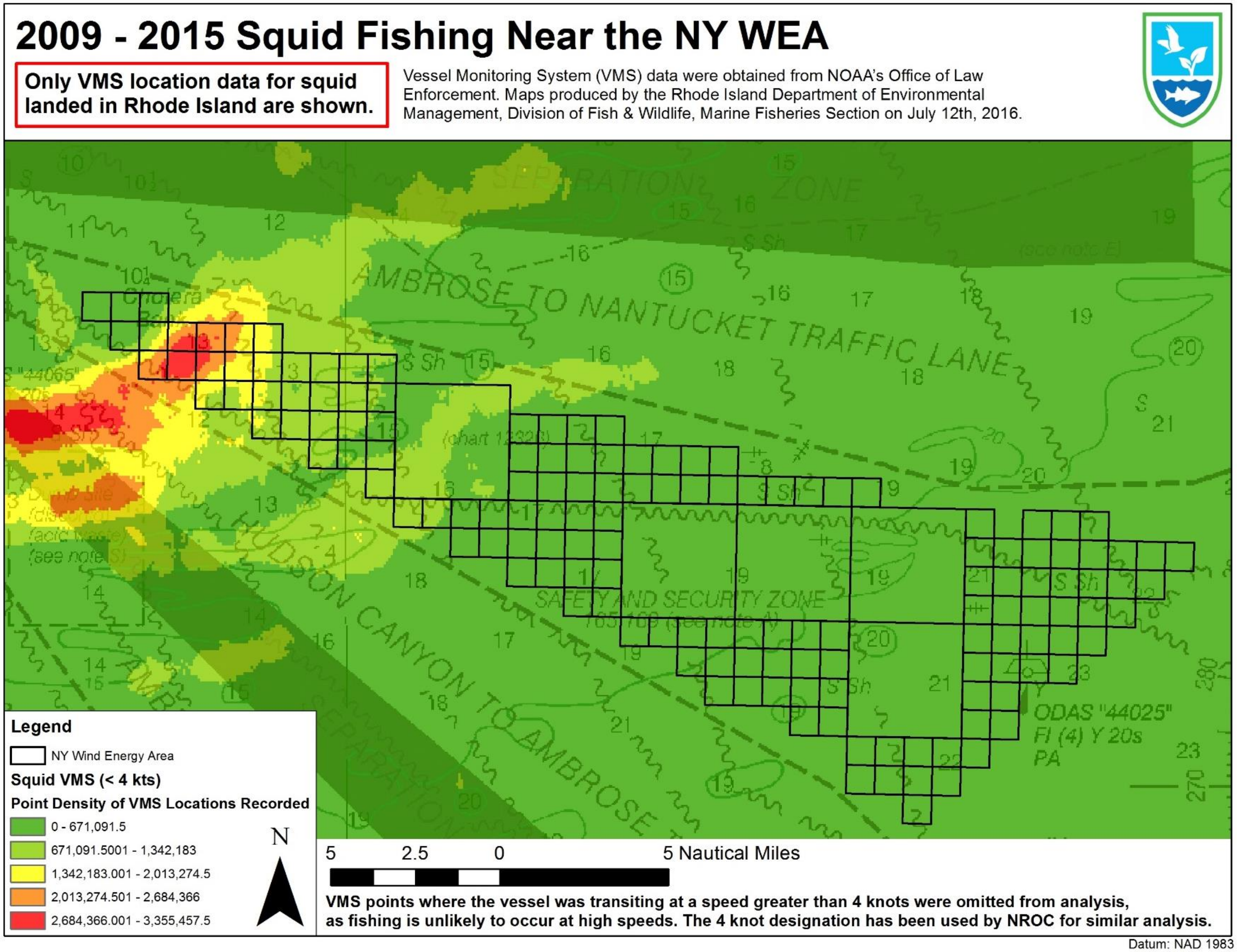

Figure 14. 2009-2015 squid fishing activity near the NY WEA

