UNITED STATES COAST GUARD

Atlantic Coast Port Access Route Study

Final Report

Docket Number USCG-2011-0351

ACPARS Workgroup

24 February 2016

Executive Summary

The Atlantic Coast Port Access Route Study (ACPARS) Workgroup (WG) was chartered on 11 May 2011, and was given three objectives to complete within the limits of available resources: 1) Determine whether the Coast Guard should initiate actions to modify or create safety fairways, Traffic Separation Schemes (TSSs) or other routing measures; 2) Provide data, tools and/or methodology to assist in future determinations of waterways suitability for proposed projects; and 3) Develop, in the near term, Automatic Identification System (AIS) products and provide other support as necessary to assist Districts with all emerging coastal and offshore energy projects. The WG published an Interim Report dated 13 July 2013 with the status of efforts up to that date.[1] The WG concluded that modeling and analysis tools, as described in the Phase 3 section of the report, were critical to determine if routing measures are appropriate and to evaluate the changes in navigational safety risk resulting from different siting and routing scenarios.

The charter for the WG was extended pending completion of the modeling and analysis to be conducted by the Pacific Northwest National Laboratory (PNNL). The PNNL efforts concluded in the fall of 2014, but did not produce a model capable of accurately predicting changes in vessel routes and determining the resultant change in the risk to navigation safety. During this period, the WG continued gathering data and conducting stakeholder outreach. The availability and usability of processed AIS data has greatly improved, as has the ability to analyze the AIS data. The Coast Guard contracted the services of a Geographic Information System (GIS) analyst to support efforts to better characterize vessel traffic and further explore creating initial proposals for routing measures independent of the Phase 3 modeling and analysis. This enabled the Coast Guard to improve its understanding of vessel routes, beyond the understanding gleaned through generic heat maps.

Based on comments by the shipping industry and more recent literature on addressing shipping during marine spatial planning, the WG conducted additional research into the necessary sea space for vessels to maneuver in compliance with the International Regulations for Preventing Collisions at Sea. This research led to the development of recommended marine planning guidelines. In addition, an effort focused on determining the appropriate width of a navigation route was undertaken for alongshore towing operations. These efforts enabled the WG to identify navigation safety corridors along the Atlantic Coast that combine the width necessary for navigation and additional buffer areas based on the planning guidelines. The WG has also identified deep draft routes that it recommends be given priority consideration to navigation over other uses, which is consistent with the United Nations Convention of the Law of the Sea.

[1] http://www.uscg.mil/lantarea/acpars/docs/ACPARS_Interim_Report-Final_09AUG.pdf

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A. Purpose

The United States Coast Guard Deputy Commandant for Operations and the Commander, Atlantic Area jointly chartered the Atlantic Coast Port Access Route Study (ACPARS) team on 11 May 2011 (Enclosure 1). The team was chartered to address the potential navigational safety risks associated with the development of offshore renewable energy installations (primarily wind farms) and to support future marine spatial planning efforts. The team, referred to as the ACPARS workgroup (WG), was given three objectives to complete within the limits of available resources: 1) Determine whether the Coast Guard should initiate actions to modify or create safety fairways, Traffic Separation Schemes (TSSs) or other routing measures; 2) Provide data, tools and/or methodology to assist in future determinations of waterways suitability for proposed projects; and 3) Develop, in the near term, Automatic Identification System (AIS) products and provide other support as necessary to assist Districts with all emerging coastal and offshore energy projects.

B. Background

The ACPARS was initiated to study the navigational uses off the Atlantic Coast in support of the Department of Interior's (DOI) "Smart from the Start" initiative and provide data to support future Marine Planning (MP) efforts. The ACPARS study area includes the entire Atlantic Coast (Maine to Florida) and is not focused on the port areas from the sea buoy into the port like a typical port access route study. It is focused on those waters located seaward of the existing port approach systems within the Exclusive Economic Zone (EEZ). The intent of the ACPARS is to identify all current and anticipated new users of the Western Atlantic near coastal zone, and determine what impact the siting, construction and operation of proposed alternative energy facilities may have on existing near coastal users and whether routing measures should be modified or created to ensure the safety of navigation.

DOI's "Smart from the Start" wind energy initiative for the Atlantic Outer Continental Shelf (OCS) was launched in November 2010 "to accelerate siting, leasing and construction of new projects."[2] This initiative includes three key elements: (1) eliminating a redundant step from the "Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf" regulations; (2) identifying Wind Energy Areas (WEA) to be analyzed in an Environmental Assessment (EA) (prepared pursuant to the National Environmental Policy Act (NEPA) (42 U.S.C. § 4321 *et seq.*)) for the purpose of supporting lease issuance and site assessment activities; and (3) proceeding on a parallel track to process offshore transmission proposals. The Bureau of Ocean Energy Management (BOEM) describes a WEA as an OCS area that appears to be suitable for commercial wind energy leasing. WEAs are delineated following deliberation and consultation with Intergovernmental Renewable Energy State Task Forces.[3]

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[2] DOI Press Release dated 23NOV2010, "Salazar Launches 'Smart from the Start' Initiative to Speed Offshore Wind Energy Development off the Atlantic Coast" http://www.doi.gov/news/pressreleases/Salazar-Launches-Smart-from-the-Start-Initiative-to-Speed-Offshore-Wind-Energy-Development-off-the-Atlantic-Coast.cfm

[3] Federal Register, Volume 77, No.23, February 3, 2012

To ensure safety of navigation, the Coast Guard needs to fully characterize the impacts of rerouting traffic, funneling traffic, and placement of structures that may obstruct navigation. Some of the impacts may include increased vessel traffic density, more restricted offshore vessel routing (seaward of pilotage areas), fixed navigation obstructions, underwater cable hazards, and other economic impacts. Analyzing the various impacts requires a thorough understanding of the interrelationships of shipping and other commercial uses, recreational uses, and port operations.

C. Statutory Authority and International Guidelines

1. Routing Measures

The Ports and Waterways Safety Act (PWSA) (33 U.S.C. § 1223(c)) directs the Secretary of the Department in which the Coast Guard resides, to designate necessary fairways and Traffic Separation Schemes (TSSs) to provide safe access routes for vessels proceeding to and from United States ports. The designation of fairways and TSSs recognizes the paramount right of navigation over all other uses in the designated areas, subject however, to certain preexisting rights granted through leases or permits.

The PWSA requires the Coast Guard to conduct a study of potential traffic density and assess the need for safe access routes for vessels, before establishing or adjusting fairways or TSSs. These studies are referred to as Port Access Route Studies (PARS). Through the study process the Coast Guard must coordinate with certain Federal and State agencies, and consider the views of maritime community representatives, environmental groups, and other interested stakeholders. A primary purpose of this coordination is, to the extent practicable, to reconcile the need for safe access routes with other reasonable waterway uses such as construction and operation of renewable energy facilities and other uses of the Atlantic Ocean in the study area.

The International Maritime Organization (IMO) is the only recognized international body for developing guidelines, criteria and regulations on an international level concerning certain routing measures and areas to be avoided by ships. IMO states the purpose of ships' routing is "to improve the safety of navigation in converging areas and in areas where the density of traffic is great or where the freedom of movement of shipping is inhibited by restricted sea room, the existence of obstructions to navigation, limited depths or unfavorable meteorological conditions."[4] Guidelines for establishing routing measures and areas to be avoided are contained in the IMO "*Ships' Routeing*" publication.

2. Leasing of the Outer Continental Shelf

The Energy Policy Act of 2005 amended the Outer Continental Shelf Lands Act to authorize DOI to, in consultation with the Secretary of the Department in which the Coast Guard is operating and other relevant departments and agencies of the Federal Government, grant a lease, easement, or right-of-way on the Outer Continental Shelf (OCS) for alternate energy related uses of the OCS that produce or support production, transportation, or transmission of energy sources other than oil and gas (43 U.S.C. § 1337(p)(1)(C)).

[4] International Maritime Organization (IMO) Publication, "Ships' Routeing," 2013 Edition.

As the NEPA lead permitting agency, BOEM is responsible for the development and preparation of environmental impact documentation for such activities on the OCS. BOEM and the USCG have entered into a Memorandum of Agreement (MOA) to identify and clarify the roles and responsibilities of the agencies for the issuance of leases and approval of Site Assessment Plans (SAPs), General Activity Plans (GAPs) and Construction and Operations Plans (COPs) for offshore renewable energy installations (OREIs). Under the MOA, BOEM will utilize the USCG's expertise during the NEPA process and invite the USCG to be a Cooperating Agency during the preparation of NEPA documentation. The USCG will participate in the NEPA process as a subject matter expert for maritime safety, maritime security, maritime mobility (management of maritime traffic, commerce, and navigation), national defense, and protection of the marine environment. During BOEM's preparation of NEPA documentation, the USCG should participate at the earliest possible time.[5]

In addition to BOEM's authorities, both the Federal Energy Regulatory Commission (FERC) and the U.S. Army Corps of Engineers (USACE) play roles in the permitting and licensing on the OCS. FERC issues licenses under Part I of the Federal Power Act (FPA), 16 U.S.C. §§ 791a *et seq*, and for the construction and operation of hydrokinetic projects on the OCS, and will conduct any necessary analyses, including those under NEPA, related to those actions.

The USACE will be the lead permitting agency for projects located within state waters.[6] Section 10 (33 § USC 403) of the Rivers and Harbors Act of 1899 covers construction, excavation, or deposition of materials in, over, or under such waters, or any work which would affect the course, location, condition, or capacity of those waters. Activities requiring Section 10 permits include structures (e.g., piers, wharfs, breakwaters, bulkheads, jetties, weirs, transmission lines) and work such as dredging or disposal of dredged material, or excavation, filling, or other modifications to the navigable waters of the United States. The geographic jurisdiction of the Rivers and Harbors Act includes all navigable waters of the United States which are defined, in33 CFR Part 329 as, "those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce." This jurisdiction extends seaward to include all ocean waters within a zone three nautical miles from the coastline. However,the authority of the Secretary of the Army to prevent obstructions to navigation in navigable waters of the United States was extended to artificial islands, installations, and other devices located on the seabed, to the seaward limit of the outer continental shelf, by section 4(f) of the Outer Continental Shelf Lands Act of 1953 as amended (43 U.S.C. § 1333(e)). (See 33 CFR Part 322.).

[5] Memorandum of Agreement between the Bureau of Ocean Energy Management, Regulation and Enforcement – U.S. Department of Interior and the U.S. Coast Guard – U.S. Department of Homeland Security, "Offshore Renewable Energy Installations on the Outer Continental Shelf," 27 July 2011.
[6] Along the Atlantic Coast state waters extend to 3 NM.

3. Interference with Navigation

The United Nations Convention on the Law of the Sea (UNCLOS), Article 60, Paragraph 8 states "Artificial islands, installations and structures and the safety zones around them may not be established where interference may be caused to the use of recognized sea lanes essential to international navigation." A similar provision is found in U.S. Law – The Outer Continental Shelf Lands Act (OCSLA) as amended by the Energy Policy Act of 2005 (EPAct), provides that the Secretary of the Interior shall ensure that any leases, easements or rights-of-way are carried out in a manner that prevents interference with reasonable uses of the exclusive economic zone, the high seas and the territorial seas; and in consideration oany other use of the sea or seabed, including use for a fishery, sealane, a potential site for a deepwater port, or navigation. [7]

D. Study Approach

A Coast Guard workgroup was chartered to conduct the Atlantic Coast Port Access Route Study. The WG is co-chaired by Deputy Commander, Atlantic Area (LANT-09) and the Director, Marine Transportation Systems (CG-5PW)[8]. The core group consists primarily of waterways management specialists from Coast Guard Headquarters, Coast Guard Atlantic Area, and Coast Guard Districts One, Five and Seven, but at times also includes other personnel from supporting offices throughout the Coast Guard, the National Oceanic and Atmospheric Administration (NOAA) and the Maritime Administration (MARAD) as needed. The WG created a Project Management Plan consisting of Four Phases that include:

1. Phase 1- Data Gathering. In Phase 1, includes gathering data on existing and future waterway usage.

a. Determining traditional shipping routes using available AIS data and any other available data on maritime traffic patterns;

b. Combining AIS and other available data, analyzing to determine existing shipping routes and displaying routes in a geospatial format;

c. Gathering additional data and information to identify existing and future waterways usage through public comments;

d. Conducting stakeholder outreach through industry organizations and port level committees; and,

e. Gathering Maritime Transportation System (MTS) information from other federal agencies.

[7] Energy Policy Act, Section 388- Alternative Energy-Related Uses on the Outer Continental Shelf
[8] CG-5PW was formerly CG-55

2. <u>Phase 2- Apply Suitability Criteria</u>. In Phase 2, use the shipping routes identified in Phase 1 and apply best available guidance (such as United Kingdom (UK) Maritime Guidance Note MGN-371) to identify areas within the study area that are:

a. Unsuitable for Offshore Renewable Energy Installations (OREIs) because of proximity to or location within existing routes;

b. Potentially suitable for OREIs but require further study and analysis to determine if mitigation measures can reduce the navigational safety risk to tolerable levels; or,

c. Potentially suitable for OREIs based on available data that suggest the navigational safety risk is acceptable without additional mitigation measures.

3. <u>Phase 3- Modeling and Analysis</u>. The WG recognized the need to conduct modeling and analysis to predict changes in traffic patterns and determine the change in navigational risk due to the complex interactions of the various factors that would impact navigational safety. The tasks to be accomplished in Phase 3 were beyond the technical capabilities and capacity of the WG and Coast Guard resources. Phase 3 would include:

a. Developing a Geospatial Information System (GIS) based model to predict traffic density and traffic patterns that incorporates the UK methodology[9] or equivalent, to determine the resultant navigational safety risk given alternative siting scenarios and mitigating measures. The model should be able to identify the individual and cumulative effects on the MTS along the Atlantic Coast;

b. Assessing the resultant navigational safety risk associated with potential wind development areas with and without changes to routing measures or other navigational safety measures (e.g. pilotage, separation distances, regulated navigation areas, etc.);

c. Conducting analyses of potential mitigating measures to determine if modifying existing or creating new routing measures, or implementing other navigational safety measures (e.g. pilotage, separation distances, regulated navigation areas, etc.) are necessary to reduce risk to within acceptable levels and to minimize overall impacts to the MTS;

d. Evaluating options for the creation of coastwise routing measures and make recommendations for the creation of a system of routing measures that ensure navigational safety remains within acceptable limits, while having the ability to accommodate multiple uses today and in the future; and,

e. Publishing findings and recommendations in an ACPARS Final Report.

[9] United Kingdom Maritime and Coastguard Agency(MCA) "Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of Offshore Renewable Energy Installations (OREI)," 2013.

4. <u>Phase 4- Implementation of Study Recommendations</u>.

a. Review the ACPARS Final Report from Phase 3 to determine:

(1) If additional information is needed;

(2) If changes to routing measures or creation of new routing measures are recommended; or,

(3) Whether other actions are necessary, such as documentation of traditional routes, changes in Coast Guard processes to determine suitability of proposed siting or updates to the Coast Guard Navigational Vessel Inspection Circular (NVIC) for Offshore Renewable Energy Infrastructure (OREI).

b. If no additional information is needed, issue a Notice of Study Results.

c. If additional information is needed, reopen the docket through a Federal Register notice and conduct outreach and public meetings as necessary.

d. Initiate the regulatory process to create or modify any routing measures.

e. Initiate International Maritime Organization (IMO) processes as applicable to establish or amend any routing measures.

E. Status Summary

1. Phase 1 – Status of Data Gathering

a. Determine Traditional Shipping Routes Based on AIS:

Over time the publicly available AIS data and derivative products have greatly improved. The 2011 data has been processed and made available as density plots by vessel type on the Multipurpose Marine Cadastre (MarineCadastre.gov). In addition, analysis has been conducted using the 2009 dataset to quantify the amount of conflict for all of the wind energy areas and wind lease areas as of May 2013. Appendix IV is a summary of the results for each area being considered for development. Analysis was also conducted to evaluate additional options to the initial Call areas for Maryland and North Carolina, resulting in better informed recommendations to BOEM that attempt to preserve navigation safety, while maximizing area available for renewable energy development. See Appendices V and VI.

b. Stakeholder and Public Outreach:

The WG has continued to engage local, regional, national and international port and industry stakeholders. To achieve this, the WG has taken several approaches to gather input:

1) LANTAREA, Districts, and Sectors leveraged existing regional partnerships and relationships between local Coast Guard units and local port partners to encourage input to the study;

2) The WG continued outreach to the towing vessel community and initiated a Quality Action Team to develop recommended distances necessary for towing vessels to maneuver safely;

3) The WG participated in numerous conferences and industry forums for both the shipping and wind industry to exchange information and provide updates on the progress of the ACPARS;

4) The WG participated in regional outreach activities with the Mid-Atlantic Regional Portal Team and the Northeast Regional Portal team; and,

5) National level outreach was conducted by the Coast Guard Marine Transportation Systems Directorate (CG-5PW) to ensure partner agencies and national level organizations were engaged.

c. Gather Marine Transportation System Data:

As part of the data gathering phase, the WG explored the social and economic benefits of the many uses of the waters off the Atlantic Coast including maritime trade, commercial fishing, recreational fishing, tourism, and recreation. In understanding the many varied uses of the MTS, it is important to consider future trends, particularly as they pertain to balancing multiple uses. The WG identified three major areas that may impact future uses of the Atlantic Coast waters

including the expansion of the Panama Canal, the Maritime Administration's (MARAD) America's Marine Highway Program, and future exploitation of energy resources on the OCS. A description of the MTS and the potential effects of future trends were included in Appendix V of the Interim Report.

d. Planning Guidelines and Recommendations:

Additional information was gathered on planning standards and guidelines with respect to navigation and offshore structures. One of the key themes across standards and guidelines internationally, is the recognition that structures should not interfere with navigation based on the United Nations Convention on the Law of the Sea (UNCLOS).

A common approach in determining appropriate separation or buffer distances is accounting for the sea space necessary for a vessel to maneuver safely in accordance with the International Regulations for Preventing Collisions at Sea, 1972 (72 COLREGS). The Confederation of European Shipmasters' Associations (CESMA) and the Shipping Advisory Board Northsea recommend minimum distances necessary for vessels to comply with the COLREGs, interpreted as the ability of a vessel to complete a full round turn. The World Shipping Council has submitted information from vessel masters to the BOEM and the Coast Guard providing distances it believes are required for maneuvers that may occur when a vessel encounters an emergency, such as emergency stopping, anchoring, or completing a 180º turn.

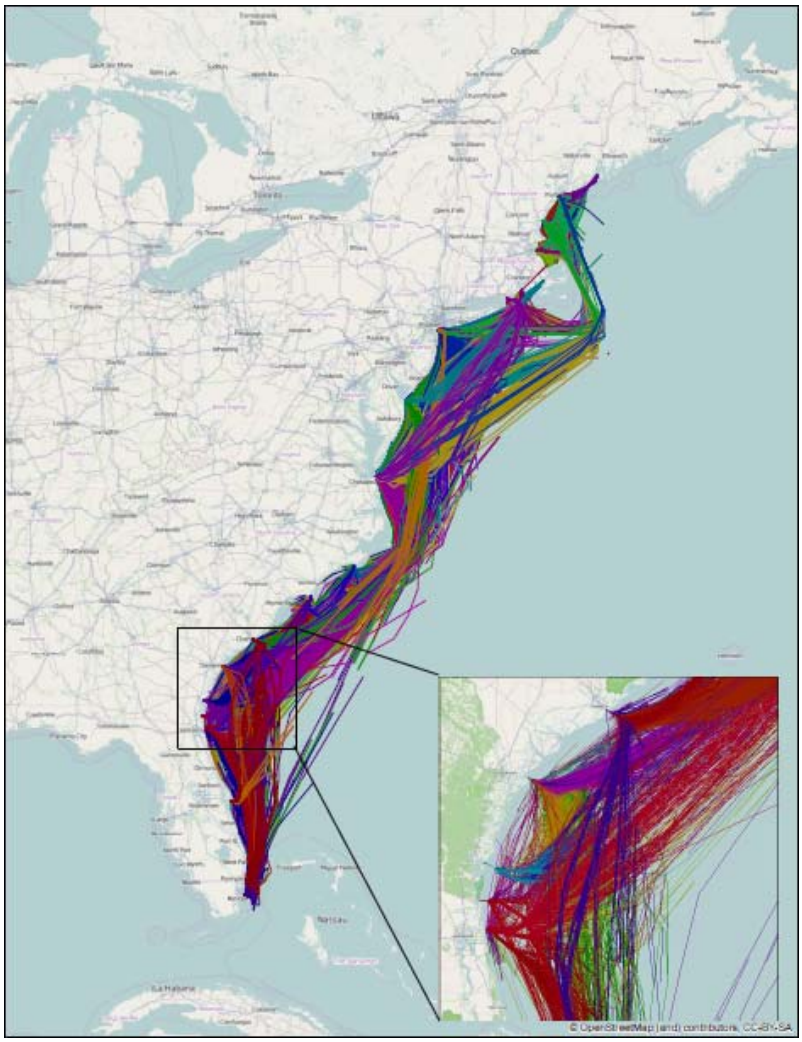
Recognizing that maneuvers performed by a tug towing a barge astern varied greatly from a standard commercial vessel, the Coast Guard and the American Waterways Operators (AWO) partnered to develop recommended safe distances for these operations along the Atlantic Coast. The results from the Coast Guard/AWO Quality Action Team are contained in enclosure (3).

2. Phase 2- Status of Applying Suitability Criteria

The original intent in Phase 2 was to make an analytical determination of existing shipping routes by analyzing the AIS data to determine routes that encompassed 95% of the traffic (+ or- 2 standard deviations) traveling in the same or opposing directions.[10] The WG would then apply the Red-Yellow-Green methodology[11] to make an initial determination of where there is high, medium, or low conflict for the entire study area. Due to the limitations in the ability to process and analyze the AIS data (as described in the Interim Report), this task was included in the Statement of Work (SOW) as part of the modeling and analysis effort conducted by Pacific Northwest National Lab (PNNL). The products produced from the task were port-to-port routes by vessel type.

[10] United Kingdom Department of Trade and Industry (DTI) Guidance on the Assessment of the Impact of Offshore Winds Farms: Methodology for Assessing the Impact of Wind Farms, p.97. www.bis.gov.uk/files/file22888.pdf

[11] See ACPARS Interim Report for a full description of the Red-Yellow-Green Methodology.



As part of the AIS analysis, PNNL produced a geo-database of vessel port-to-port routes that were further subdivided into the broad "vessel type" categories of cargo, tanker, and towing vessels. When all of the routes were layered together, the result essentially covered all of the offshore waters, which was not conducive to completing a Red-Yellow-Green assessment for the Atlantic Coast.

Figure 1 - PNNL Port to Port Layers

The R-Y-G methodology was developed using the UK MGN-371 as a reference. However, the methodology did not account for the more specific concerns near a Traffic Separation Scheme (TSS). The UK MGN-371 lists 5 NM as the minimum distance from the entrance/exit of a TSS and also states risk becomes low beyond 2 NM from the parallel boundary of a route, EXCEPT near a TSS. With a better understanding of the sea space necessary to maneuver safely, the Coast Guard decided to move forward with developing marine planning guidelines applicable to U.S. waters, and consistent with guidelines used internationally. The recommended Marine Planning Guidelines are contained in enclosure (2).

3. Phase 3- Status of Modeling and Analysis

a. Develop a GIS based model to predict changes in traffic patterns and determine navigational safety risk:

BOEM expressed an interest in funding the contract directly, using one of the Department of Energy (DOE) National Labs. The WG worked closely with BOEM staff to develop a detailed SOW and review/evaluate proposals. PNNL was selected by BOEM to conduct the modeling and analysis consisting of the following tasks:

1) Data Acquisition, Review, and Validation;
2) Geospatial Analysis;
3) Development of a GIS-based Model;
4) Numerical Modeling Assessment of Navigational Safety Risks from Offshore Wind Development; and,
5) Development and Analysis of Recommendations:

Members of the WG participated on both a Technical Committee and an Expert Panel to advise and assist PNNL as appropriate. During the model development, concerns and issues were raised regarding the approach being used for modeling vessel movements, and how vessel interactions with other vessels and stationary objects were simulated. The underlying approach for determining vessel movements did not accurately predict changes in vessel routes. The approach remained in place through completion of the PNNL project, and as a result, a useable model that accurately reflected vessel movements and vessel interactions was never realized.

b. Evaluate options for creation of routing measures:

The PNNL efforts did not result in the development and analysis of recommendations for routing measures along the Atlantic Coast. Establishment of routing measures requires a determination that navigational safety would be improved. In absence of a working model, the WG is unable to predict changes in vessel routes and determine the resultant change in navigation safety risk for any proposed routing measures. Creating routing measures where structures currently do not exist, would more likely result in an increase in risk due to vessels navigating in closer proximity to each other in a routing measure, than they would otherwise in an open ocean scenario. Therefore, to determine the balance of appropriate routing measures with proposed development would require the modeling and analysis tools.

c. Identification of Navigation Safety Corridors:

As an alternative to routing measures, the draft Planning Guidelines were used by a joint Coast Guard and AWO workgroup to determine recommended safe distances for towing vessels to operate along the Atlantic Coast.

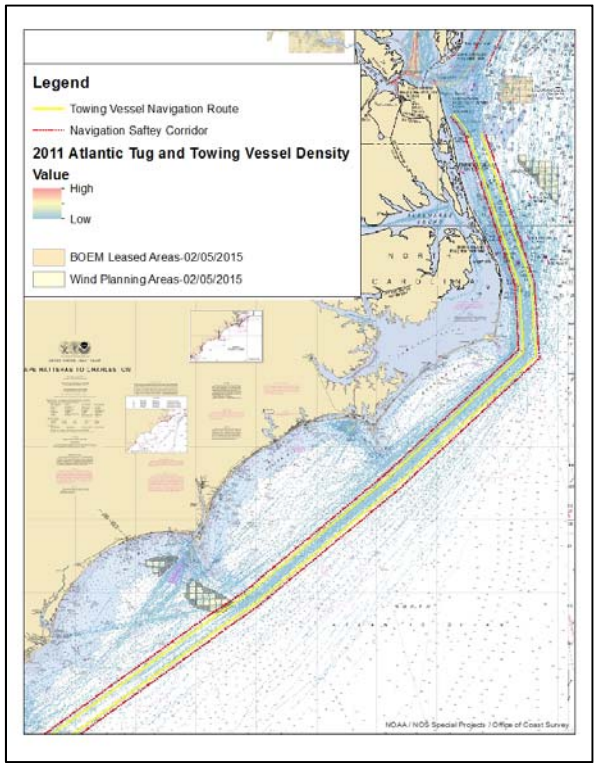


Figure 2 - Towing Vessel Navigation Route and Navigation Safety Corridor Off North Carolina Coast with 2011 Towing Vessel Density

The recommendations were then applied to the historic routes determined by AIS, to identify recommended Navigation Safety Corridors.