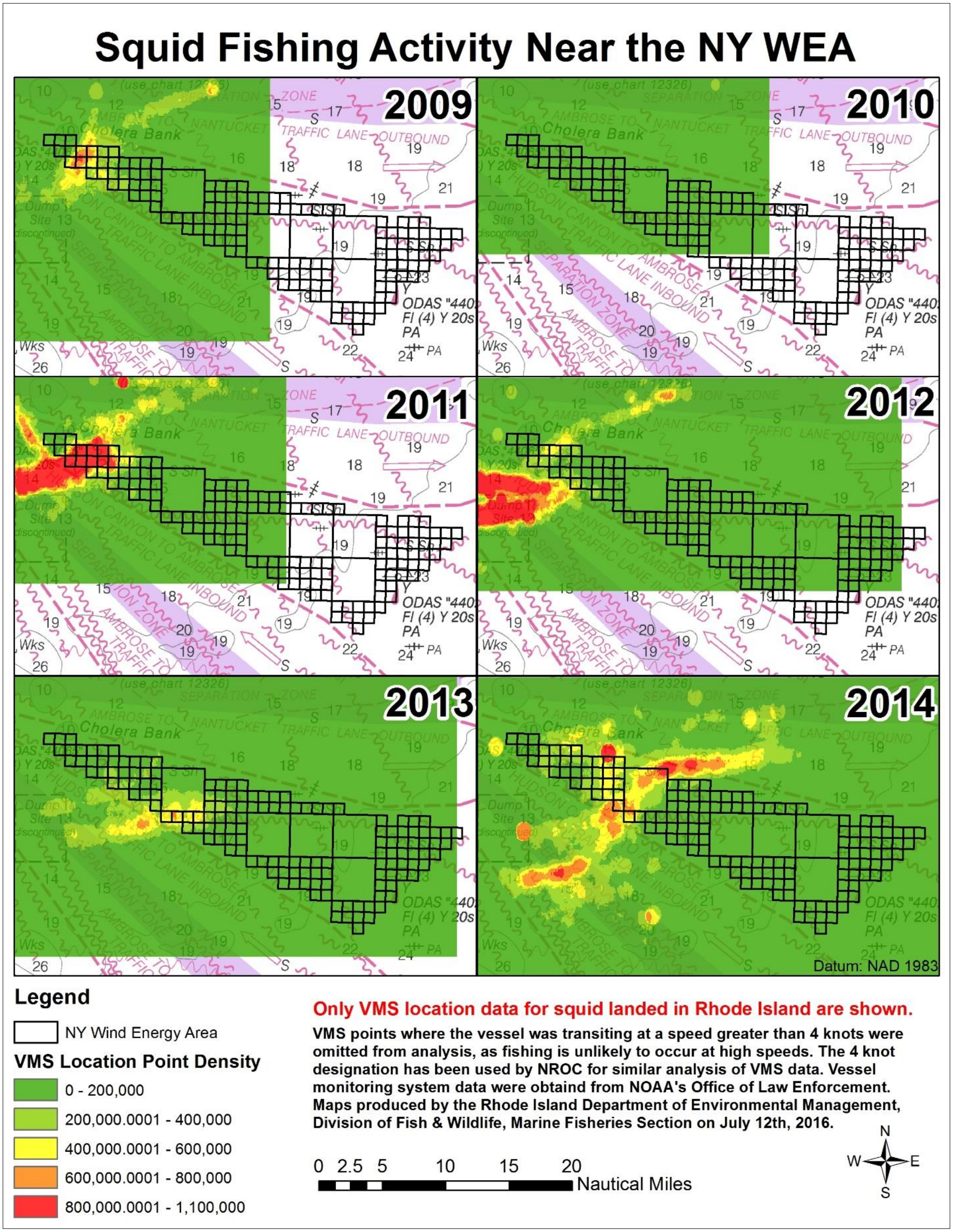

Figure 15. Annual squid fishing activity near the NY WEA, 2009-2014

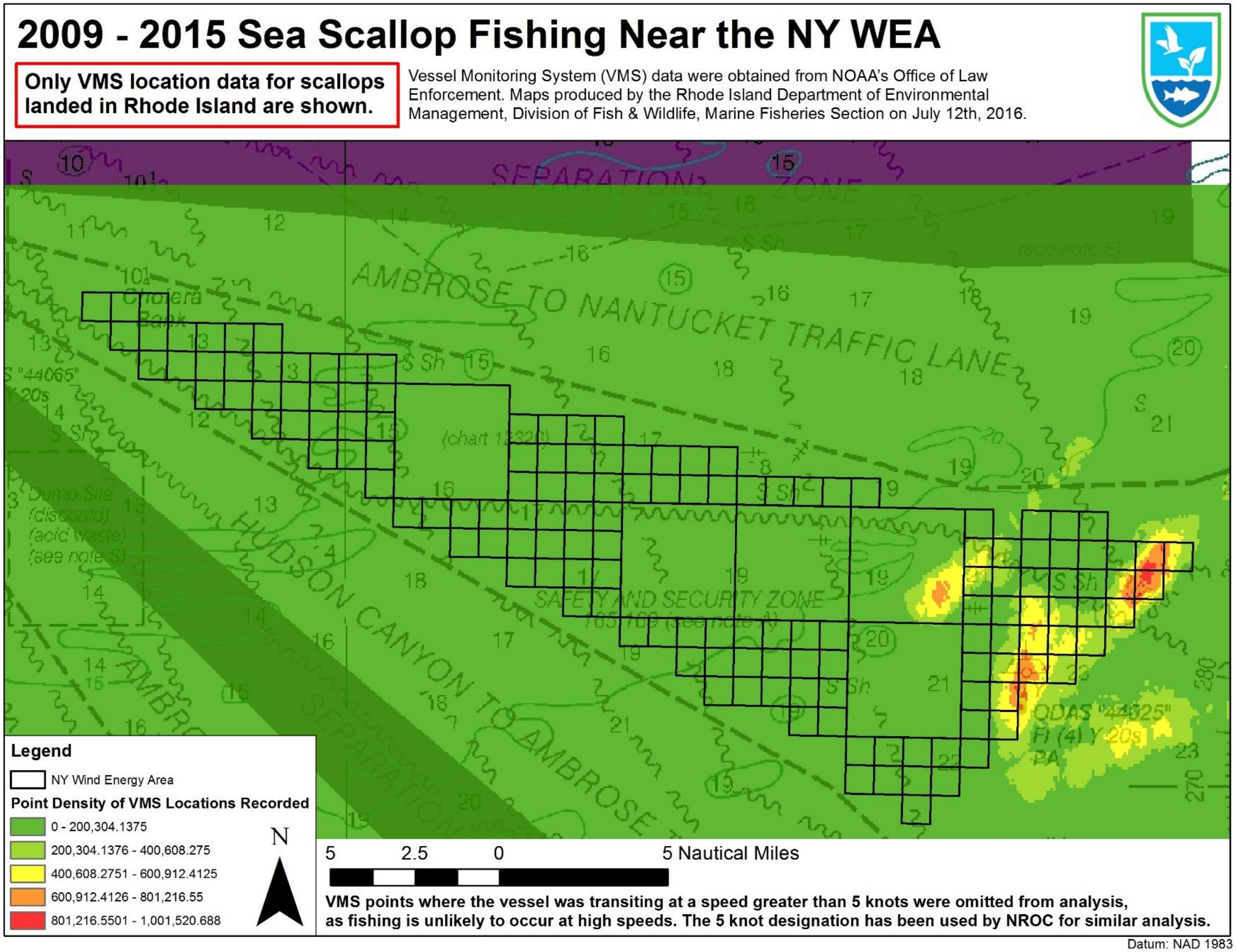

Figure 16. 2009-2015 scallop fishing activity near the NY WEA