Recognizing that many wind energy areas have been previously established and in some cases leased, the WG identified an alternate route for consideration in the vicinity of the entrance to Delaware Bay. The alternate route has been informally reviewed by towing industry representatives who did not object to the recommendation.

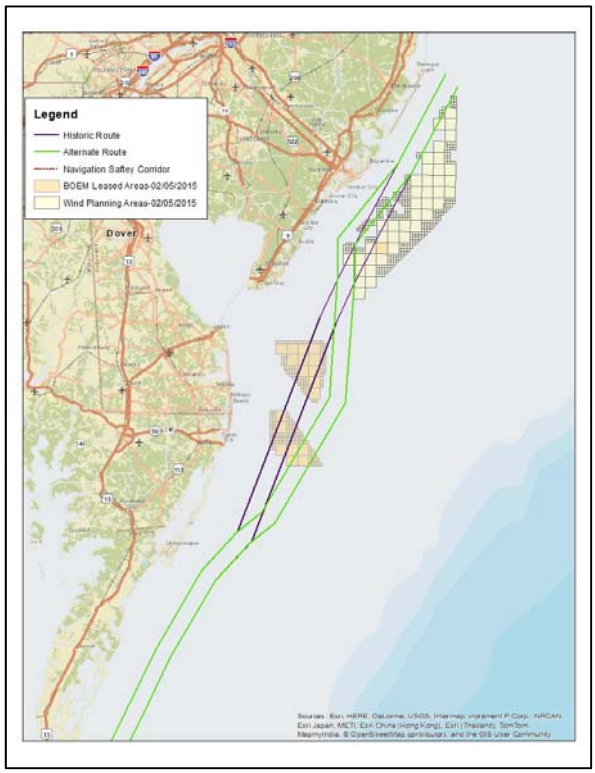


Figure 3 - Towing Vessel Historic and Alternate Navigation Routes

The WG also identified key alongshore routes utilized by deep draft vessels from New York/New Jersey to the Florida Straits. In lieu of a more detailed analysis of vessel speed, density, cross track error, etc., navigation corridors of 10 NM width were used to display the routes. See Appendix VII for more details and maps of the recommended navigation safety corridors.

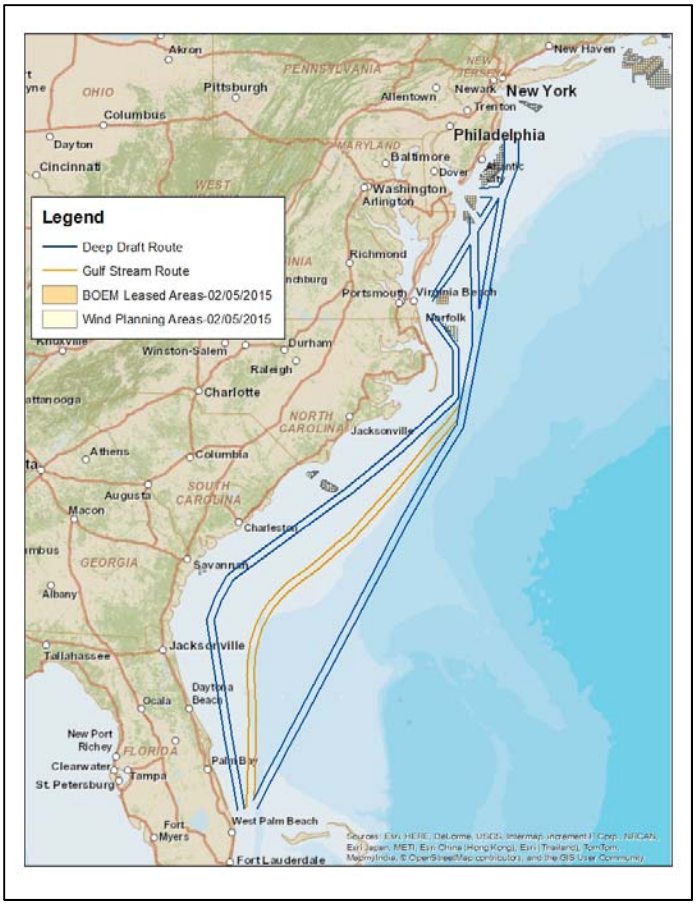


Figure 4 - Deep Draft Corridors

4. Phase 4- Status of Implementing Study Results.

Phase 4 Implementation of Study Results will be completed following the publication of the Notice of Study Results in the Federal Register and the receipt of public comments.

F. Summary and Conclusions

The WG was given three objectives in the initial charter. The first objective, to determine whether the Coast Guard should initiate actions to create or modify routing measures, cannot be met without further analysis. The WG determined that modeling and analysis beyond the capability of the WG is required to make these determinations. In absence of the modeling and analysis tool, the WG developed Planning Guidelines and applied those guidelines to recommend areas that should be given priority consideration for safe navigation. The second objective, to provide data, tools and/or methodology to assist in future determinations, was initially met with the R-Y-G Methodology, but the WG now recommends the use of the Planning Guidelines to make future recommendations. The third objective, to develop AIS products and support Districts with emerging coastal and offshore energy projects has been met through the use of contract support. AIS layers are now widely available through the Multi-purpose Marine Cadastre (MarineCadastre.gov), and several regional portals offer tools to visualize multiple data layers without technical training. Additional summaries and conclusions on specific topic areas are provided below.

1. Impact to Shipping

The placement of structures on the OCS, where previously no structures existed, increases risk of a vessel allision (with a fixed object), and may increase risk of collision between vessels and/or increase risk of a grounding. The risks will increase as a result of the density of vessel traffic being increased through funneling and decreased sea space for maneuverability. The density plots that have been created, provide estimations of the total number of vessels that transited through a particular aliquot over a one year period. What the WG is unable to determine with the analysis to date, is how often vessels pass within close range of each other, referred to as an encounter. The number of encounters would be a more accurate estimation of risk of a collision, than vessels per aliquot per year. Rerouting (displacing) traffic may also increase the weather related casualty risk to smaller vessels engaged in coastwise shipping by forcing them further offshore, where they will be subjected to larger sea states, and where their transits will be commingled with deep draft vessels moving at higher speeds.

2. Planning Guidelines

If the Planning Guidelines are used in all stages of the identification of wind energy areas, the risk of a project being found unacceptable due to navigation safety risk would be significantly lowered. The guidelines have the benefit of providing general guidelines as a starting point, while also explaining the various criteria necessary to determine whether the guidelines would be sufficient, whether they could be relaxed, or whether additional separation distance may be warranted based on site specific conditions. The Coast Guard continues to recommend that significant navigational conflicts be addressed in the Planning Phase of the leasing process. Although impacts related to the construction and operation of a wind farm would not be fully assessed until the Development Phase of the BOEM process, thoughtful and early application of the Planning Guidelines will result in a significant decrease in project risk.

3. Other Offshore Uses

Although the current emphasis off the Atlantic Coast is for offshore wind energy, it is also necessary to consider other exploration and exploitation activities that may occur in the study area in the future, such as hydrokinetics, aquaculture, or traditional oil, gas, and mineral extraction. The Administration's[12] and the Nation's desire for energy independence, all point to further exploration and exploitation of the vast energy potential available from the Atlantic OCS. This was further reinforced in a letter to President Barack Obama dated March 13, 2012 from the Outer Continental Shelf (OCS) Governors Coalition urging the Administration to speed up permitting and open new offshore areas for traditional and renewable energy projects. The current BOEM Draft Proposed Program released January 27, 2015 for the 2017-2022 program, includes an oil and gas lease sale in the Atlantic.[13]

4. Tug and Barge Routes

Many factors affect the routes vessels take, but generally they take the most direct and safe route. Smaller and slower moving vessels tend to transit closer to shore, whereas larger and faster moving vessels tend to transit in deeper water further offshore. Based on initial evaluations, the highest conflict between tug and barge routes and proposed WEAs occurs along the coastwise routes. Their routes vary based on weather, sea state, and depth of water necessary for the catenary to clear the bottom, when towing astern.

In many cases proposed WEAs such as at the entrance to Delaware Bay, if fully developed, would displace tugs and barges forcing them to transit further inshore or offshore from their traditional routes. The offshore route would take them approximately 35 miles offshore and into routes used by larger deep draft vessels. This is much farther than they would normally transit, especially the smaller units. The inshore route would cross the entrance to the bay at the convergence of the TSSs and pilot boarding areas, increasing traffic density and creating complex crossing situations.

Through the application of the Planning Guidelines and consideration of alternate routes, alongshore towing and wind energy development can coexist with some modifications to existing wind energy/lease areas. The remaining areas would provide suitable opportunity for large scale wind development. The proposed alternate route for alongshore towing in the Mid-Atlantic is shown in Appendix VII.

[12] http://www.whitehouse.gov/sites/default/files/email-files/fact_sheet_obama_administration_92s_all_of_the_above_a_windows_approach_to_american_energy.pdf
[13] http://www.boem.gov/Five-Year-Program/

5. Deep Draft Routes

Deep draft vessels travelling on coastwise routes appear to have less of a conflict with proposed WEAs. However, the coastwise routes are located in prime areas suitable for the next round of wind development in deeper water. It appears the biggest conflicts with deep draft vessels will occur at the entrances to major port areas where wind farms are proposed at or near harbor approaches. If sited further offshore, and away from port entrances, conflicts will be less of a navigation safety risk issue. Appendix VII documents some of the major alongshore routes and some of the existing connections to major port areas.

6. Cumulative Impacts of Wind Farms

One of the primary objectives of conducting a PARS for the entire Atlantic Coast was assessing the cumulative impacts of multiple winds farms on the marine transportation system. As wind farms are developed, vessel traffic will be displaced and may also be funneled into smaller areas, increasing vessel density with a concurrent increase in risk of collision, loss of property, loss of life, and environmental damage. Evaluating the cumulative impacts is also important to understand the cascading effects of how one wind farm may change the routes and approaches to the next port or the next wind development area. Predicting how vessels would alter routes given new obstructions can be described in a qualitative manner; however, analytically determining cumulative impacts, and quantifying the resultant change in navigational risk remains beyond the capability of the WG.

7. Establishment of Routing Measures

The customary system of historic routes used by vessels transiting the Atlantic Seaboard is very complex. Minor localized changes can be evaluated using local knowledge, stakeholder input and basic risk assessment tools employed during a PARS. However, the scope of the ACPARS far exceeds that of a typical PARS. Evaluating the positive and negative impacts to navigation from significant changes, such as creating a routing system for the entire Atlantic Coast, is well beyond the capabilities of the WG. The predictability and organization provided by routing measures needs to be balanced against increased risk due to increasing vessel density and mixing previously segregated traffic. It is the opinion of the WG, and one supported in public comments from both the offshore wind industry and the maritime shipping industry, that routing measures should not be created without a full evaluation of the impacts.

G. Recommendations

1. The Coast Guard should continue to partner with BOEM to accomplish the modeling and analysis necessary to evaluate the impact of proposed wind energy areas on navigation safety, and evaluate the effectiveness of mitigating measures to maximize the areas available for offshore renewable energy installations. Although initially envisioned to inform identification of initial wind energy areas, modeling and analysis tools would still provide an invaluable capability to analytically predict changes in vessel traffic patterns and to evaluate impacts across the marine transportation. This would include evaluating cascading and changes in distance travelled that would translate to additional costs, increased emissions and time delays/disruptions to supply chain logistics.

2. The ACPARS Workgroup should transition to a standing marine planning workgroup to share information, ideas and provide assistance to one another as policy, knowledge and expertise matures. Continued interaction will promote consistency and efficiencies in carrying out Coast Guard responsibilities.

3. The Coast Guard should continue its participation in BOEM Renewable Energy State Task Forces and evaluate areas proposed for development using the best available information and applying the planning guidelines to provide sound recommendations.

4. The Coast Guard should also continue outreach efforts with affected states and federal agencies, the marine shipping industry, the wind energy industry and the general public. This may include participation in stakeholder outreach activities, public meetings, workshops and industry meetings and conferences.

5. The ACPARS Final Report should be published in the Federal Register for public comment on the Planning Guidelines and the proposed navigation corridors.

6. The identified navigation corridors (see Appendix VII) should be applied during marine planning activities and incorporated into Regional Ocean Plans to ensure appropriate consideration is given to shipping early in the siting process. In addition, the Coast Guard should consider developing these navigation corridors into official shipping safety fairways or other appropriate vessel routing measures.

7. The Coast Guard should incorporate the Planning Guidelines (see Enclosure 2) as policy into appropriate publications or documents. These could include Commandant Instructions, manuals, Navigation and Vessel Inspection Circulars (NVIC) and policy letters or any combination. The scope of the publications should also be expanded beyond renewable energy to include guidelines for the siting of any structures in the offshore environment.

Appendix I

Definition of Terms

Appendix I

The following definitions (except as noted by an asterisk) are from the International Maritime Organization's (IMO's) publication "Ships' Routeing," Tenth Edition, 2010:

Area to be avoided (ATBA) means a routing measure comprising an area within defined limits in which either navigation is particularly hazardous or it is exceptionally important to avoid casualties and which should be avoided by all vessels, or certain classes of vessels.

Deep-water route means a route within defined limits, which has been accurately surveyed for clearance of sea bottom and submerged obstacles as indicated on nautical charts.

Exclusive Economic Zone (EEZ)* means the zone established by Presidential Proclamation 5030, dated March 10, 1983.

Fairway or shipping safety fairway* (33 CFR 166) means a lane or corridor in which no artificial island or fixed structure, whether temporary or permanent, will be permitted. Temporary underwater obstacles may be permitted under certain conditions described for specific areas in Title 33 CFR 166, Subpart B. Aids to navigation approved by the U.S. Coast Guard may be established in a fairway.

Inshore traffic zone means a routing measure comprising a designated area between the landward boundary of a traffic separation scheme and the adjacent coast, to be used in accordance with the provisions of Rule 10(d), as amended, of the International Regulations for Preventing Collisions at Sea, 1972 (COLREGS).

Obstruction* (33 CFR 64.06) means anything that restricts, endangers, or interferes with navigation.

Precautionary area means a routing measure comprising an area within defined limits where vessels must navigate with particular caution and within which the direction of traffic flow may be recommended.

Recommended route means a route of undefined width, for the convenience of vessels in transit, which is often marked by centerline buoys.

Recommended track is a route which has been specially examined to ensure so far as possible that it is free of dangers and along which vessels are advised to navigate.

Regulated Navigation Area (RNA)* means a water area within a defined boundary for which regulations for vessels navigating within the area have been established under 33 CFR 165.

Appendix I

Roundabout means a routing measure comprising a separation point or circular separation zone and a circular traffic lane within defined limits. Traffic within the roundabout is separated by moving in a counterclockwise direction around the separation point or zone.

Separation Zone or separation line means a zone or line separating the traffic lanes in which vessels are proceeding in opposite or nearly opposite directions; or separating a traffic lane from the adjacent sea area; or separating traffic lanes designated for particular classes of vessels proceeding in the same direction.

Structures* (33 CFR 64.06) means any fixed or floating obstruction, intentionally placed in the water, which may interfere with or restrict marine navigation.

Traffic lane means an area within defined limits in which one-way traffic is established. Natural obstacles, including those forming separation zones may constitute a boundary.

Traffic Separation Scheme (TSS) means a routing measure aimed at the separation of opposing streams of traffic by appropriate means and by the establishment of traffic lanes.

Two-way route means a route within defined limits inside which two-way traffic is established, aimed at providing safe passage of ships through waters where navigation is difficult or dangerous.

Vessel routing system means any system of one or more routes or routing measure aimed at reducing the risk of casualties; it includes traffic separation schemes, two-way routes, recommended tracks, areas to be avoided, no anchoring areas, inshore traffic zones, roundabouts, precautionary areas, and deep-water routes.

Appendix II

Acronyms

Appendix II

ACPARS – Atlantic Coast Port Access Route Study
ATBA – Area to be Avoided
AIS – Automatic Identification System
ALARP – As Low As Reasonably Practicable
ARPA – Automatic Radar Plotting Aid
AWEA – American Wind Energy Association
BOEM – Bureau of Ocean Energy Management
CFI – Call for Information and Nominations
CFR – Code of Federal Regulations
CMSP – Coastal and Marine Spatial Planning
COLREGS - International Regulations for Preventing Collisions at Sea 1972
COP – Construction and Operations Plan
DOE – Department of Energy
DOI – Department of the Interior
EEZ – Exclusive Economic Zone
EIS – Environmental Impact Statement
FAQ – Frequently Asked Questions
FR – Federal Register
GAP – General Activity Plan
GIS – Geographic Information System
IMO – International Maritime Organization
LANTAREA – Atlantic Area
MARAD – Maritime Administration
MOA – Memorandum of Agreement
MTS – Marine Transportation System
NAVCEN – Coast Guard Navigation Center
NEPA – National Environmental Policy Act
NM – Nautical Mile
NOAA – National Oceanic and Atmospheric Administration
OCS – Outer Continental Shelf
OREI – Offshore Renewable Energy Installation
PARS – Port Access Route Study
PWSA – Ports and Waterways Safety Act
RFI – Request for Interest
R&DC – Coast Guard Research and Development Center
RNA – Regulated Navigation Area
SAP – Site Assessment Plan
SOW – Statement of Work
TEU - Twenty-foot Equivalent Unit
TSS – Traffic Separation Scheme
UK MGN – United Kingdom Maritime Guidance Note
USC – United States Code
USCG – United States Coast Guard
WEA – Wind Energy Area

Appendix III

Characterization of Traditional Shipping Routes using AIS Data

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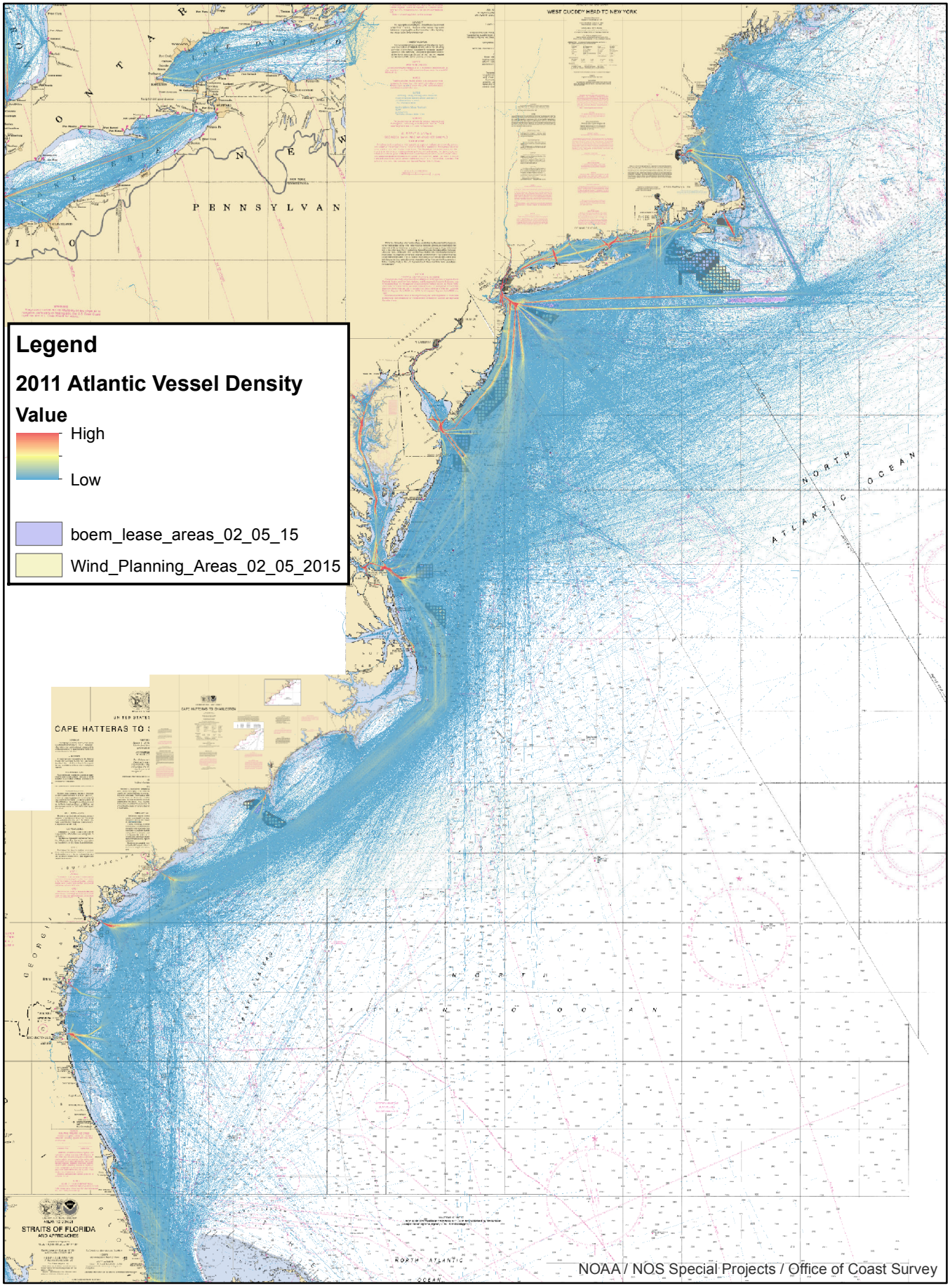
Appendix III

The following is a series of maps displaying 2011 Vessel Density plots along the Atlantic Coast. The Vessel Density plots were downloaded from the Multi-purpose Marine Cadastre website located at MarineCadastre.gov.

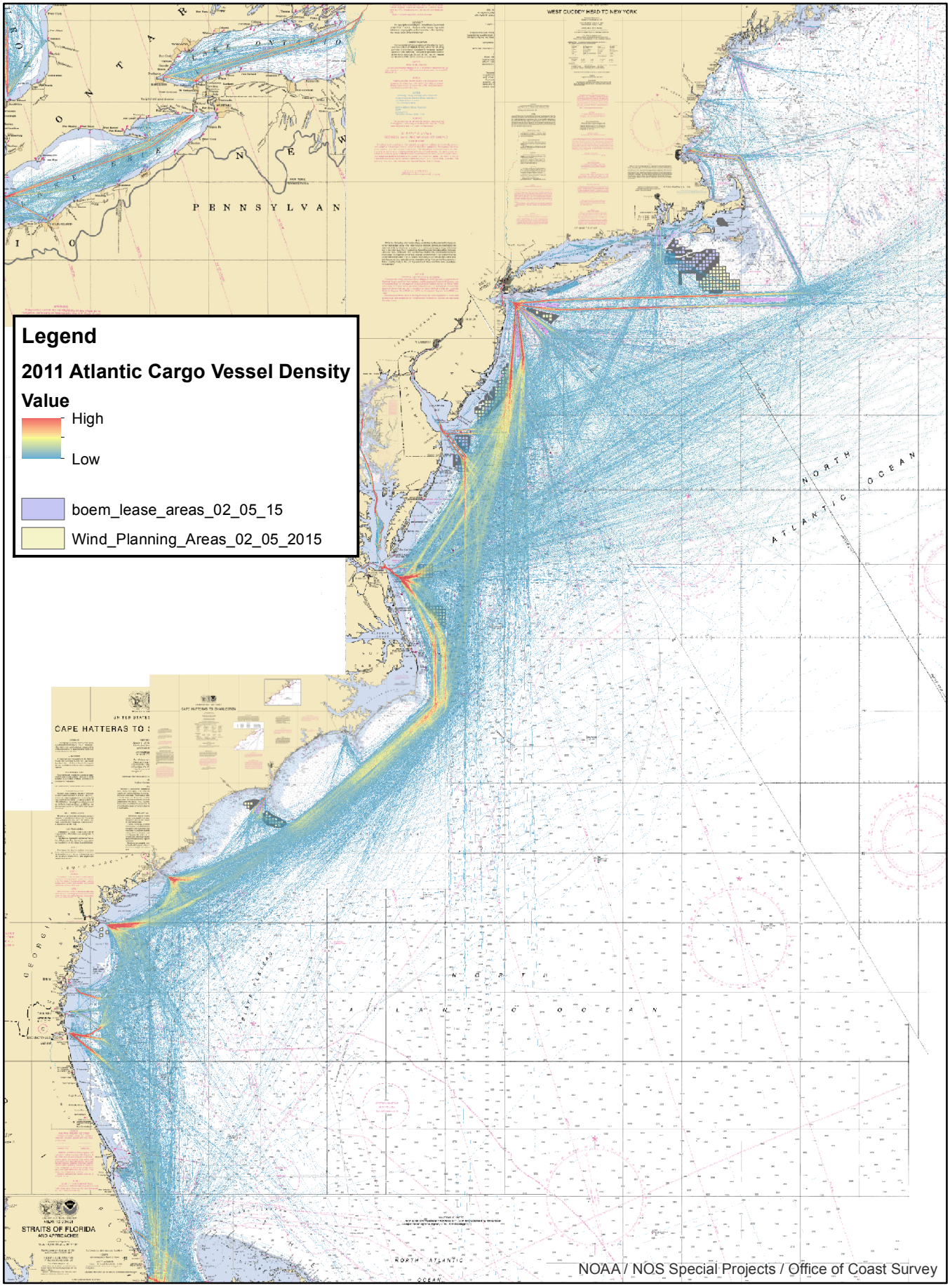
Atlantic Coast:	Page
- All Vessels	1
- Cargo	2
- Tanker	3
- Towing	4
- Passenger	5
Northeast	
- All Vessels	6
- Cargo	7
- Fishing	8
- Passenger	9
- Tanker	10
- Towing	11
New York	
- All Vessels	12
- Cargo	13
- Fishing	14
- Passenger	15
- Tanker	16
- Towing	17
Mid-Atlantic	
- All Vessels	18
- Cargo	19
- Fishing	20
- Passenger	21
- Tanker	22
- Towing	23
Southeast	
- All Vessels	24
- Cargo	25
- Passenger	26
- Tanker	27
- Towing	28