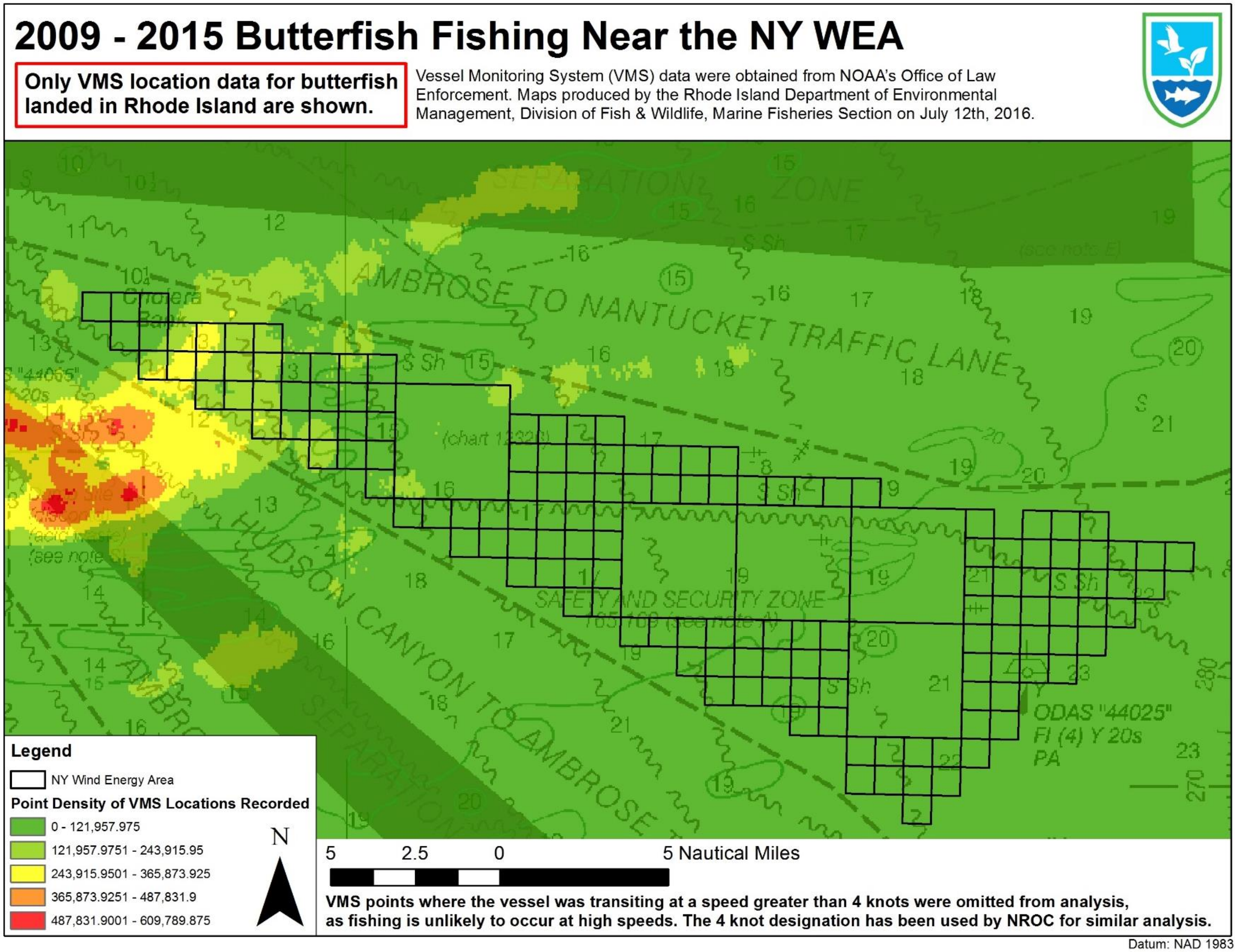

Figure 17. 2009-2015 butterfish fishing activity near the NY WEA