Atlantic Coast 2011 Vessel Density



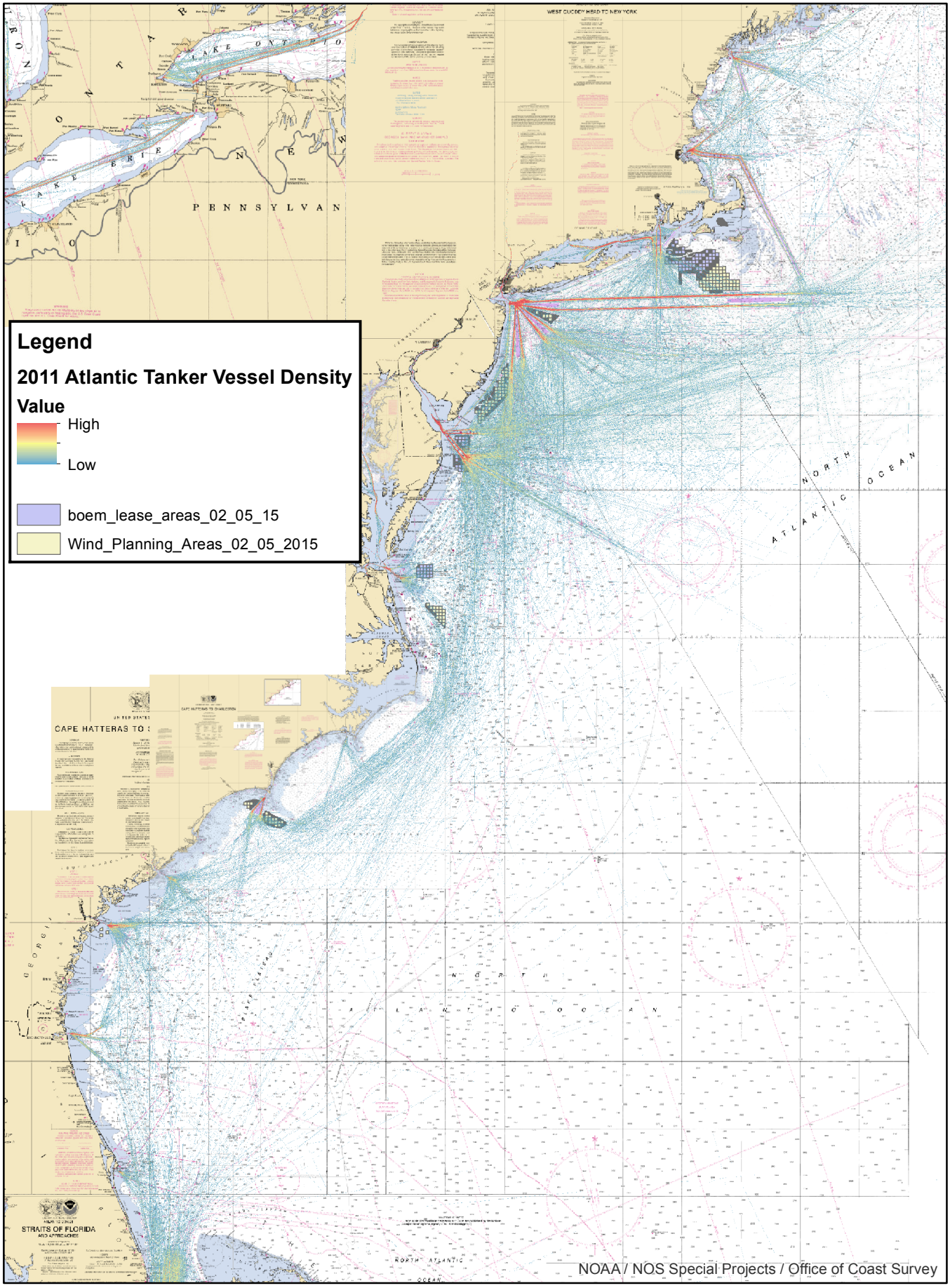
Appendix III

Atlantic Coast 2011 Cargo Vessel Density



Appendix III

Atlantic Coast 2011 Tanker Vessel Density



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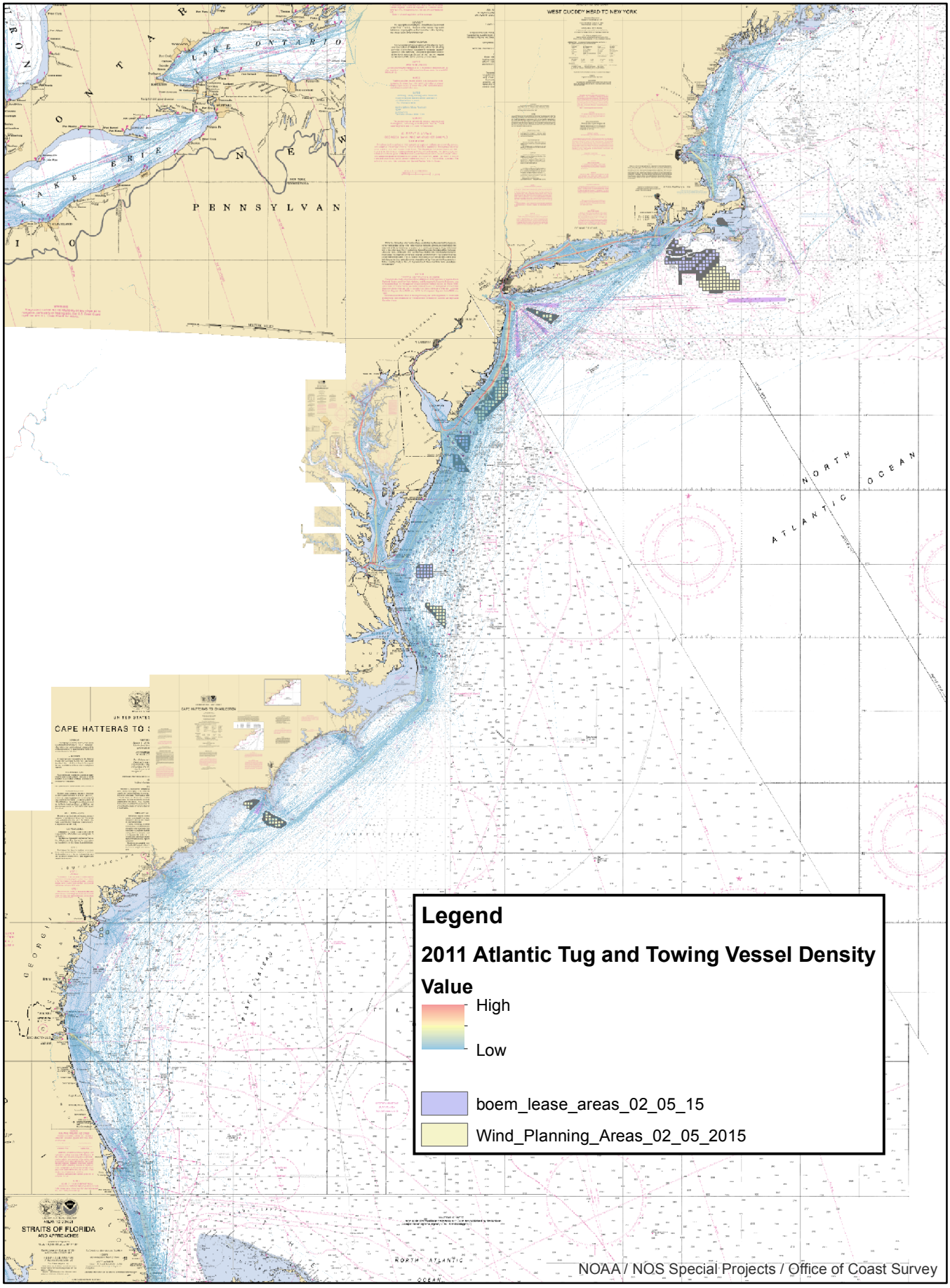
Atlantic Coast 2011 Towing Vessel Density



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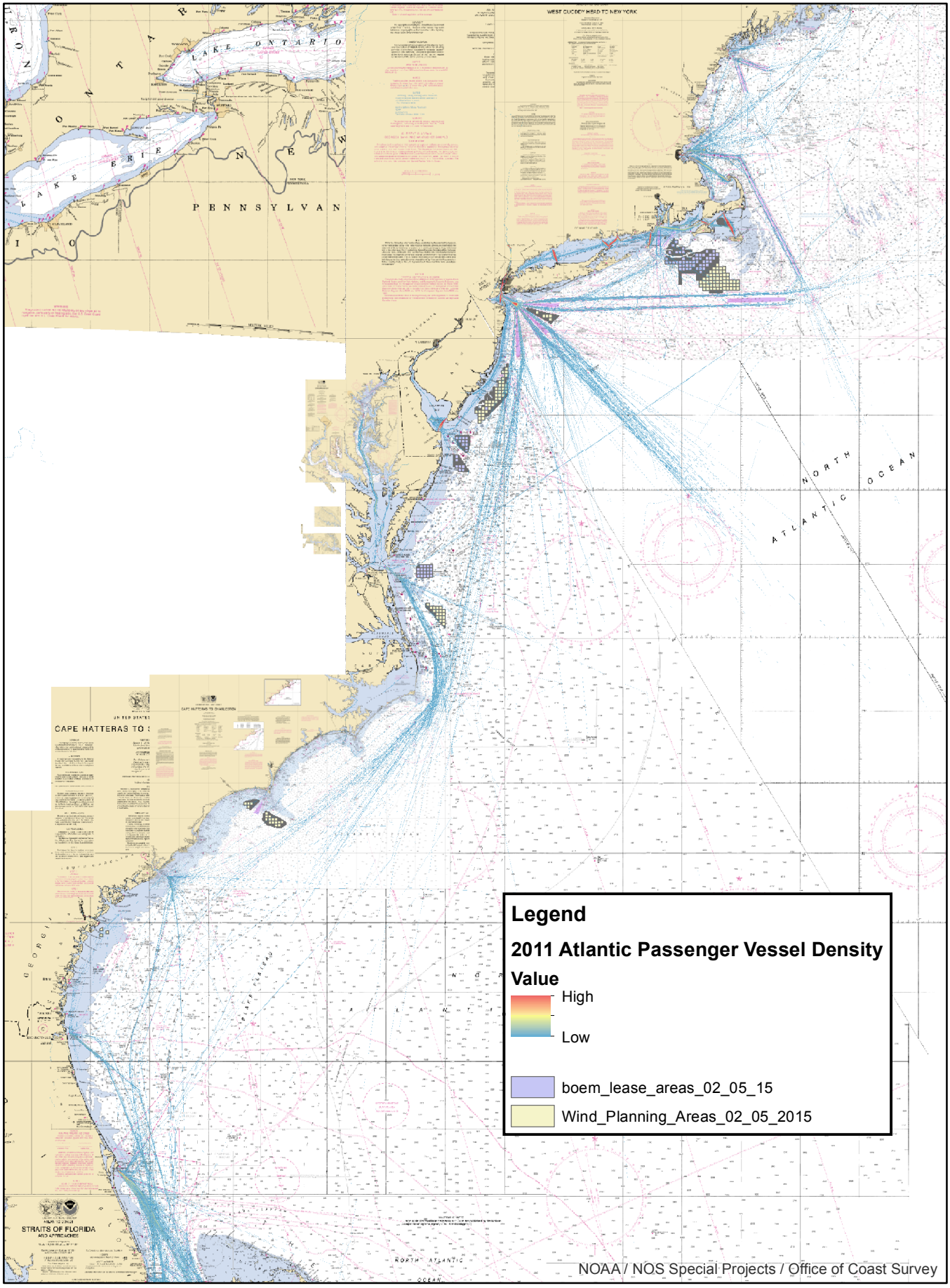

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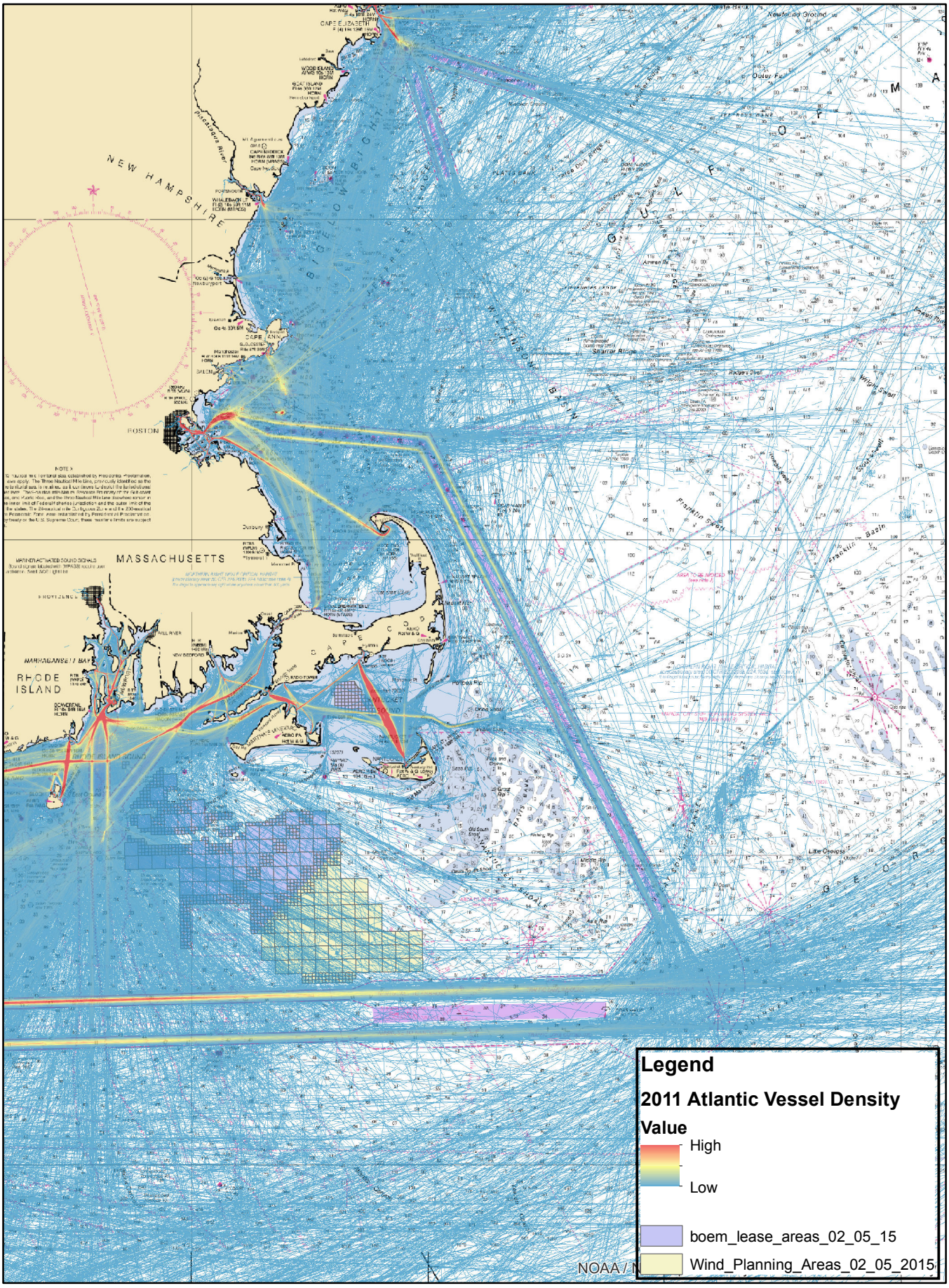
Northeast 2011 Vessel Density



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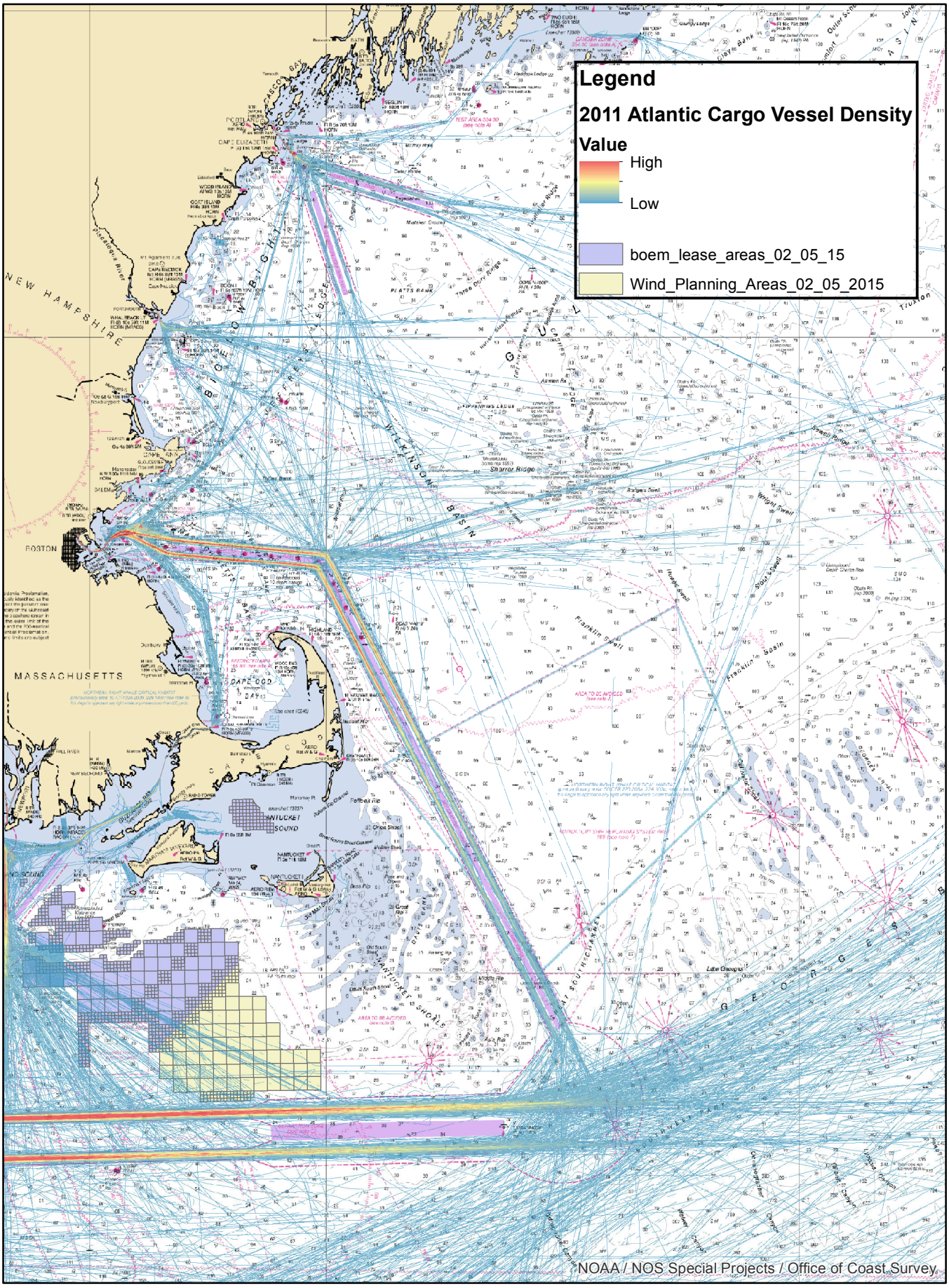

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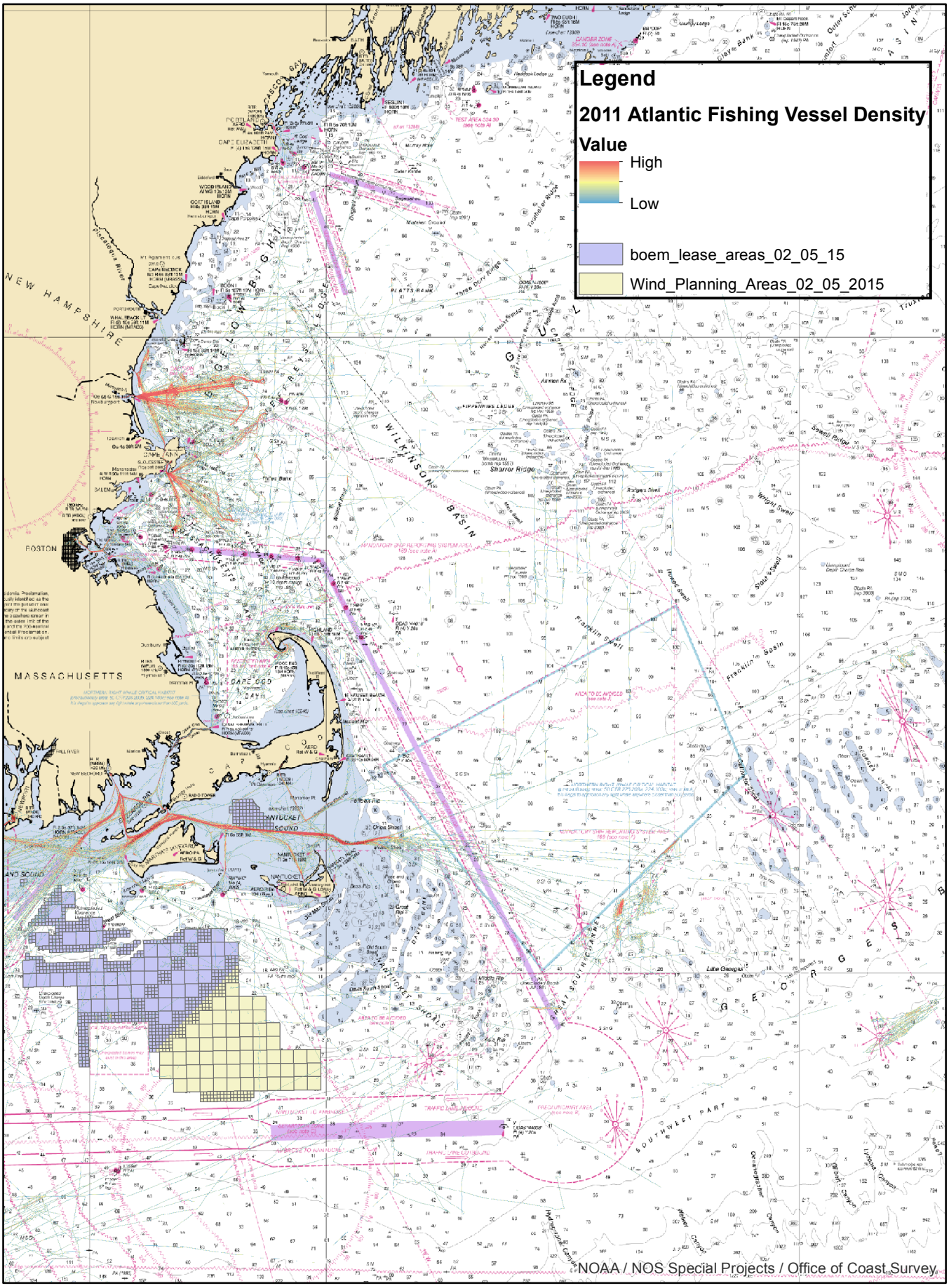
Northeast 2011 Fishing Vessel Density



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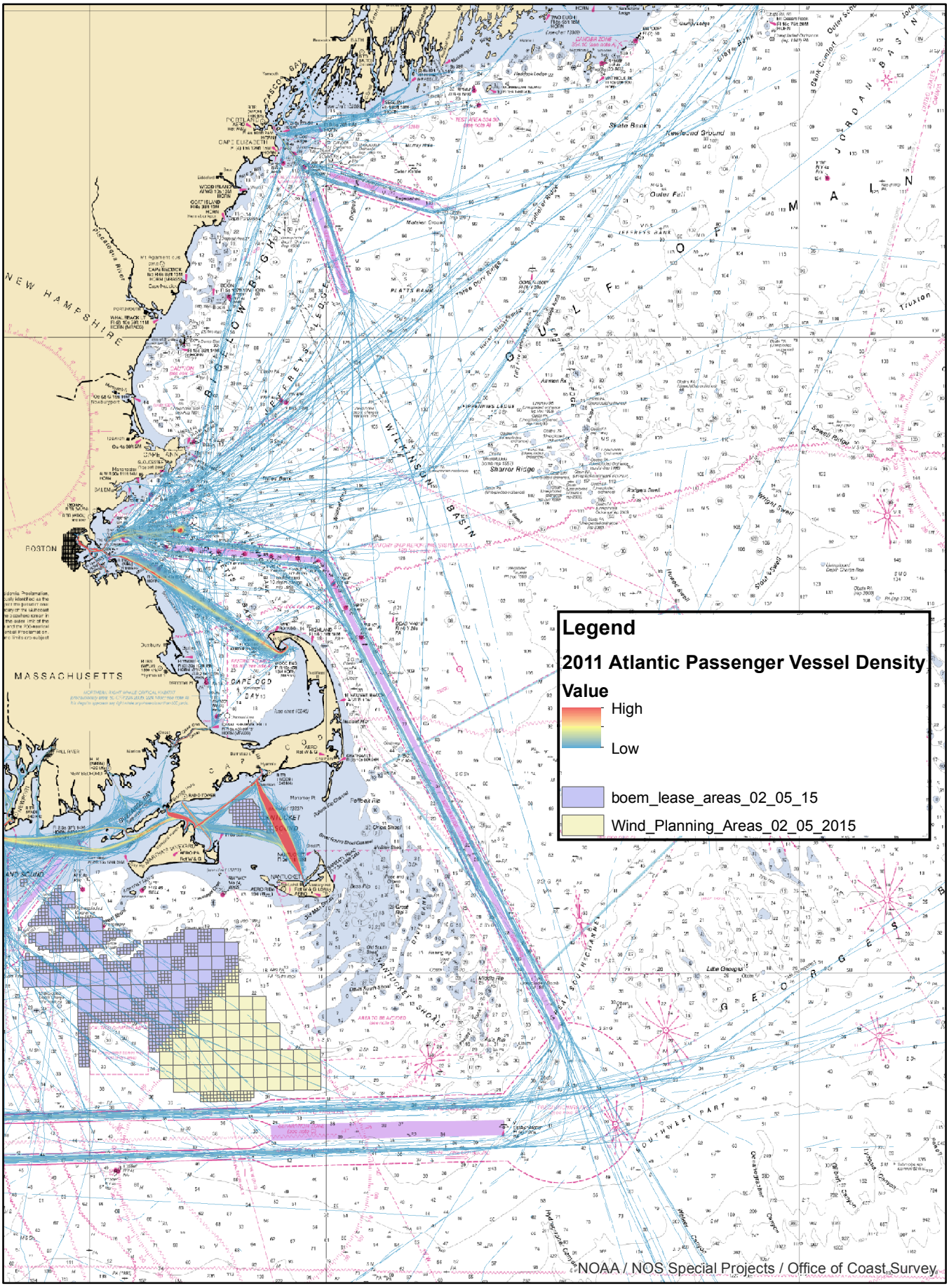