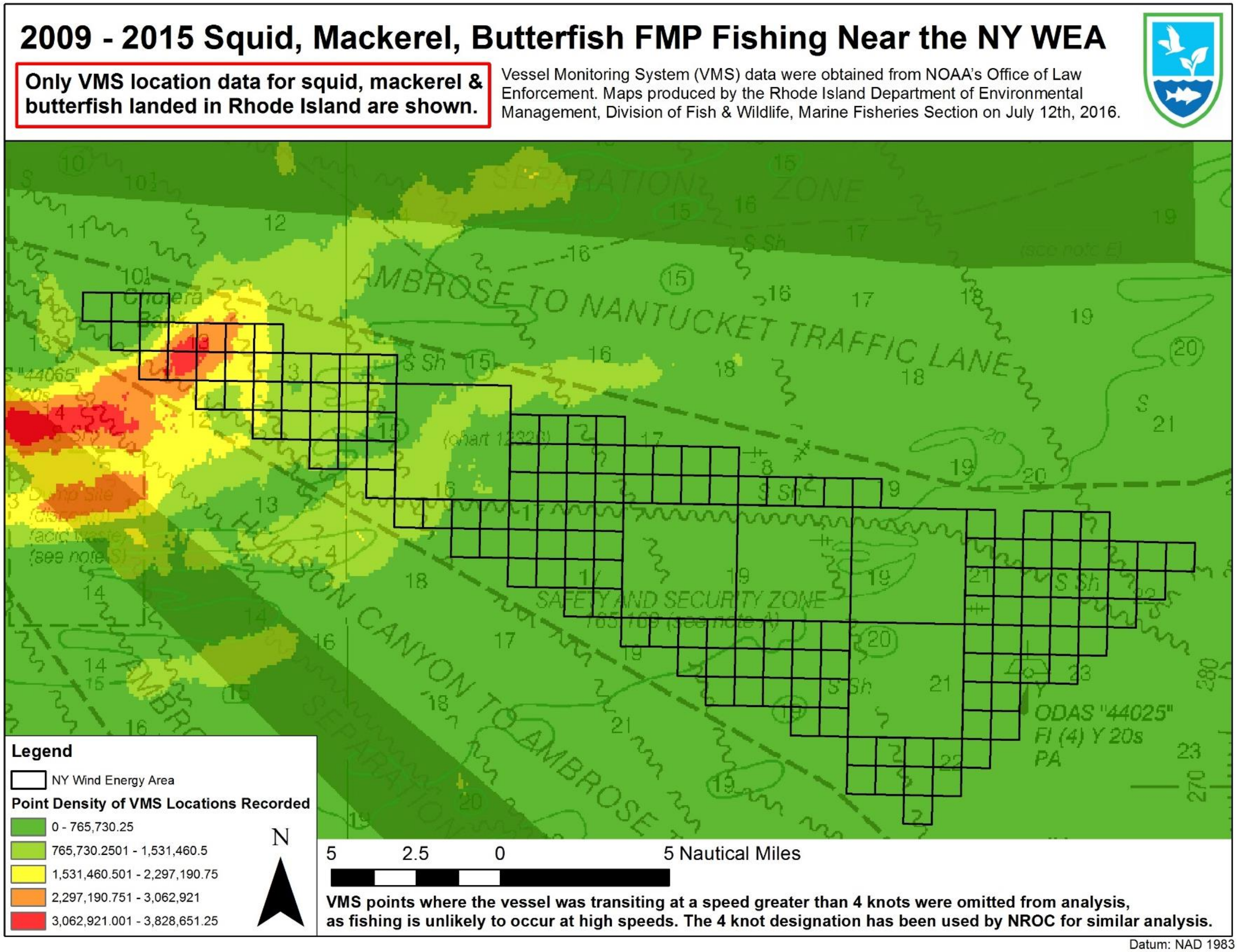

Figure 18. 2009-2015 squid, mackerel, and butterfish fishing activity near the NY WEA