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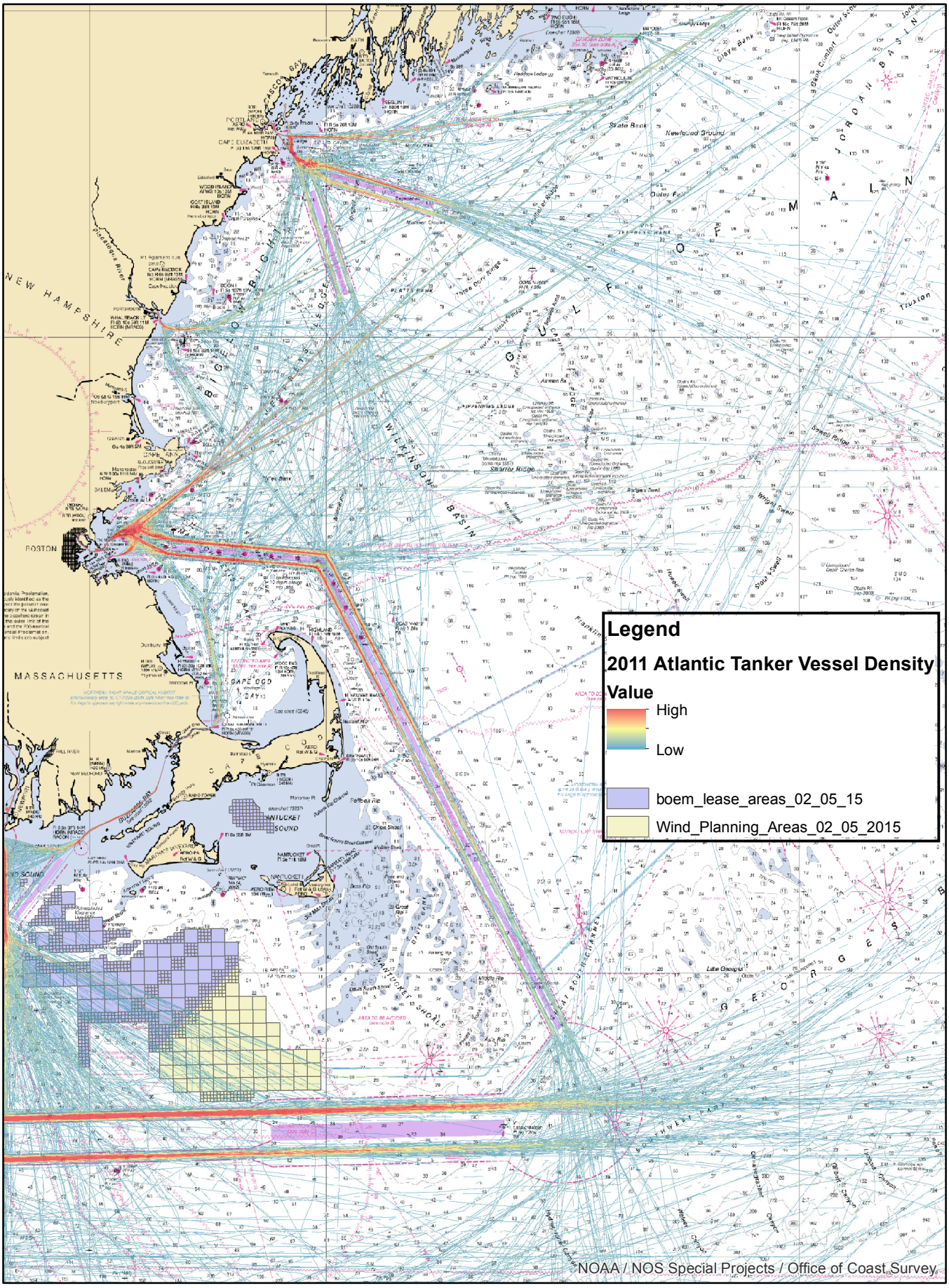

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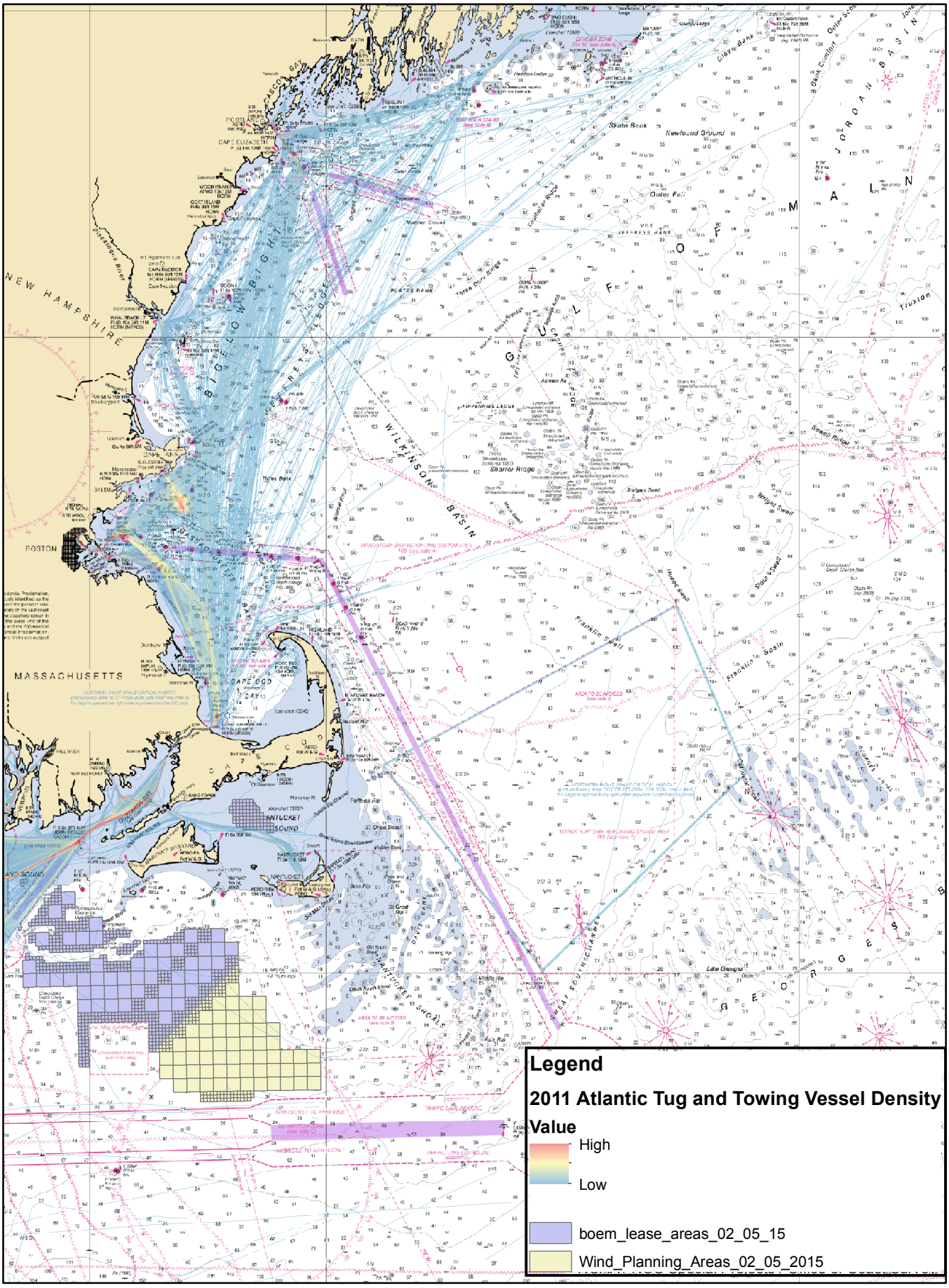

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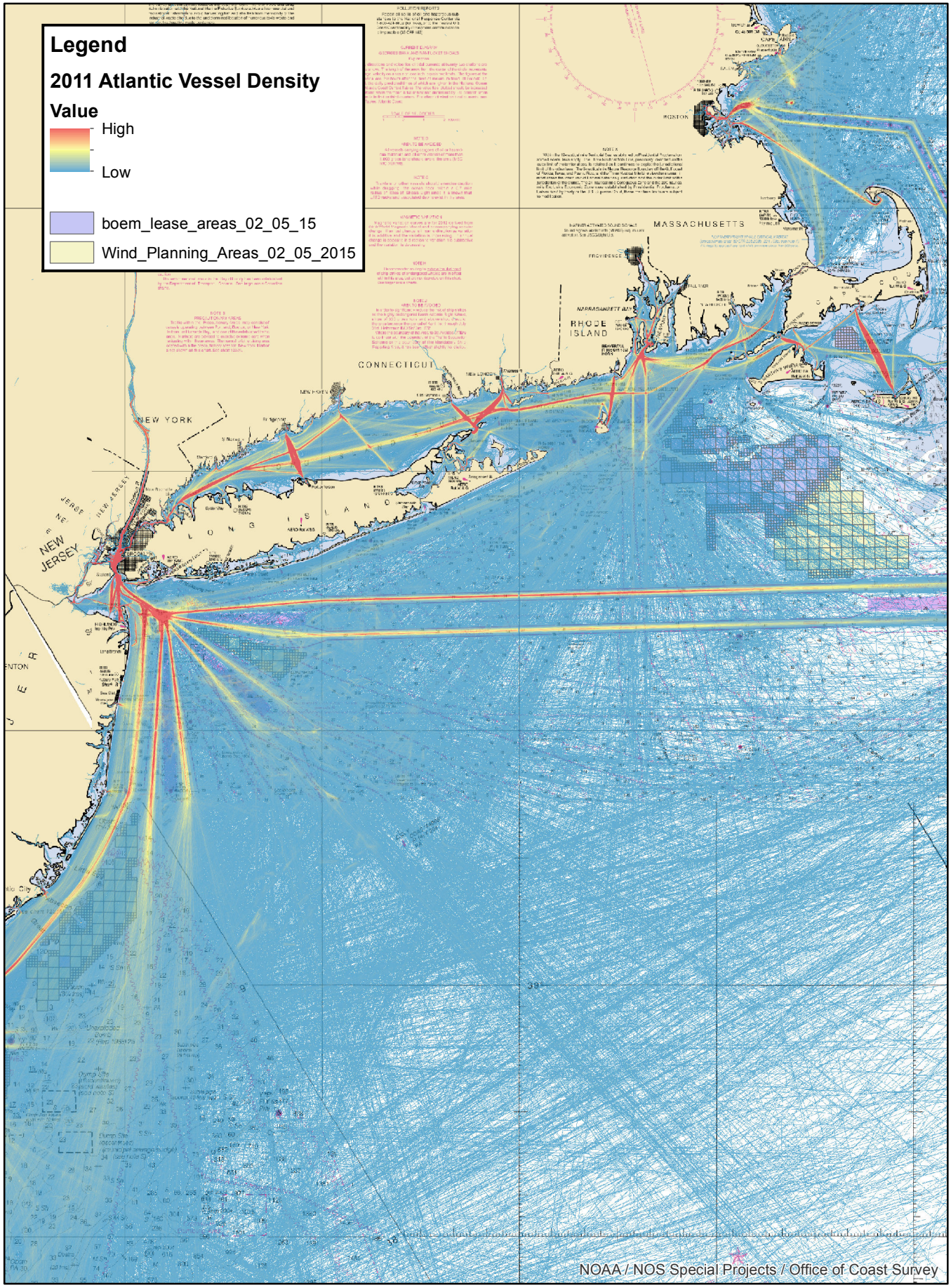
New York 2011 Vessel Density



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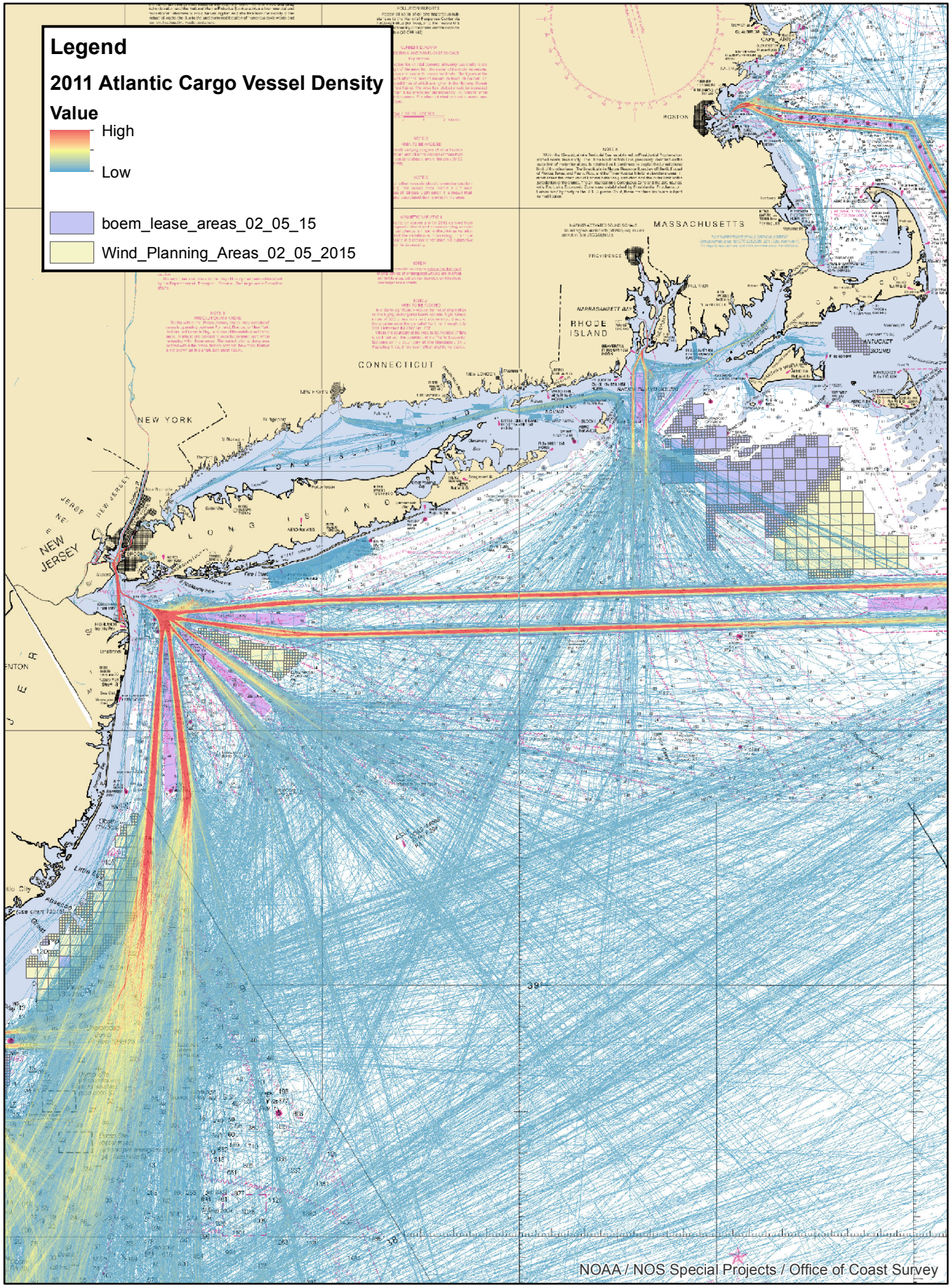

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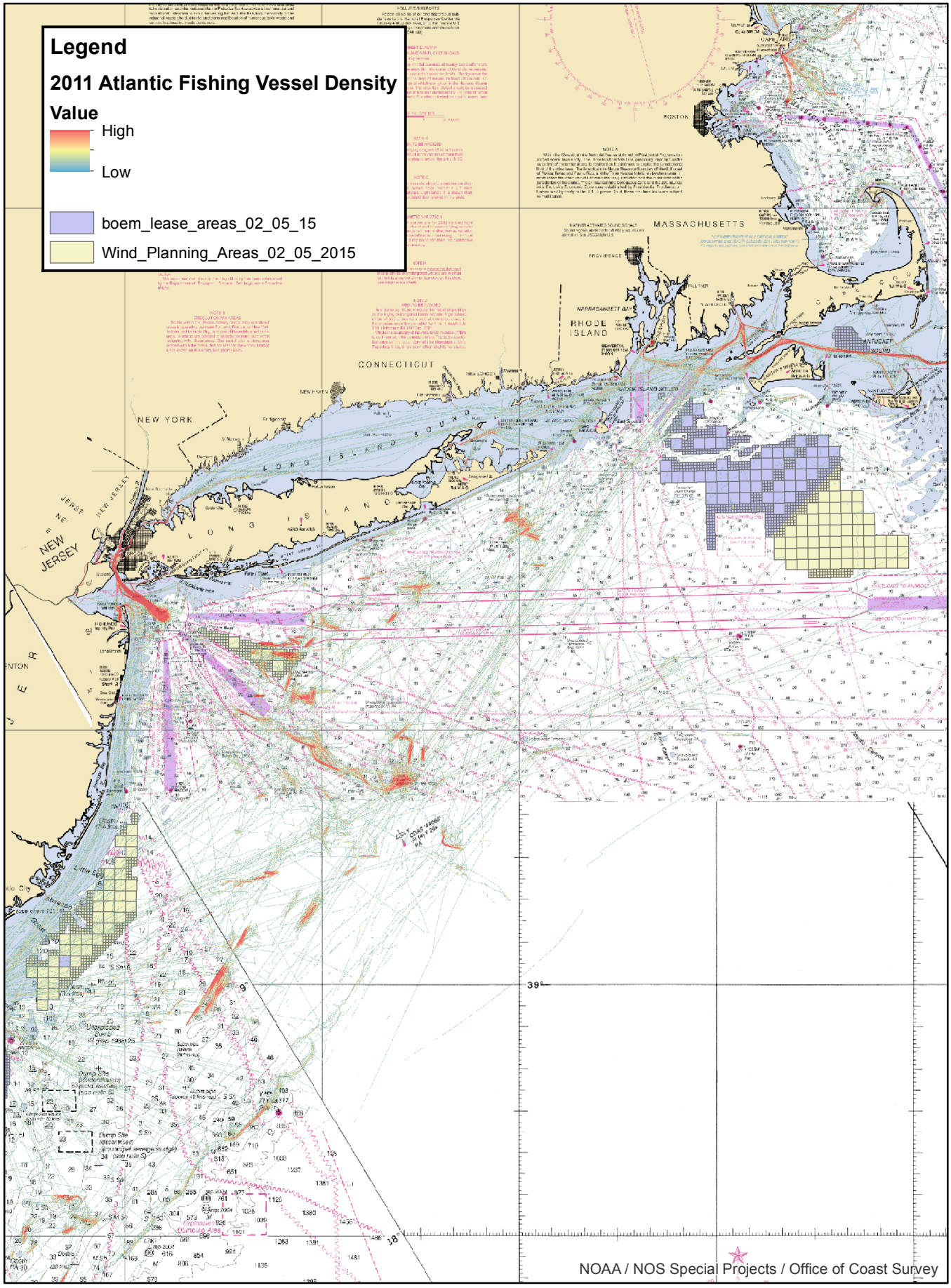

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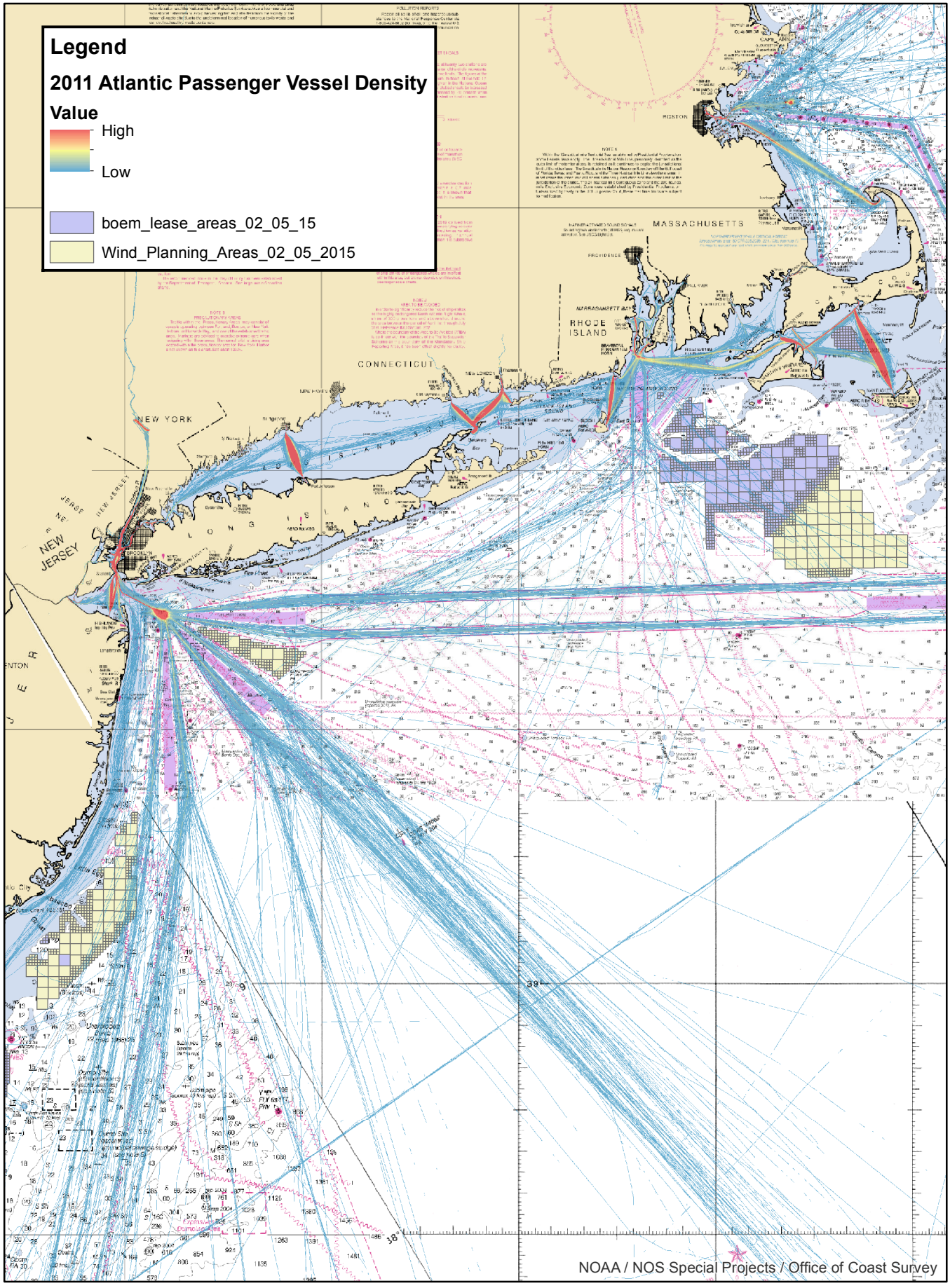

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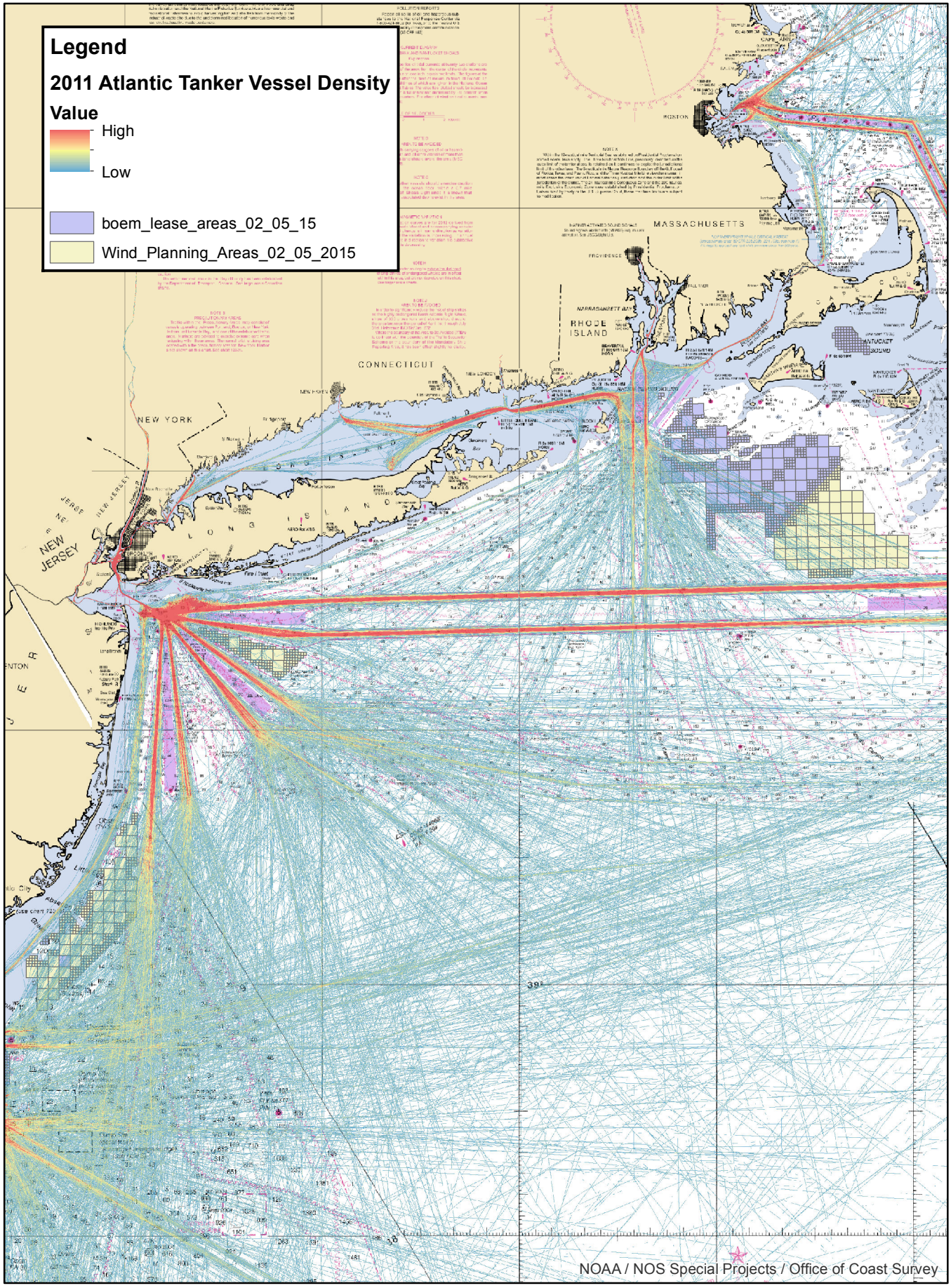

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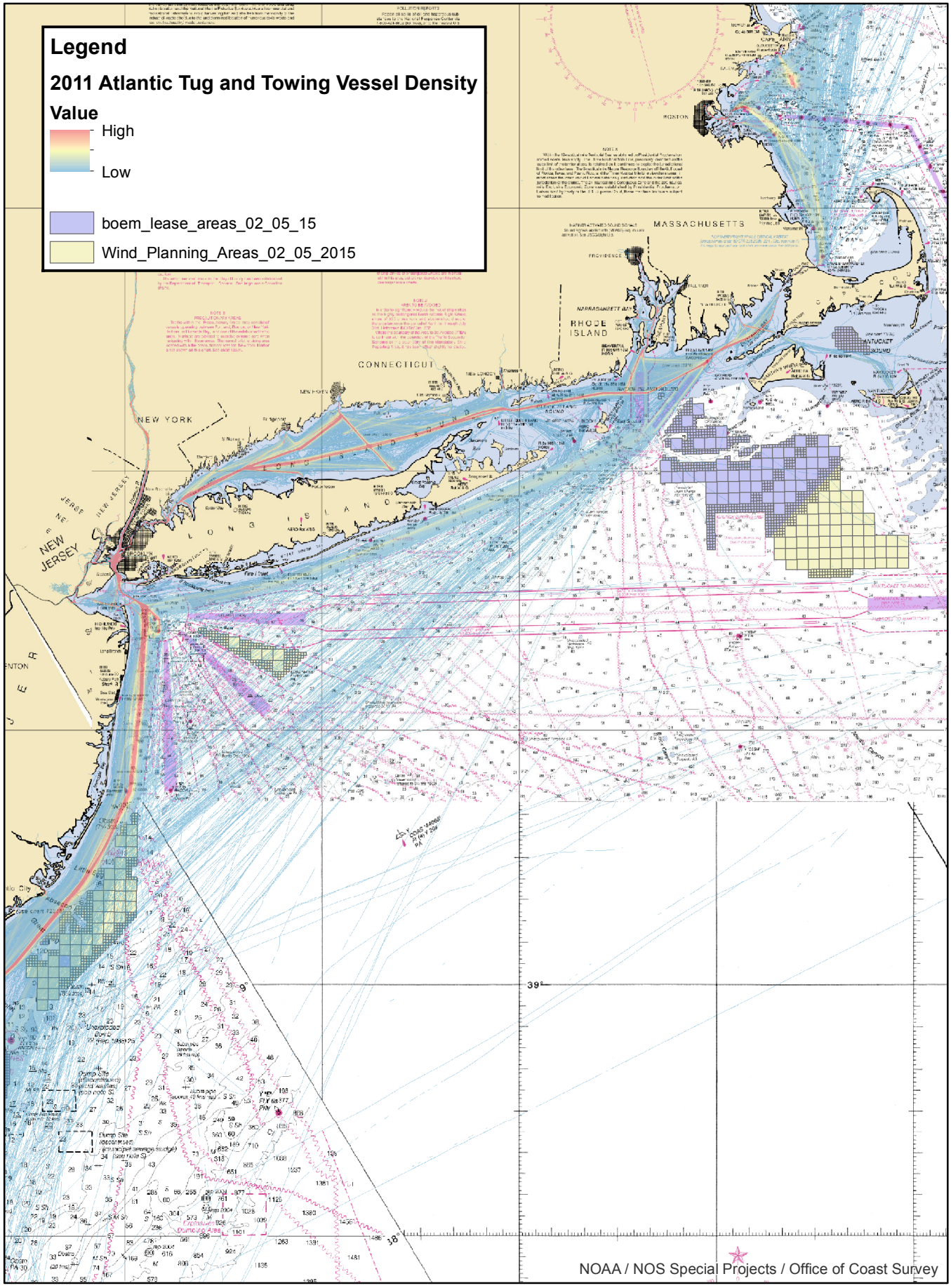

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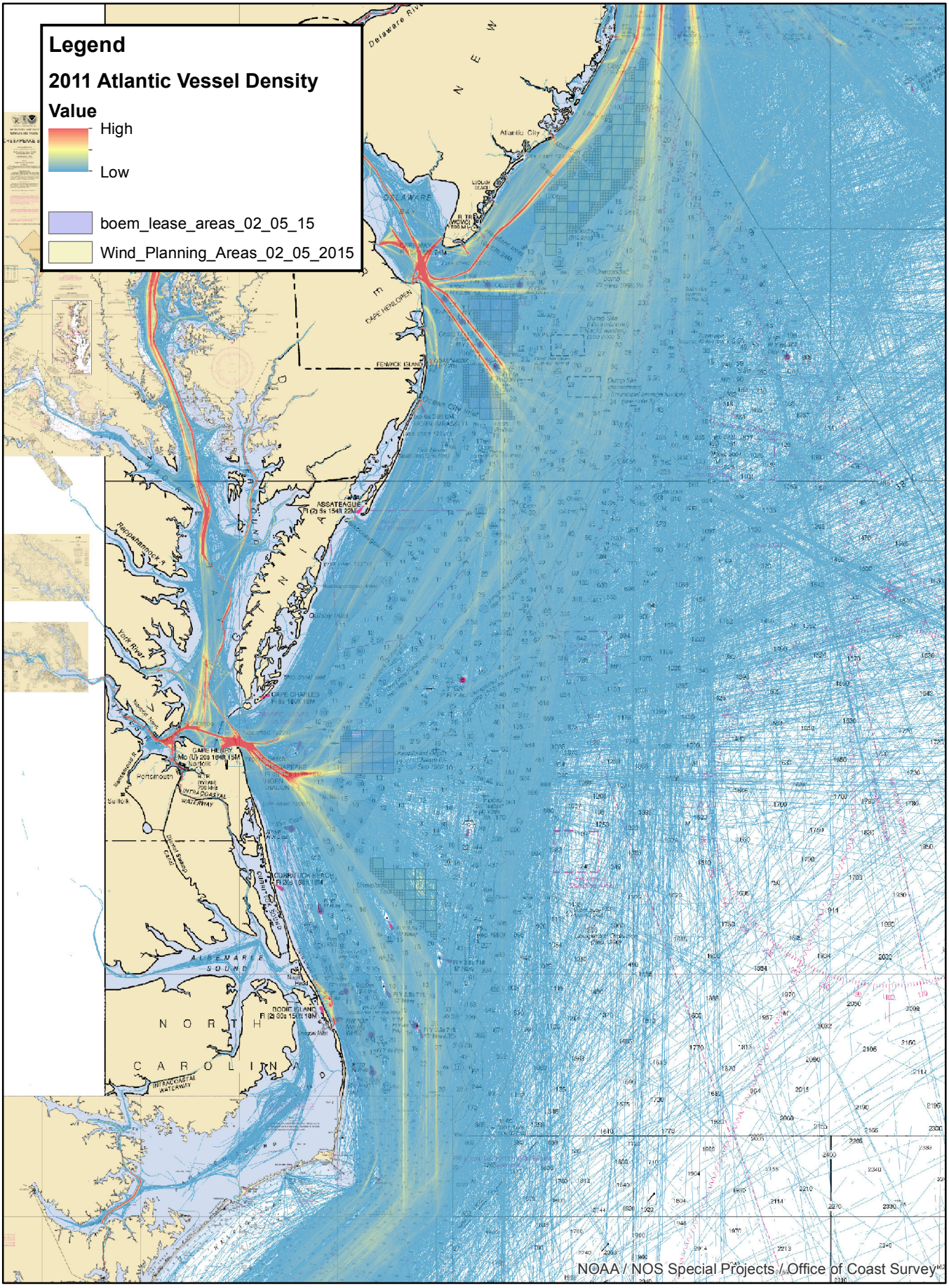

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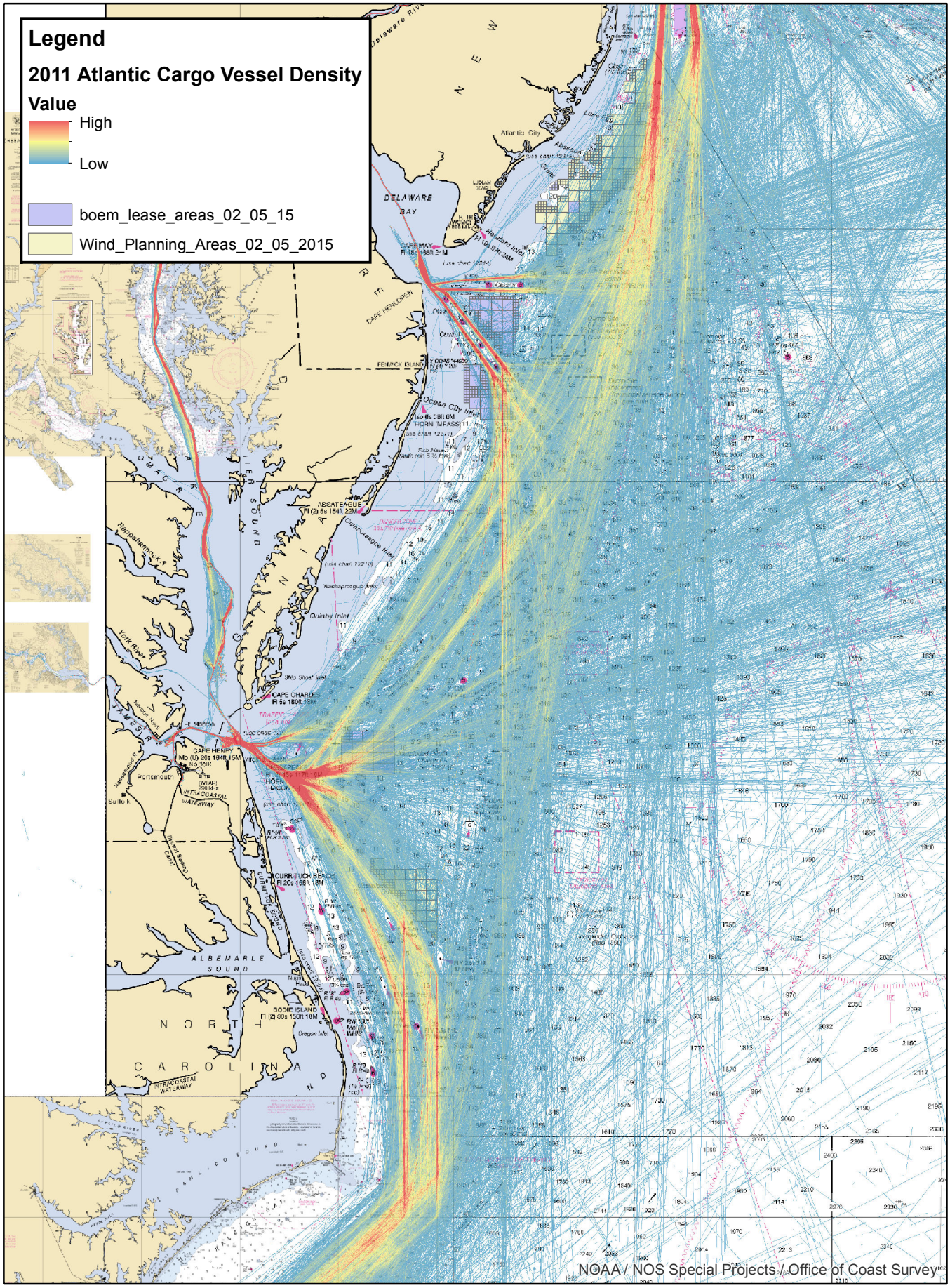

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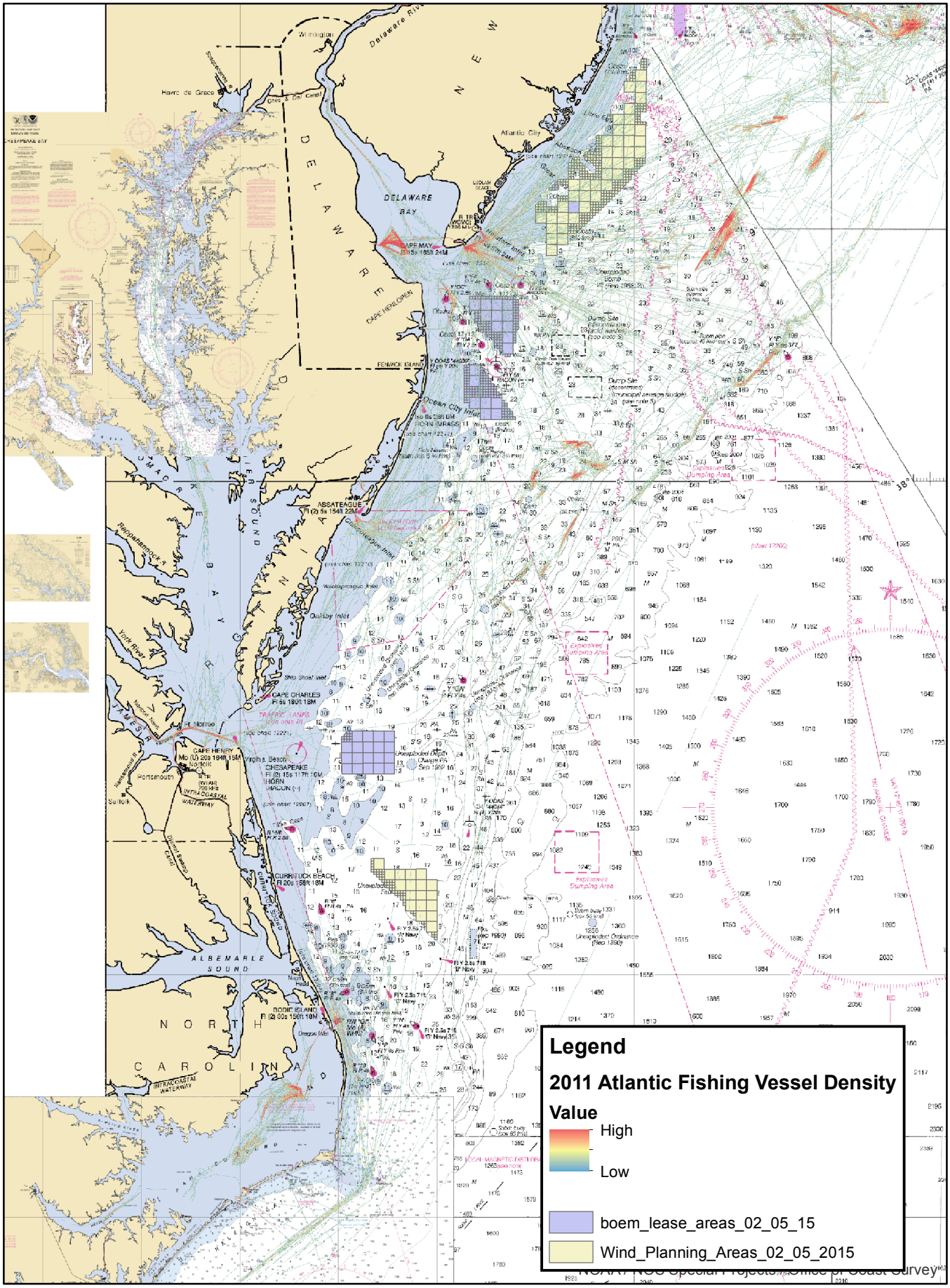

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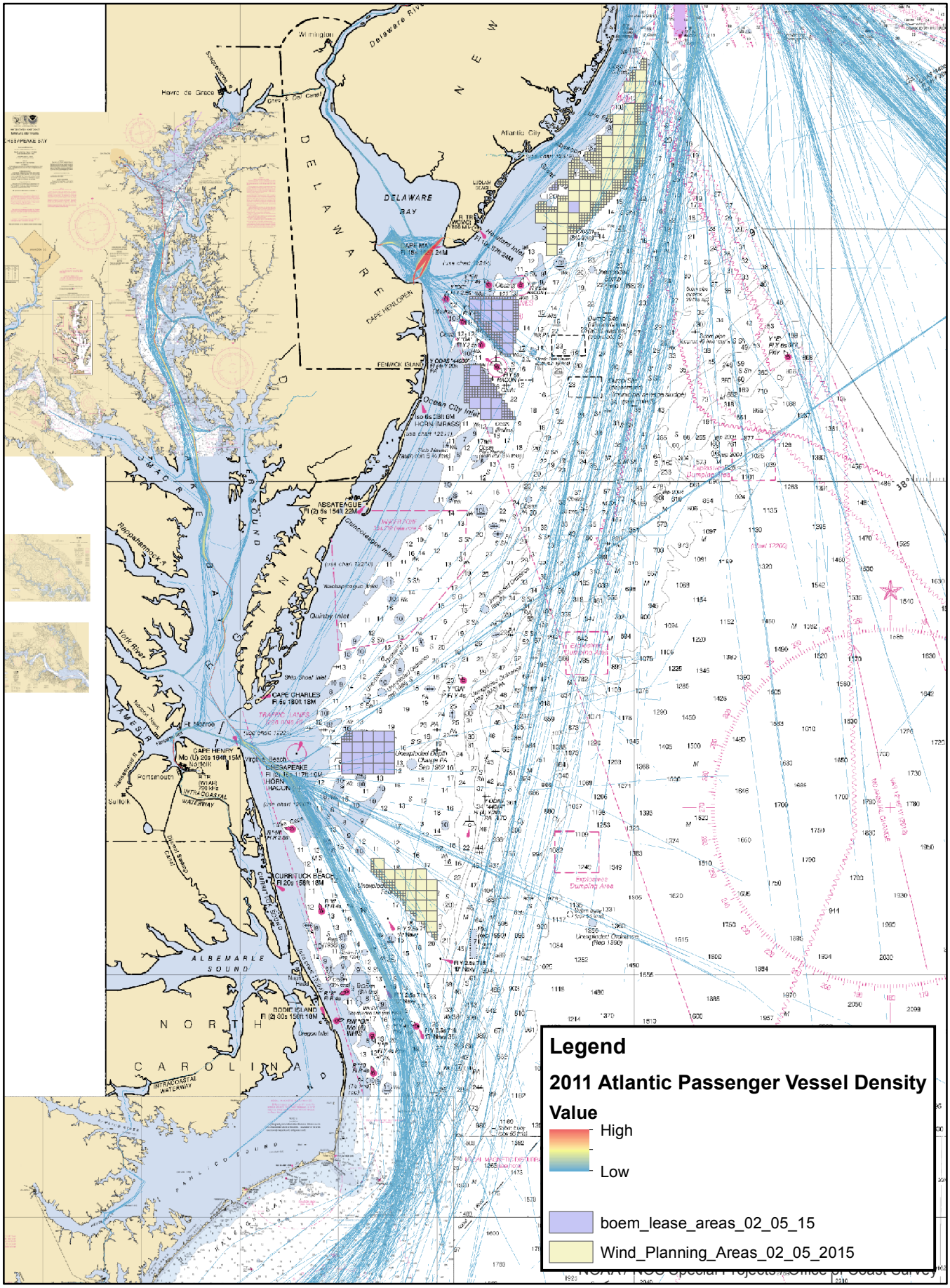

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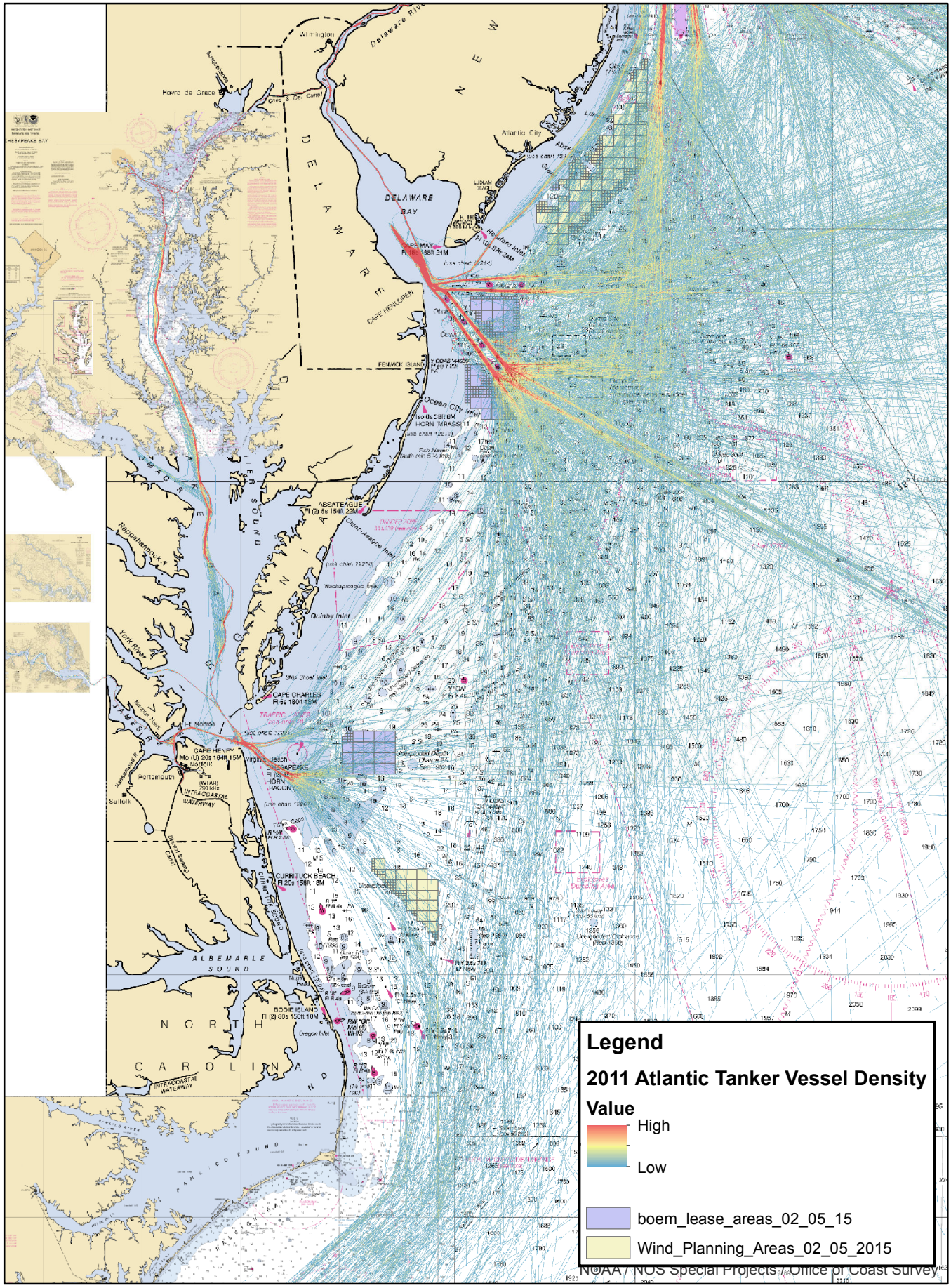

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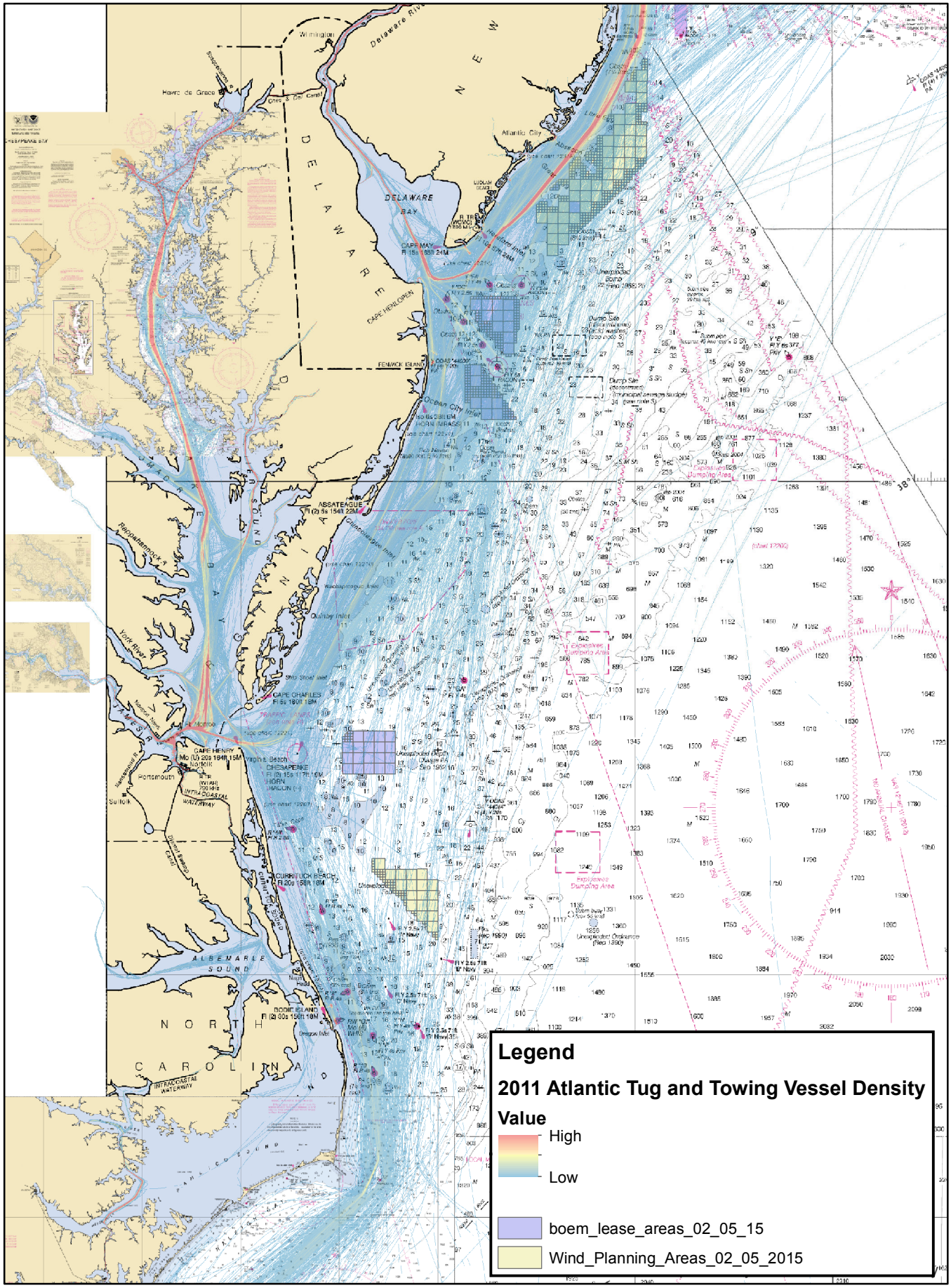