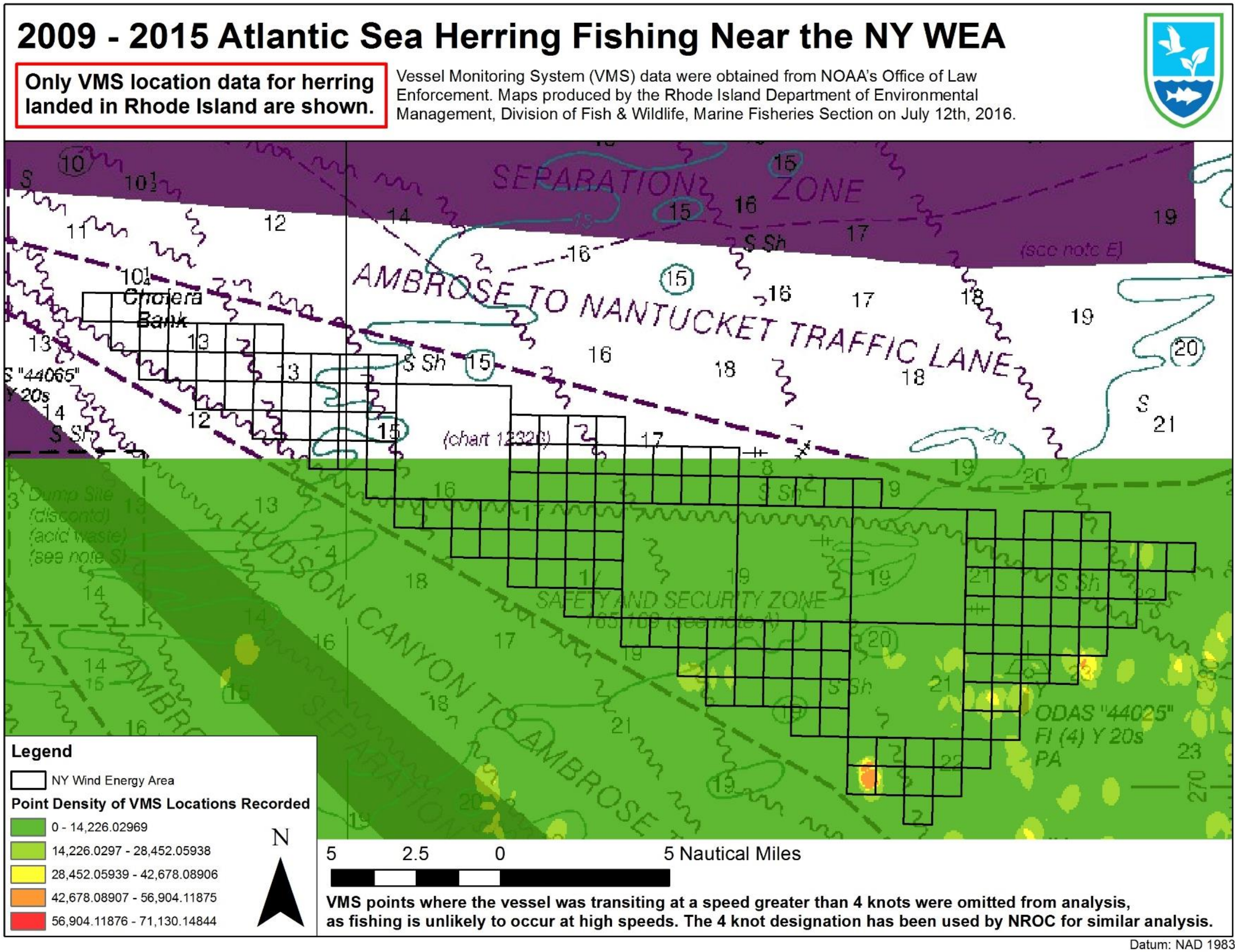

Figure 19. 2009-2015 herring fishing activity near the NY WEA