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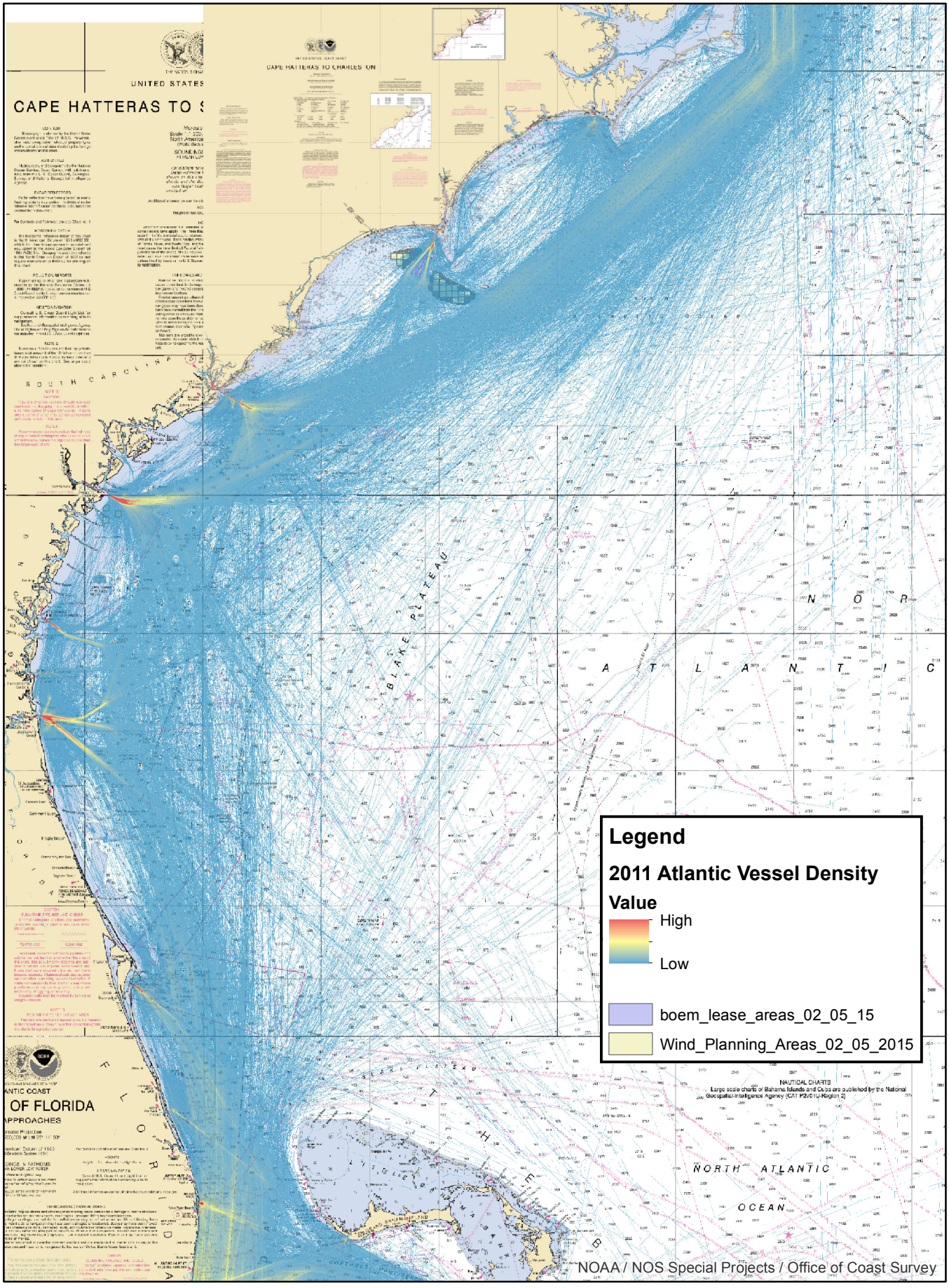
Southeast 2011 Vessel Density



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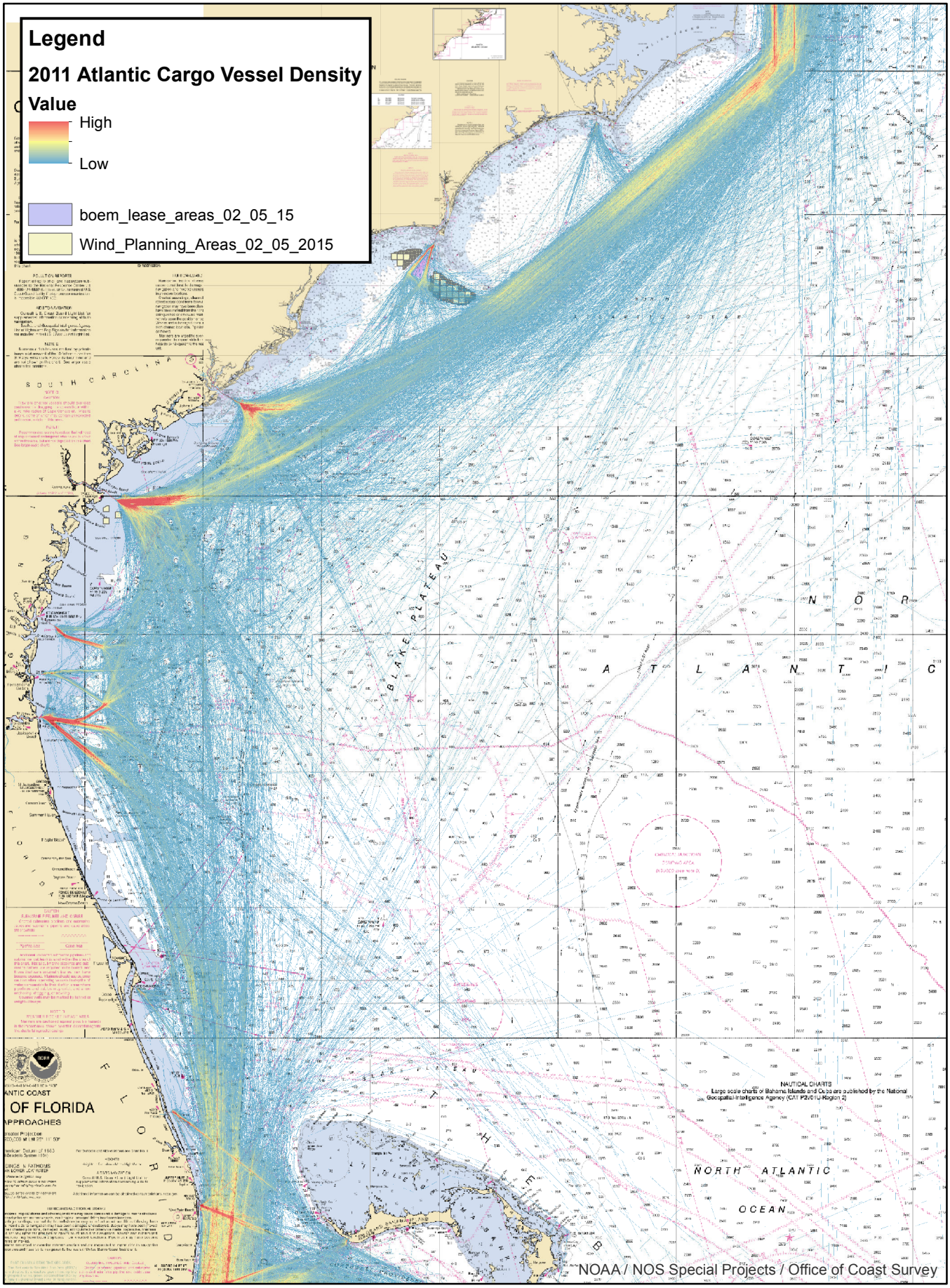

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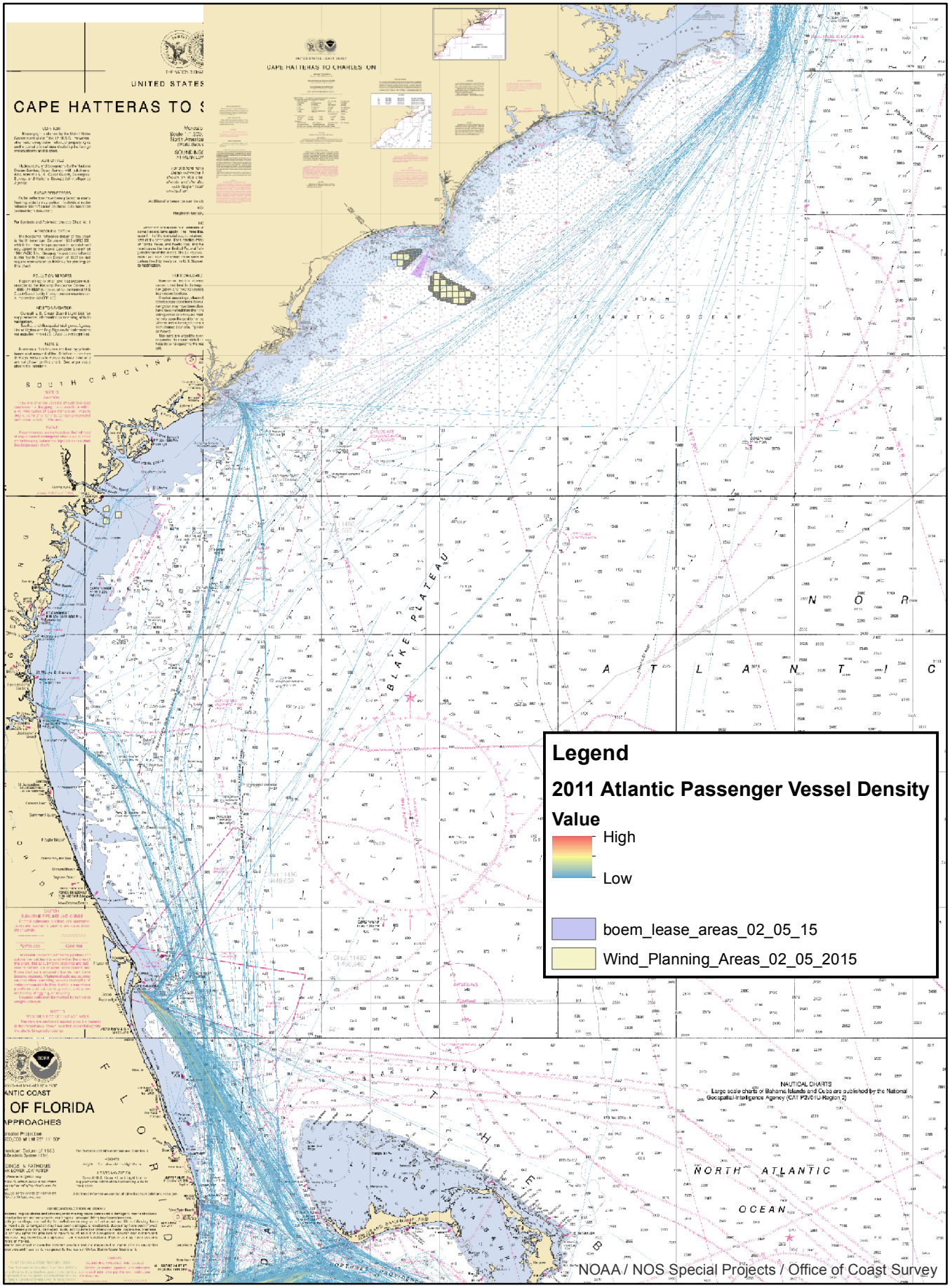

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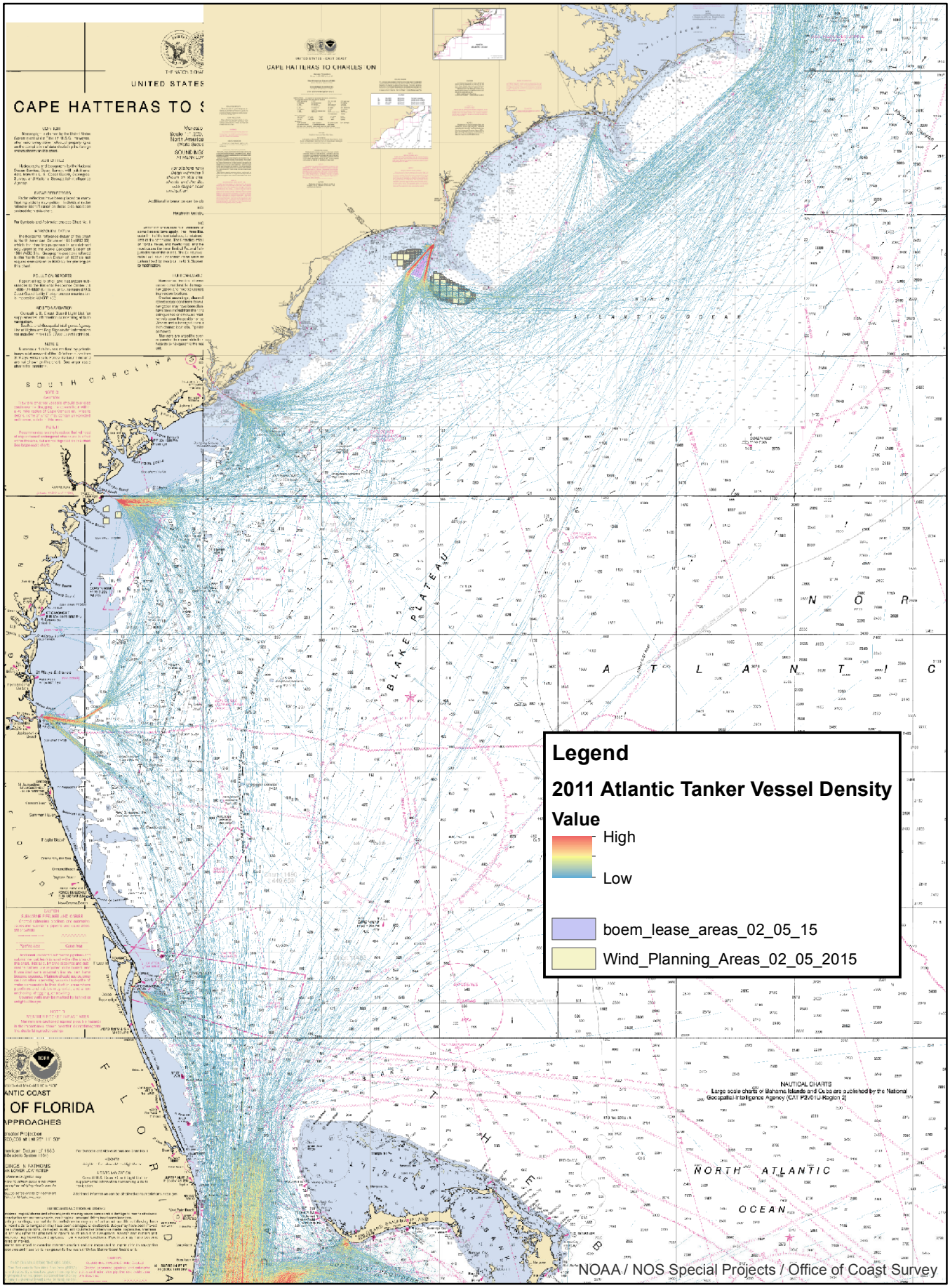

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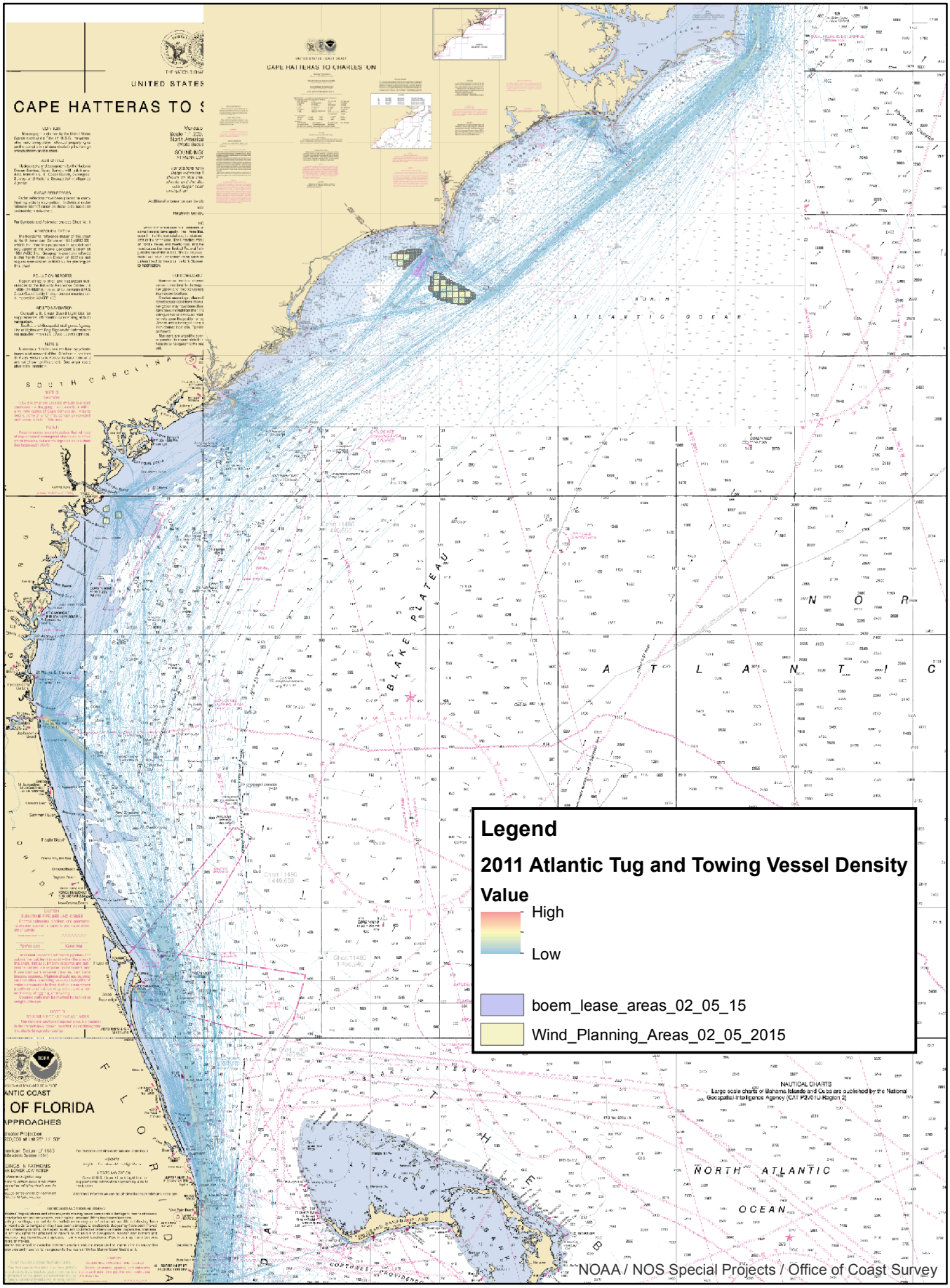


APPENDIX IV

Transits in the Atlantic Coast Wind Energy Areas and Lease Areas

Appendix IV

A. Introduction

The purpose of this analysis is to quantify the number of vessels and transits in each of the Bureau of Ocean Energy Management (BOEM) Wind Energy Areas (WEAs) and Wind Planning Areas along the Atlantic Coast and to visualize conflicts using a series of heat maps by vessel type.

B. Methods

1. Quantify Unique Vessels and Unique Transits:

For this analysis, the 2009 Automatic Identification System (AIS) data was obtained from the Marine Cadastre website (http://marinecadastre.gov/AIS/default.aspx). This data represents one-minute samples of AIS messages. This dataset does not include data from June 5, 2009 through June 30, 2009. The AIS data obtained from the Marine Cadastre is organized in separate files by month and Universal Transverse Mercator (UTM) zone. A master Atlantic Coast dataset was created by merging the data from all twelve months in 2009 in UTM zones 17, 18, and 19.

Fourteen areas along the Atlantic coast were analyzed. The location of each is shown in Figure 1.

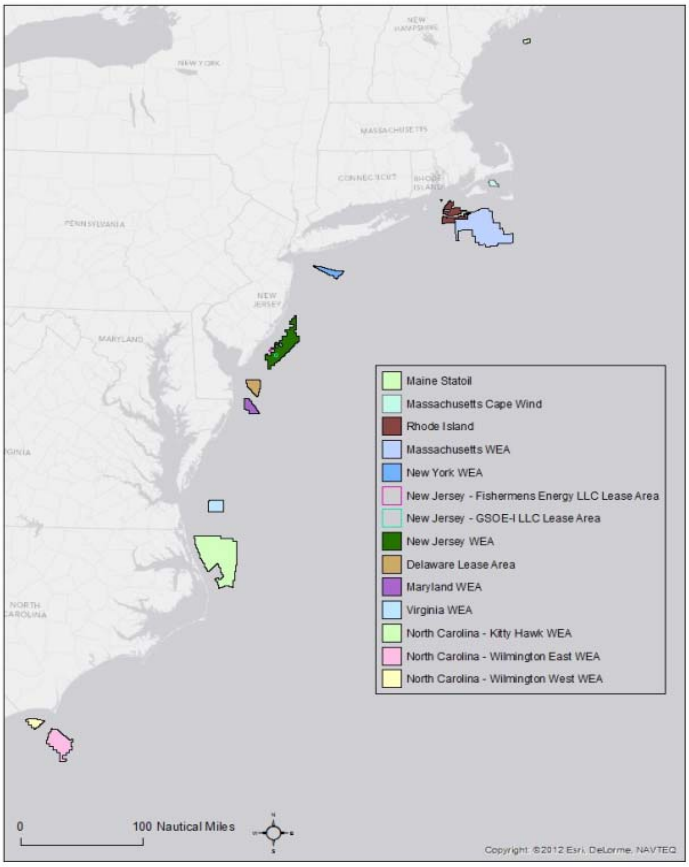


Figure 1: WEAs and Wind Planning Areas

The number of unique vessels transiting an area was determined by creating track lines from the AIS messages in the area surrounding the area of interest. See Appendix 1 for an example Python script used in for this analysis. First, a 50 nautical mile (nm) buffer was calculated around the area of interest. An analysis dataset was created by selecting the AIS message points that were within this buffer. Track lines were created by connecting the AIS message points in the analysis dataset by Maritime Mobile Service Identity (MMSI) in date and time order (Figure 2). The MMSI is a unique vessel identifier. However, there are instances of MMSI misuse and multiple vessels could have broadcasted the same MMSI. This AIS dataset has been processed in such a way that each MMSI correlates with one vessel. Because of the processing, it is impossible to determine how many vessels are using the same MMSI. With this dataset, MMSI is the best proxy for unique vessels. However, it is possible that some of the track lines generated do not represent true historical vessel movement and could be the movement of multiple vessels.

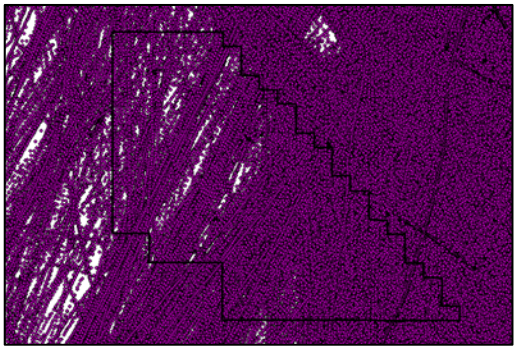


Figure 2 - 2009 AIS Broadcast Messages

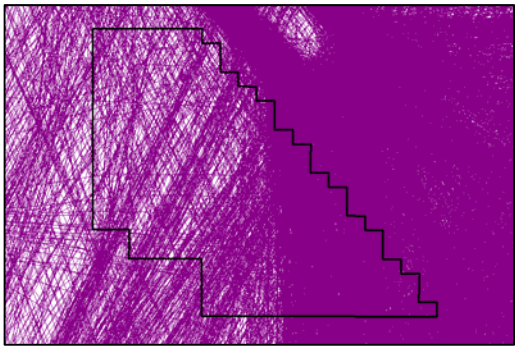


Figure 1 - Connecting the AIS Messages in the Vicinity of the Maryland WEA

Next, the track lines were clipped to the area of interest, as shown in Figure 3, below.

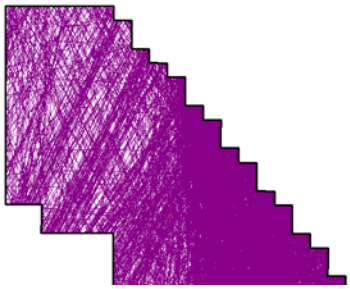


Figure 3 - 2009 Track Lines Clipped to the Maryland WEA

Each track line represents the movement of each MMSI over the entire year. The track lines are multipart features, meaning that multiple transits through the area of interest are drawn as one line feature. The track line was converted to single part features to determine the total number of transits in 2009 in the area of interest.

An example showing the multipart line feature from one vessel and the corresponding unique transits is shown in Figure 4 below.

Appendix IV

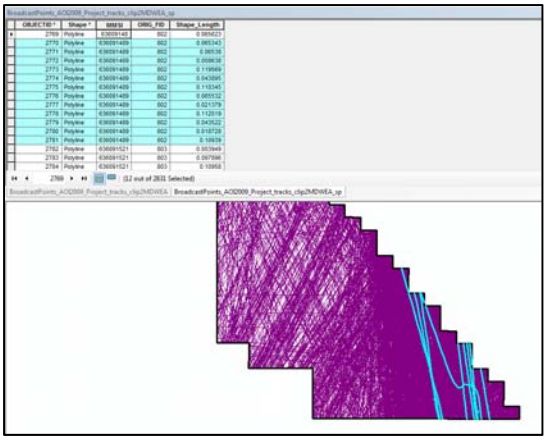


Figure 4 - Example of a Track Line From a Single MMSI and the Twelve Corresponding Transits

For this analysis, a transit is defined as any time a line enters and exits the area of interest. By counting this way, a vessel that is transiting near the edge of the area of interest may enter and exit the area several times, each time being counted separately. Figure 5 shows an example of an MMSI that had ten transits through the WEA in 2009.

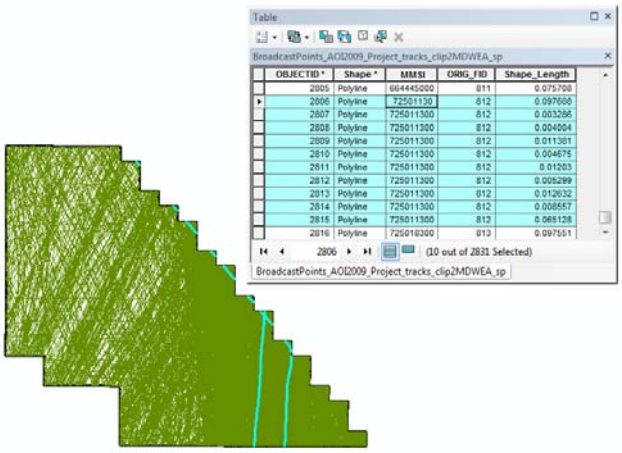


Figure 5 - Example of a Transit Near the Edge of the Maryland WEA

The number of features in the multipart line feature class was recorded as the number of unique vessels for the area being investigated. The number of features in the single part line feature class was recorded as the number of unique transits for the area being investigated. The area, in square meters and square nm, was calculated for each of the WEAs and lease areas. The number of unique vessels per square nm and the number of transits per square nm were calculated. This normalizes the number of vessels and transits by unit area and allows for a comparison between different WEAs and lease areas. Maps showing the track lines in the vicinity of the area of interest were created to show the distribution of vessel traffic in the area.

Appendix IV

Summary of Transits Through Wind Energy Areas and Wind Lease Areas
by Summary Vessel type

C. Results of Quantifying Transits through Wind Energy Areas and Wind Lease Areas

The number of unique MMSIs and unique transits for 2009 for all vessel types are summarized below in Table 1 for Wind Energy and lease areas (as of May 2013).

Wind Energy and Wind Lease Areas	Unique MMSI	Unique Transits
Maine Statoil	44	133
Massachusetts WEA	373	1206
Massachusetts Cape Wind	170	1087
Rhode Island/ Massachusetts Are of Mutual Interest	347	2609
New York	220	677
New Jersey	1257	10774
New Jersey - Fishermens Energy LLC	119	533
New Jersey - GSOE-I LLC	160	360
Delaware WEA	459	1508
Maryland WEA	823	2841
Virginia	892	2263
North Carolina - Kitty Hawk WEA	1553	7180
North Carolina - Wilmington East WEA	1008	4119
North Carolina - Wilmington West WEA	87	218

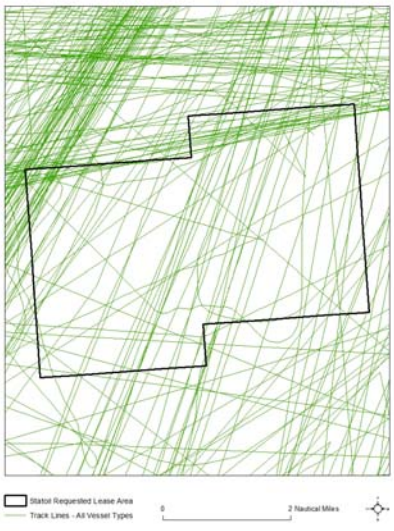


Figure 7 - Tracklines for Statoil

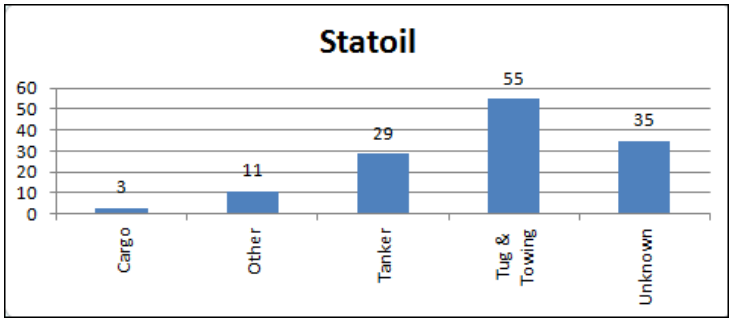


Figure 6 - Number of Transits by Summary Vessel Type

Appendix IV

Summary of Transits Through Wind Energy Areas and Wind Lease Areas
by Summary Vessel type

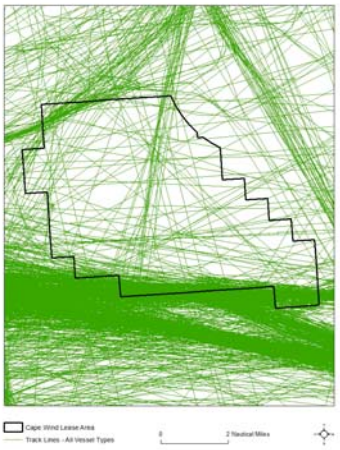


Figure 11 - Tracklines for Cape Wind

Table 1: Summary of Unique Vessels and Unique Transits

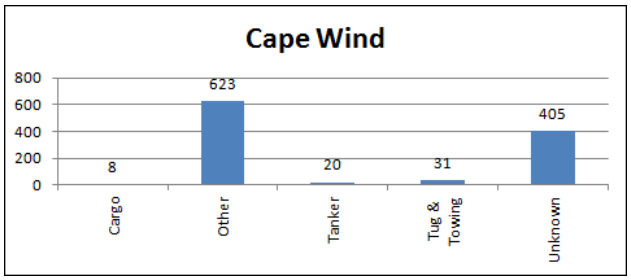


Figure 12 - Number of Transits by Summary Vessel Type

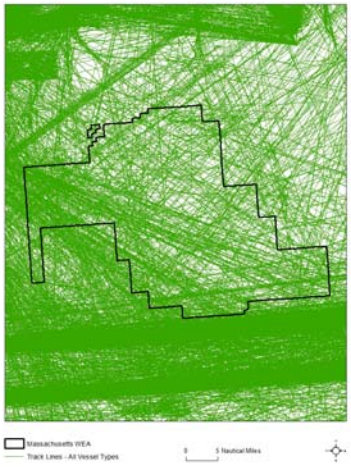


Figure 10 - Tracklines for Massachusetts

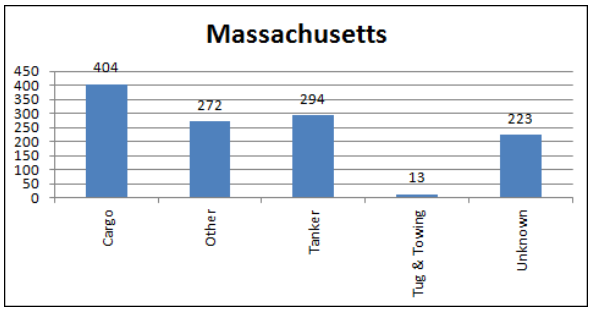


Figure 13 - Number of Transits by Summary Vessel type

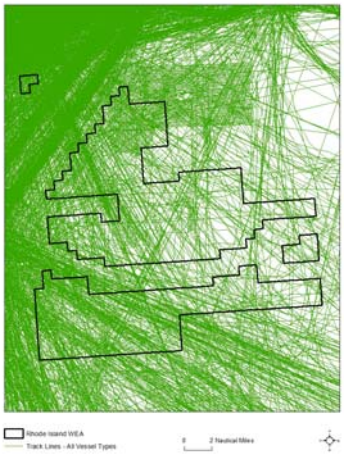


Figure 8 - Tracklines for Rhode Island

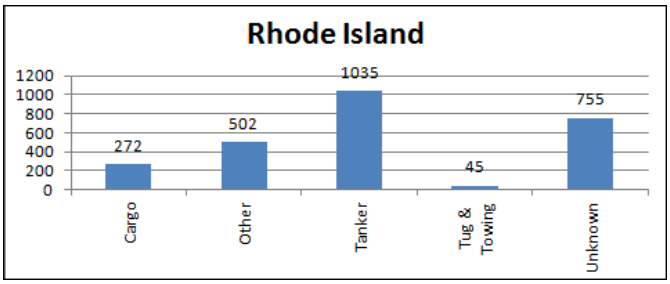


Figure 9 - Number of Transits by Summary Vessel type

Appendix IV

Summary of Transits Through Wind Energy Areas and Wind Lease Areas
by Summary Vessel type

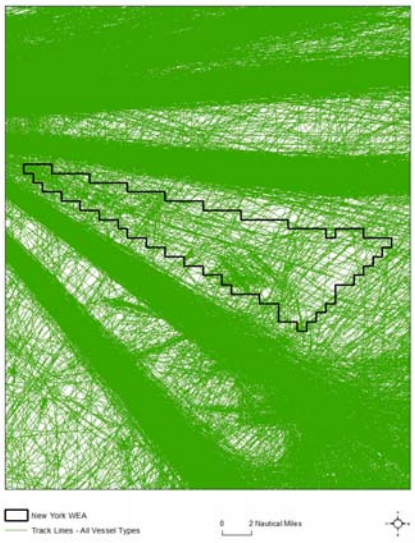


Figure 17 – Tracklines for New York

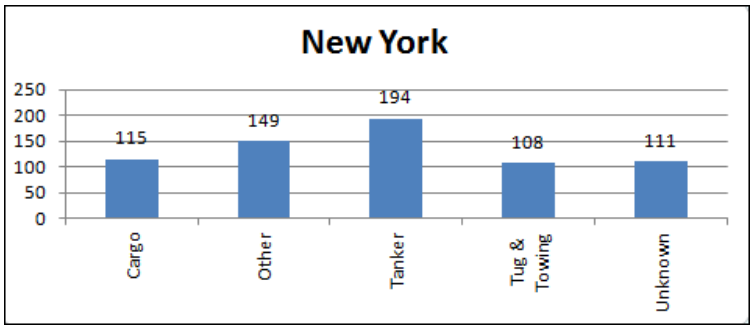


Figure 16 - Number of Transits by Summary Vessel type

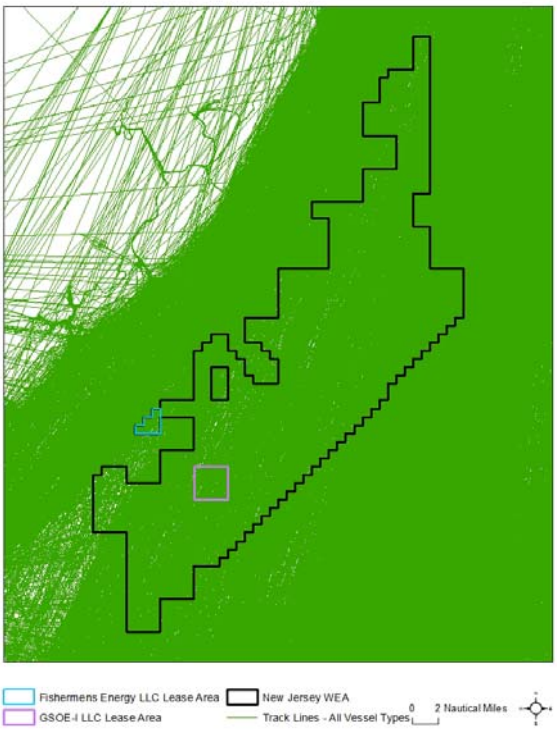
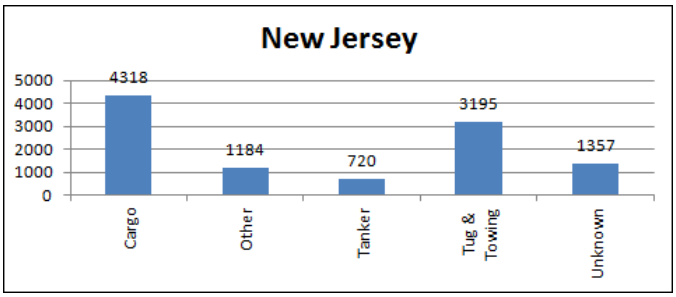
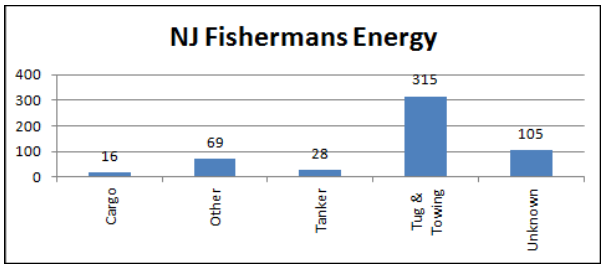


Figure 15 – Tracklines for New Jersey





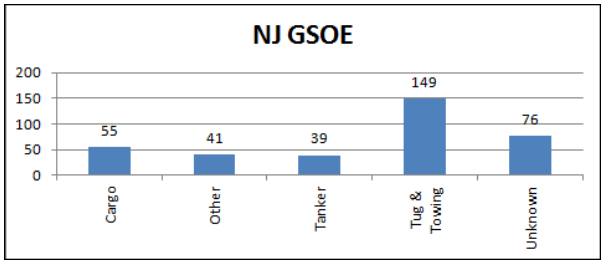


Figure 14 - Number of Transits by Summary Vessel type

Appendix IV

Summary of Transits Through Wind Energy Areas and Wind Lease Areas
by Summary Vessel type

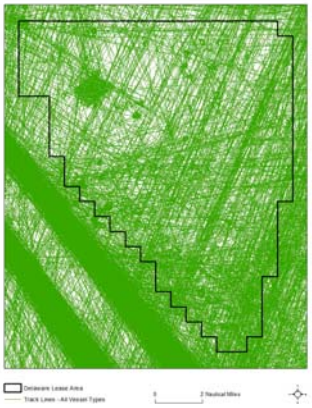


Figure 23 – Tracklines for Delaware

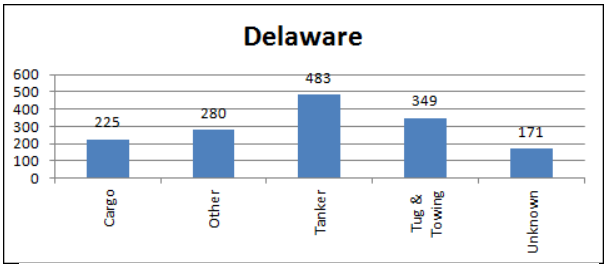


Figure 22 - Number of Transits by Summary Vessel type

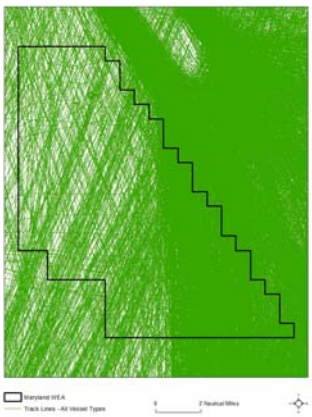


Figure 21 – Tracklines for Maryland

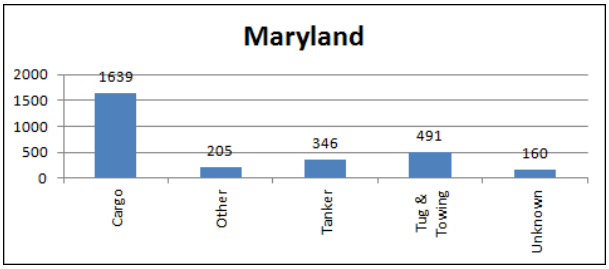


Figure 20 - Number of Transits by Summary Vessel type

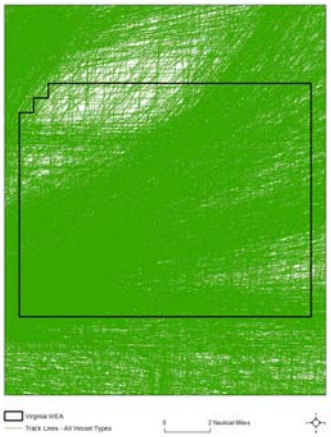


Figure 19 – Tracklines for Virginia

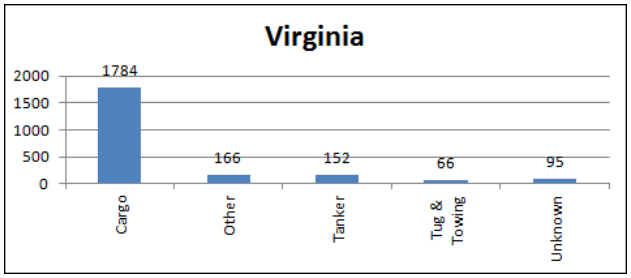


Figure 18 - Number of Transits by Summary Vessel type

Appendix IV

Summary of Transits Through Wind Energy Areas and Wind Lease Areas
by Summary Vessel type

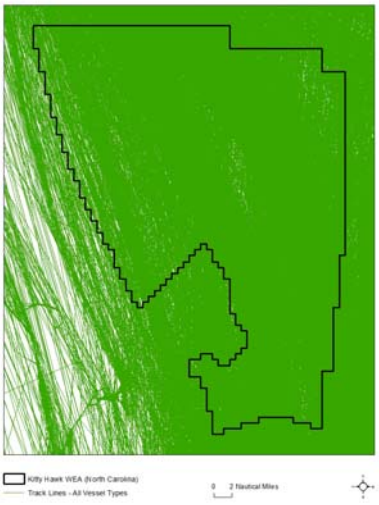


Figure 27 – Tracklines for Kitty Hawk

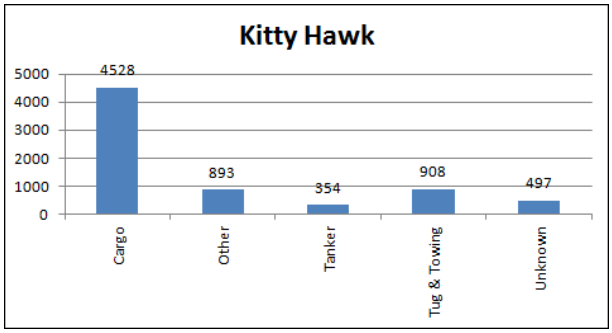


Figure 26 - Number of Transits by Summary Vessel type

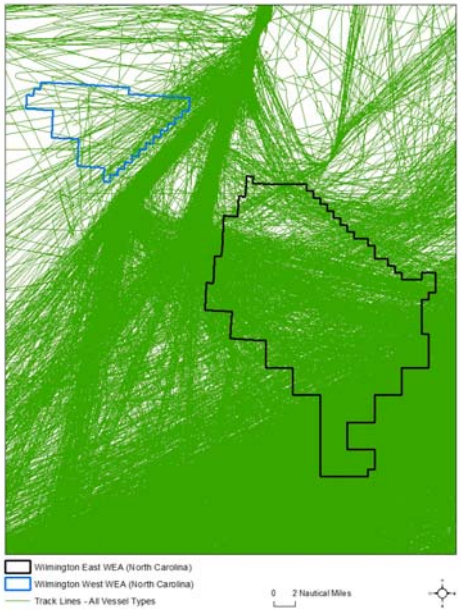
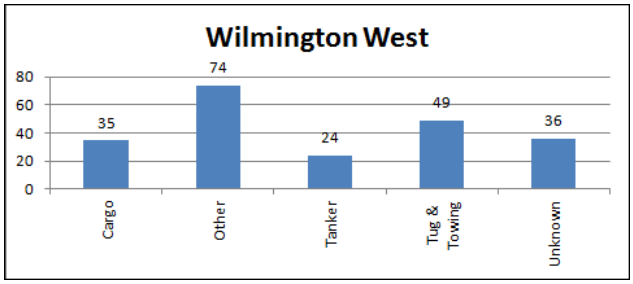


Figure 24 - Tracklines for Wilmington West and Wilmington East



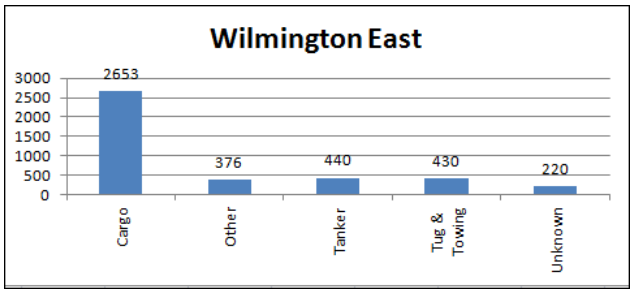


Figure 25 – Number of Transits by Summary Vessel type

APPENDIX V

Analysis of Navigational Conflicts with the Maryland Wind Energy Area

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Prepared for:

UNITED STATES COAST GUARD ATLANTIC AREA

Prepared by:

Emile Benard
Lead Associate
Booz Allen Hamilton

Brittney White
Associate
Booz Allen Hamilton

09 AUG 2013

APPENDIX V

A. Overview

The Bureau of Ocean Energy Management (BOEM) Renewable Energy State Task Force for Maryland held its first meeting in April 2010. The U.S. Coast Guard Fifth District has been involved in the task force from its inception. Although aware of the southern Traffic Separation Scheme (TSS) entering and exiting Delaware Bay, the initial area proposed by the Maryland Department of Natural Resources and later announced as part of the "Smart from the Start" initiative, completely blocked the TSS. The Maryland Wind Energy Area (WEA) is now approaching the release of the Proposed Sale Notice (PSN). Some modifications have been made to remove the area completely blocking the TSS; however, the WEA still conflicts with existing alongshore routes and existing routes to and from Delaware Bay.

B. Maryland WEA Timeline[1]

- The first task force meeting was held on April 14, 2010, with the federal, state, local and tribal governments. The goal of the task force was to facilitate intergovernmental communications regarding OCS renewable energy activities.

- The second Maryland task force meeting was held on July 14, 2010 in Annapolis to present and discuss a draft Request for Interest (RFI). The Maryland Department of Natural Resources (DNR) presented their recommendation for the RFI planning area based on developer interest and stakeholder feedback.[2] Although the southern Traffic Separation Scheme (TSS) to/from Delaware Bay was acknowledged, the conflict was not addressed and the recommended area completely blocked the TSS. The Coast Guard presentation highlighted the conflicts with the TSS and other shipping routes.[3]

- The Maryland RFI was published in the Federal Register on November 9, 2010 under Docket ID: BOEM-2010-0038.

- The comment period for the Maryland RFI closed on January 10, 2011. BOEM received nine expressions of interest from eight developers and twelve public comments. Most of the public comments were related to conflicts with existing uses and navigational safety concerns.

- A third Maryland task force meeting was held on March 23, 2011 in Annapolis. The purpose of this meeting was to discuss comments to the RFI area and to discuss next steps of the leasing process. During this meeting a potential "Call" area was discussed.

- A fourth Maryland task force meeting was held on June 24, 2011 in Annapolis. The purpose of this meeting was to discuss the area to include in the Call for Information and Nominations. During this meeting, the U.S. Coast Guard provided a presentation that applied concepts from the United Kingdom's Maritime Guidance Note (MGN)-371 in order to determine the risk levels based on the proposed WEA distances from shipping routes. This was the first presentation of the Red-Yellow-Green (R-Y-G) methodology that designated areas that should not be included

[1] The timeline was developed from information contained on the BOEM State Activities website: http://boem.gov/Renewable-Energy-Program/State-Activities/Maryland.aspx
[2] Maryland DNR presentation: http://boem.gov/uploadedFiles/BOEM/Renewable_Energy_Program/State_Activities/MD_DNR_presentation.pdf
[3] Coast Guard presentation: http://boem.gov/uploadedFiles/BOEM/Renewable_Energy_Program/State_Activities/USCG_presentation.pdf

for development (Red), areas that needed further study, but can be included in the Call (Yellow), and areas that posed minimal concerns for development (Green).

- The Maryland Call for Information and Nominations was published in the Federal Register on February 3, 2012 under Docket ID: BOEM-2011-0058. BOEM received six comments in response to the Call for Information and Nominations (to include comments submitted by the USCG).[4]

- A fifth Maryland task force meeting was held on January 29, 2013 in Annapolis. The purpose of this meeting was to discuss the zones delineation for the Call for Information and Nominations, as well as discuss a Draft Proposed Sale Notice (PSN).

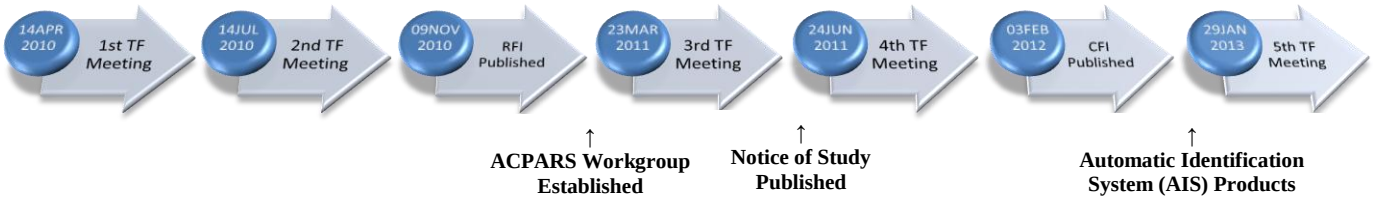

Figure 1: Maryland WEA Timeline

C. Analysis of Navigational Conflicts

1. Determine Traditional Shipping Routes Based on AIS.

AIS data is the primary source of vessel transit data available to determine traditional routes used by commercial vessel traffic. At the time of the development of the proposed WEA for Maryland, the AIS products available were very limited due to the extremely long processing times and lack of resources to complete the analyses. Figures 3, 4, and 5 are some examples of the early products being produced.

[4] http://www.regulations.gov/#!documentDetail;D=BOEM-2011-0058-0005.

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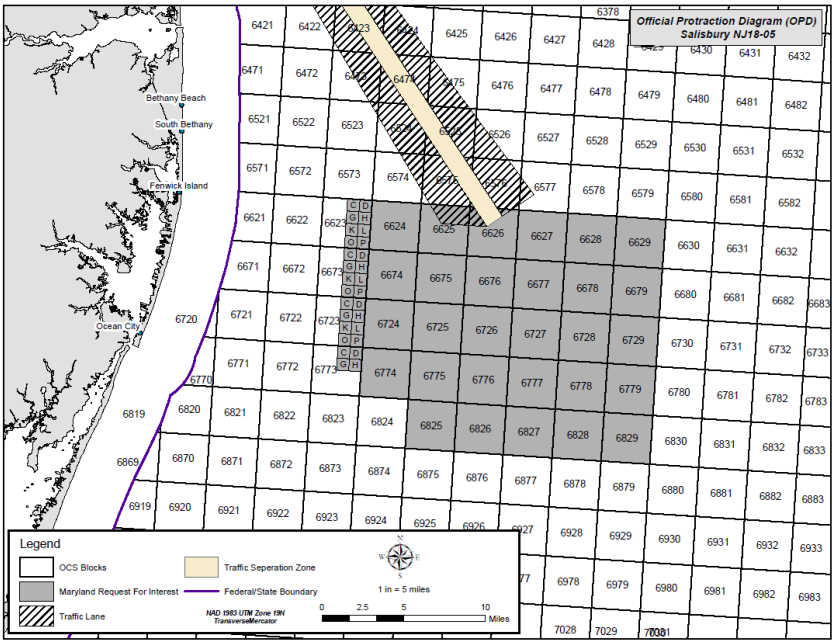

Figure 2: Maryland Map Showing the Request for Information

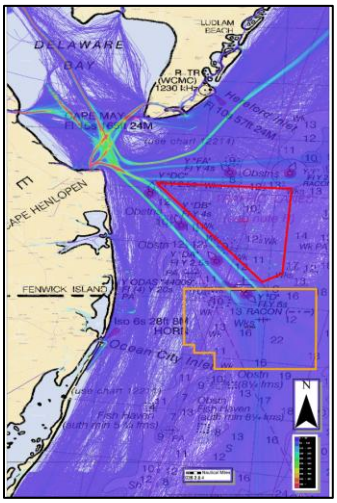

Figure 3: Heat Map with Initial Maryland and Delaware WEAs

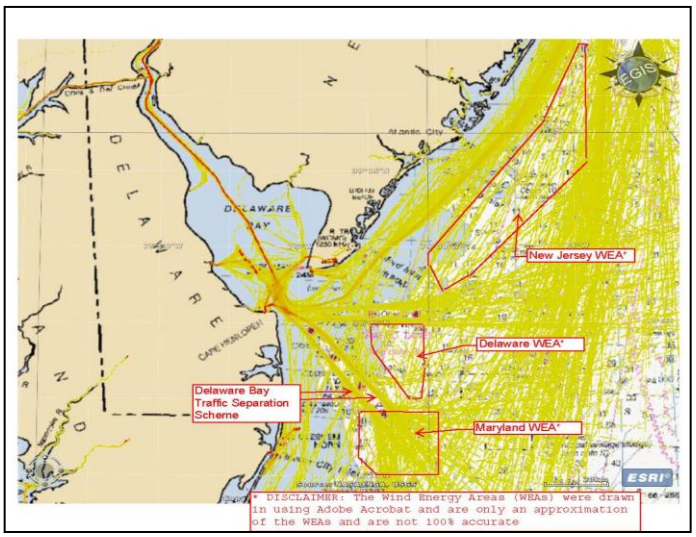

Figure 4: Heat Map with Initial Maryland, Delaware, and New Jersey WEAs Roughly Approximated

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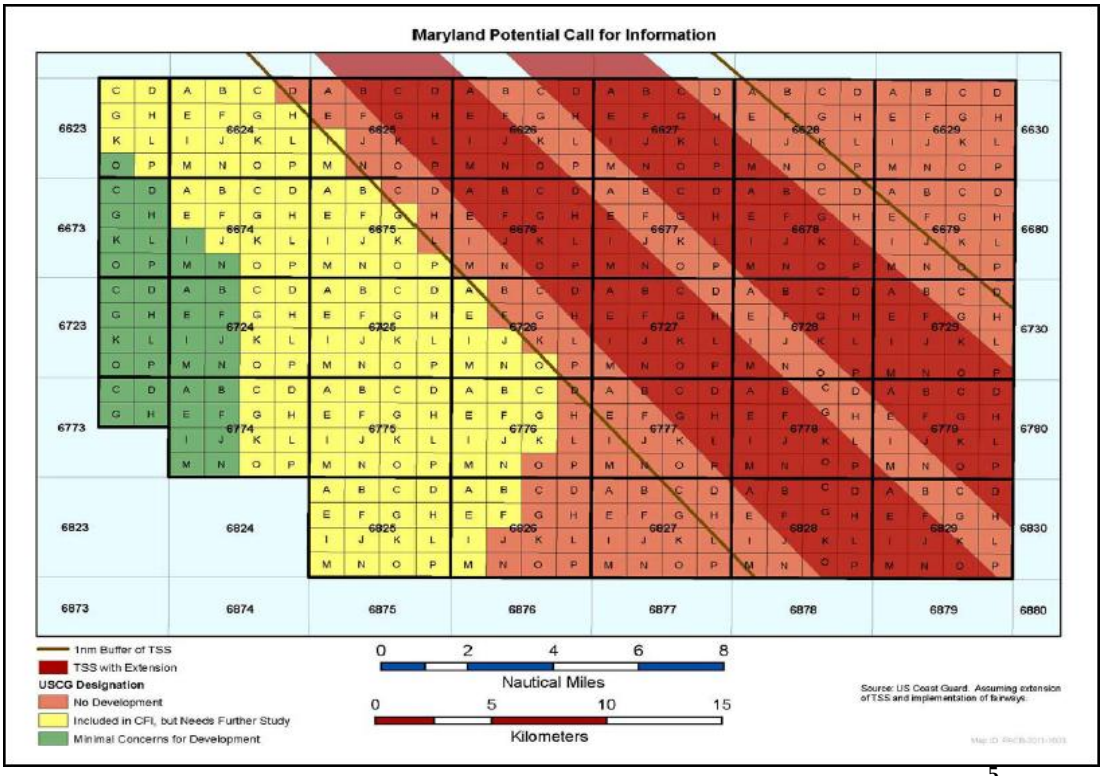

Figure 5: Maryland Call Area with TSS Extension (Red, Yellow, Green) [5]

One of the first priorities of the ACPARS Work Group (WG) was to get better AIS products. The WG requested heat maps and trackline plots broken out by vessel type for the entire Atlantic Coast. The ACPARS was the first effort by the Coast Guard to analyze AIS data on such a large scale. The AIS database was designed to store large amounts of historical AIS data, but was not designed to extract and analyze data. As a result, the Coast Guard did not have the capability to process the AIS as desired, and the WG was not able to characterize vessel traffic to the extent that was needed. By the Fall of 2011, the Coast Guard was eventually able to produce AIS density plots in the form of Adobe pdf files that enabled the WG to compare all vessel traffic to the proposed MD wind energy area. This occurred after the fourth task force meeting where the "Call" area was determined. The density plot mostly confirmed the conflicts of high vessel density in the eastern portion of the "Call" area of which the task force was already aware.

[5] Source: USCG. Assumes vessels entering the TSS would do so further to the East, but would likely not change the alongshore route.

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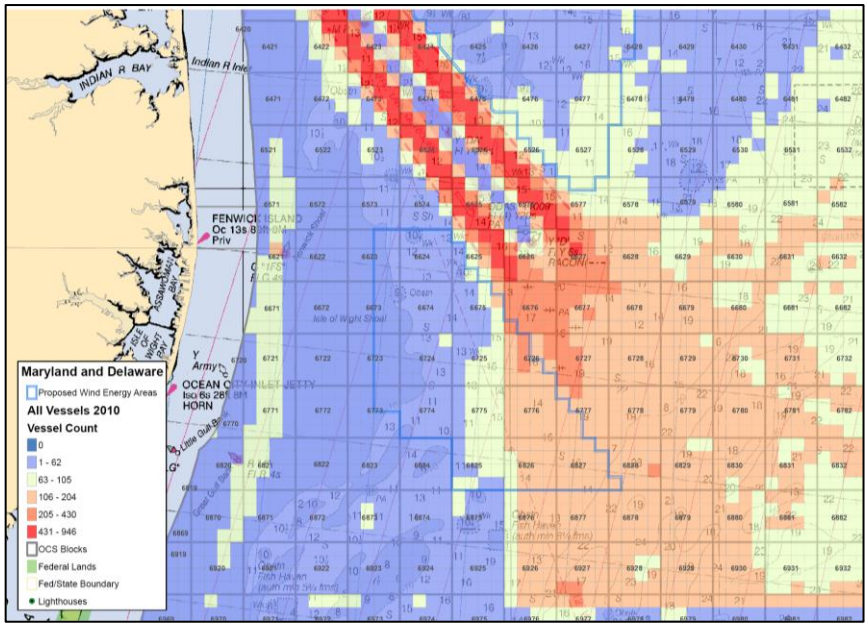

Figure 6: Density Plot of the Maryland "Call" Area Produced by the Coast Guard using 2010 AIS Data

Available in the AIS data are several information fields including, but not limited to, the vessel type, speed, direction, length, draft, and a time/date stamp. The heat maps and density plots produced by the Coast Guard were primarily limited to only depicting all vessels for a one year period. What the WG needed, but was initially unattainable, was the ability to process the AIS data by each of the individual information fields.

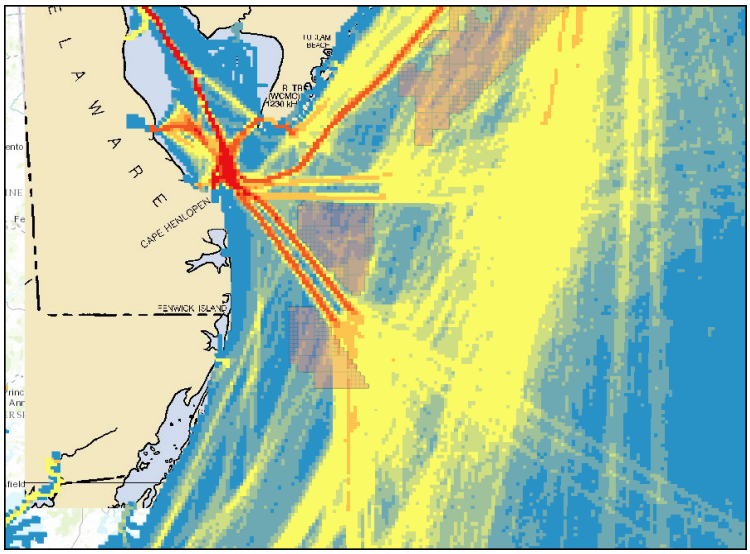

Figure 7: All Commercial Vessel Traffic[6]

[6] Source: National Oceanic and Atmospheric Administration (NOAA) product available for download through Marine Cadastre (Fall 2011).

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By the Fall of 2012, AIS products created by NOAA and BOEM were made available through the Marine Cadastre. The NOAA products were better refined heat maps that included the offshore areas of the continental U.S. The BOEM products were broken out by vessel type for the Atlantic Coast. Looking at maps by vessel type proved to be extremely valuable in understanding vessel traffic patterns, particularly Tug and Barge units that transit closer to shore than larger Deep Draft vessels. When viewing density plots of all vessels, such as in Figure 6, it appears all of the conflict with the MD area is in the southeast corner of the area. However, for Towing vessels only, Figure 8 shows the route of towing vessels bisects the MD area. In the plots showing all vessels, the higher numbers of Deep Draft vessels "masked" the routes of Towing vessels.

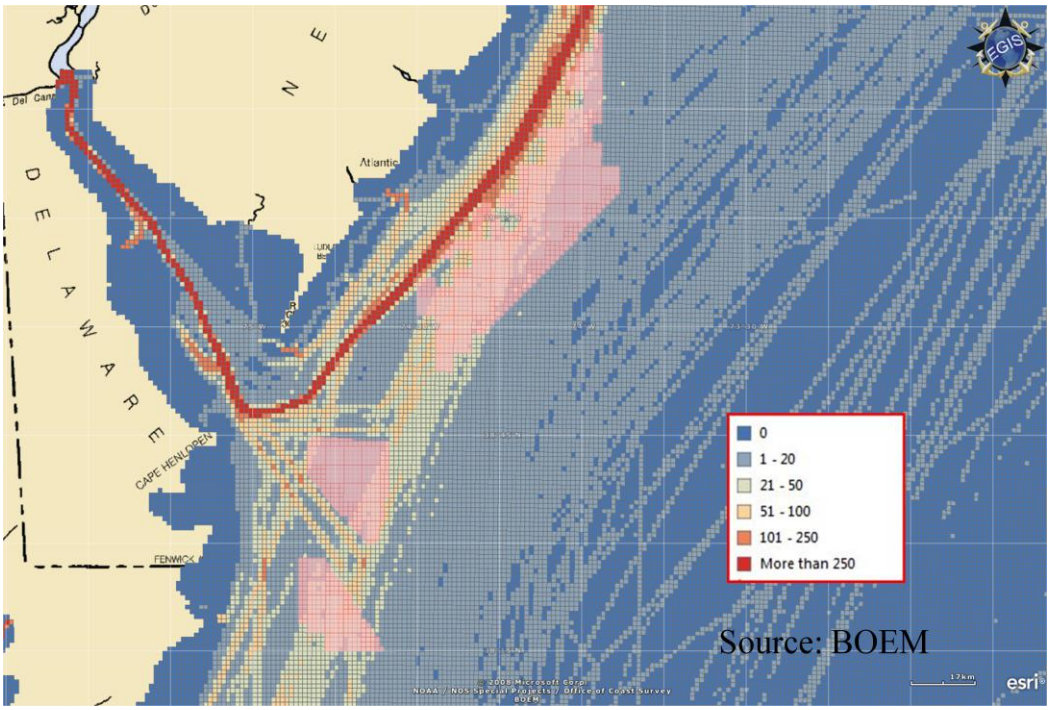

Figure 8: Density Plot of Tug and Barge Routes Through NJ, DE, and MD WEAs Using 2010 AIS Data

2. Stakeholder Input

The BOEM Renewable Energy State Activities Site for Maryland contains links to the comments and recommendations received on the RFI and the Call for Information. For additional information on the specific comments received, refer to the following site: http://www.boem.gov/Maryland/.

Captain Bill Broadley, a professional mariner, indicated how wind farm development in the RFI and Call Area would seriously impact deep draft marine traffic. In response to the U.S. Coast Guard's ACPARS announcement on May 11, 2011, he responded with seven separate proposals specifically describing two "Precautionary Areas," four close to shore Two-Way Routes, an extension and modification to the existing Barnegat TSS, a new TSS running North East to/from the Delaware Bay, and an extension to the existing Delaware Bay TSS. After numerous meetings with the various parties involved, including many active mariners, Mr. Broadley suggested a compromise that included extending the Delaware TSS,

and a Precautionary Area which would allow for a wind turbine development area to the West of the "Call for Information" area. He further reviewed this suggestion with many of the mariners involved and, after some modifications, he included this TSS proposal along with the "Precautionary Area" as part of his response to the May 11, 2011 ACPARS letter dated August 2, 2011.

The Mariner's Advisory Committee (MAC) for the Bay and River Delaware expressed its concerns with the proposed Maryland WEA located at the southeastern terminus of the Delaware TSS. This project would block deep-draft access to the Delaware Bay and River severely, thus impacting the viability of the ports in the region. The MAC also expressed concerns regarding safe navigation around wind energy structures and the impact that a ship strike might have on the environment and economy of the local area.

The World Shipping Council (WSC) commented that positioning fixed wind turbines in close proximity to significant maritime transportation corridors and in the pathway of oceangoing ships is not something that an RFI should allow to be contemplated. The environmental costs and damage of a single allision between a ship and a wind turbine, as well as the potential loss of life and property could easily exceed any benefits of siting such turbines in the area. Safety of navigation dictates that there should be no circumstance where a lease should be invited in or near the approaches to a commercial shipping channel delineated by a TSS. At the approaches to TSSs, large commercial vessels (which require many miles to alter course and speed) vector in from the various compass headings they have been steering. These transition zones between open ocean and the fairways of the TSS already present significant navigational challenges, which would be made much more dangerous by the presence of wind turbines. The RFI appears to recognize that most of these particular blocks off Maryland will have to deal with significant navigational restrictions and presumably cannot be appropriate locations for wind farms, yet BOEM nevertheless has included these areas in the RFI. A more deliberate process that more fully integrates the expertise, analysis, and advice of the U.S. Coast Guard before taking this step would be advisable. *We strongly recommend that BOEM adopt as a general policy that the agency will not invite interest in wind farm leases in areas that overlap with a TSS or to the approaches to a TSS.*

The American Waterways Operators (AWO) commented that the Call Area "Maryland" is located within a traffic lane utilized by the maritime industry, including tugboats and barges, for north-south routes. While some vessels do prefer a nearshore route, many tugboats and barges utilize an offshore north-south route because it allows vessels to avoid the congestion present at the mouth of Delaware Bay. This congestion is present due to heavy traffic into and out of Delaware Bay, which is directed into a TSS. Maintaining the current north-south route for tugboats and barges will allow them to cross the inbound-outbound traffic lanes for Delaware Bay further from shore at nearly right angles. This will minimize congestion in the area. Congestion is a potential safety hazard, especially during inclement weather, when visibility is reduced and tugboats may require longer tow lines for barges under tow. The current MD WEA would force tugboats to navigate an additional 10-12 miles offshore from the current north-south routes at all times and in all weather conditions. In certain weather conditions, just one mile further offshore can change sea conditions

drastically for certain vessels, putting these vessels at greater risk and jeopardizing a safe transit. In addition to these safety concerns, forcing vessels out of normal navigational routes will waste up to 100 gallons of fuel per hour, increase air emissions, and add hours to transit times, adding to the cost of goods moved. These new proposed transit routes will lead to increased costs in the transportation of essential commodities that are the building blocks of our national economy. Given the safety, economic, and environmental disadvantages of proceeding east of the current MD WEA, many tugboats would likely opt to proceed inland of the WEA. This would result in increased congestion into and out of Delaware Bay, as tugboats and barges cross the traffic separation schemes. The plan titled "USCG Alternative 1" modifies the eastern edge of the MD WEA to allow tugs and barges to continue their preferred north-south route, albeit with several modifications.

Keeping the aforementioned safety, economic, and environmental concerns in mind, AWO strongly recommends that BOEM modify the MD WEA using "USCG Alternate 1" as the eastern edge of the call area. This includes removing the following lease blocks from WEA consideration: 6827; 6826; 6825; 6777; 6776; 6775 (except aliquots A, B, and E); 6726 (except aliquot A); and 6725 (aliquot P only). Modification of the MD WEA to allow for a north-south vessel route will be a positive improvement on the current siting scheme. However, AWO is concerned with the cumulative impact of additional WEAs planned in the region. Many AWO members utilize a near-shore route from Virginia to New Jersey and those routes must also be preserved. The current WEA development process relies on a piecemeal, state-by-state approach for addressing vessel navigation issues. Developing additional offshore wind energy projects in Delaware and New Jersey could severely disrupt offshore and near-shore vessel operations on the Atlantic coast. A significant portion of the region's chemical and petroleum goods are moved by tug and barge from Norfolk, Baltimore, and Philadelphia to New York, Boston, and points north. The proposed WEAs offshore of Maryland, Delaware, and New Jersey will have a substantial impact on this trade.

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D. Analysis of Alternatives

If the Coast Guard's R-Y-G Methodology were to be applied to the density plot in Figure 8 to account for the alongshore Tug and Barge route, the remaining area would result in the equivalent of approximately three lease blocks as shown in Figure 9.

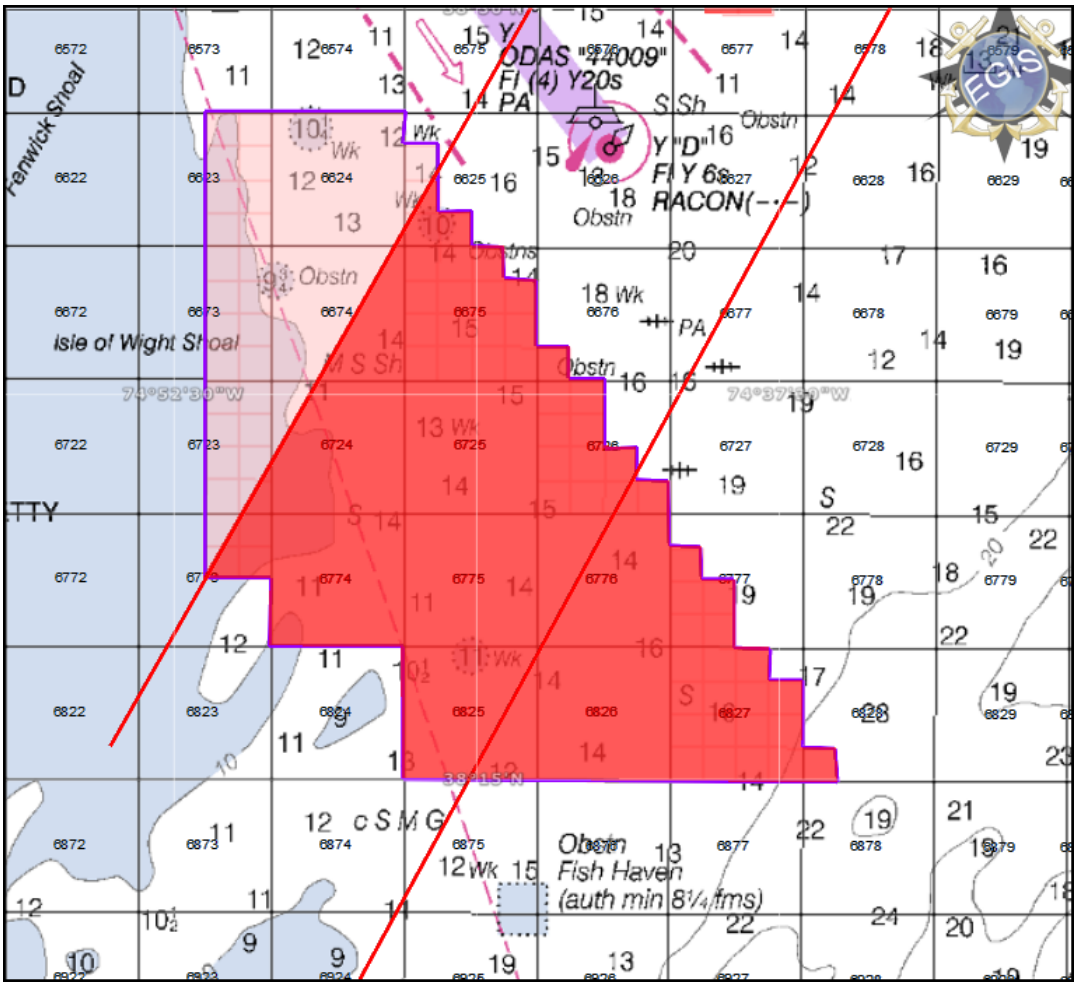

Figure 9: Representation of DE and MD WEAs if Existing Tug and Barge Routes Were Preserved. The Red Lines Represent the Edges of the Tug and Barge Route

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When looking at alternative routing scenarios, the Coast Guard attempted to account for all three of the WEAs (Maryland, Delaware, and New Jersey) to ensure a more direct route. Alternative 1 consisted of determining a direct North/South route between the Eastern edge of the Delaware WEA and providing for a sufficient width to the east. This would result in eliminating almost two lease blocks on the western side of the New Jersey WEA. The route continues South until it clears the Delaware WEA, such that vessels would then cross the TSS at an approximate right angle.

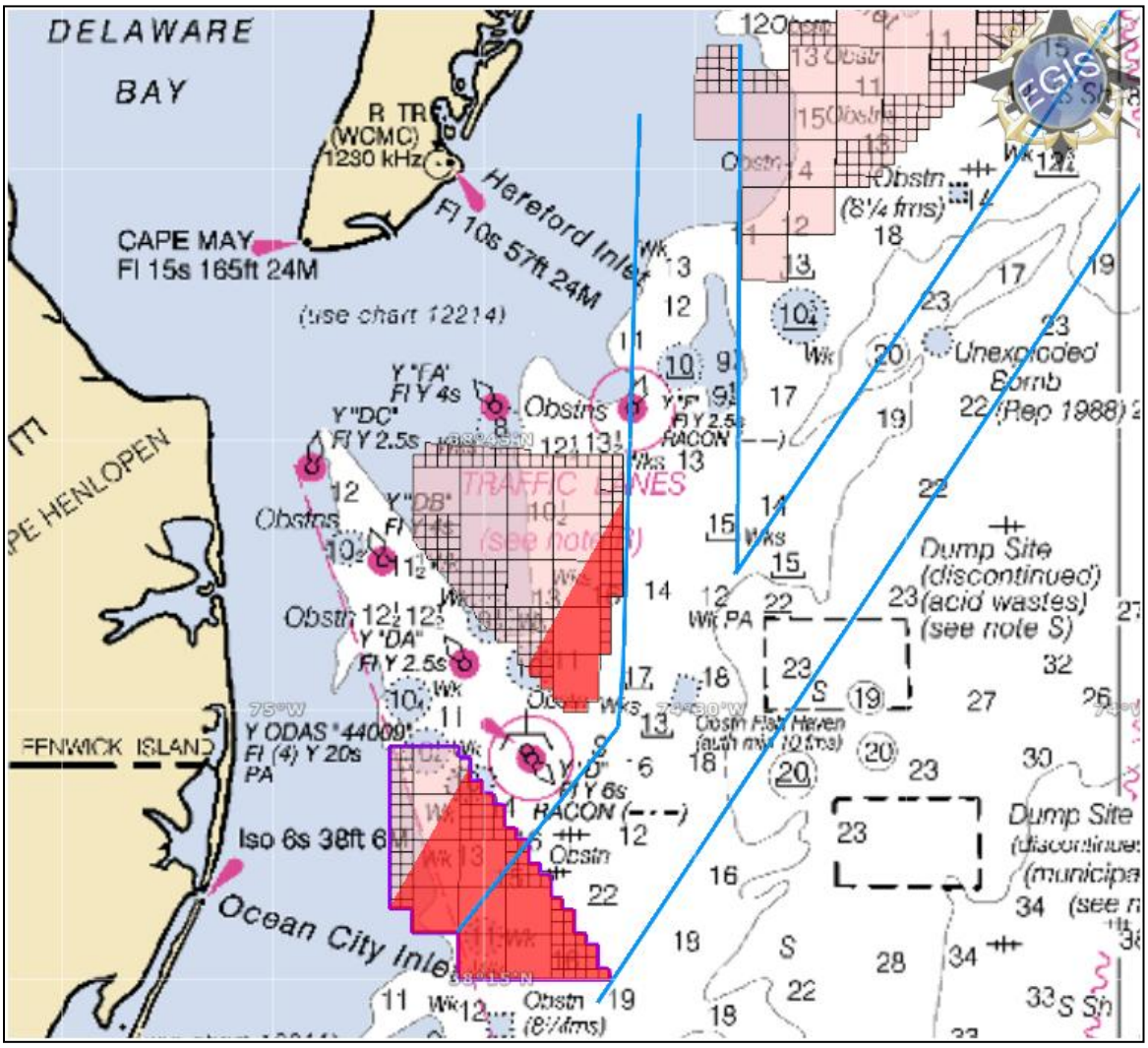

Figure 10: Alternative Routing Scenario #1 (Shown in Blue)

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Alternative 2 consisted of the same direct North/South route used in Alternative 1, but extended slightly further South prior to crossing the TSS at an approximate right angle. This is as far South as the route could be located and still enable vessels to cross at an approximate right angle.

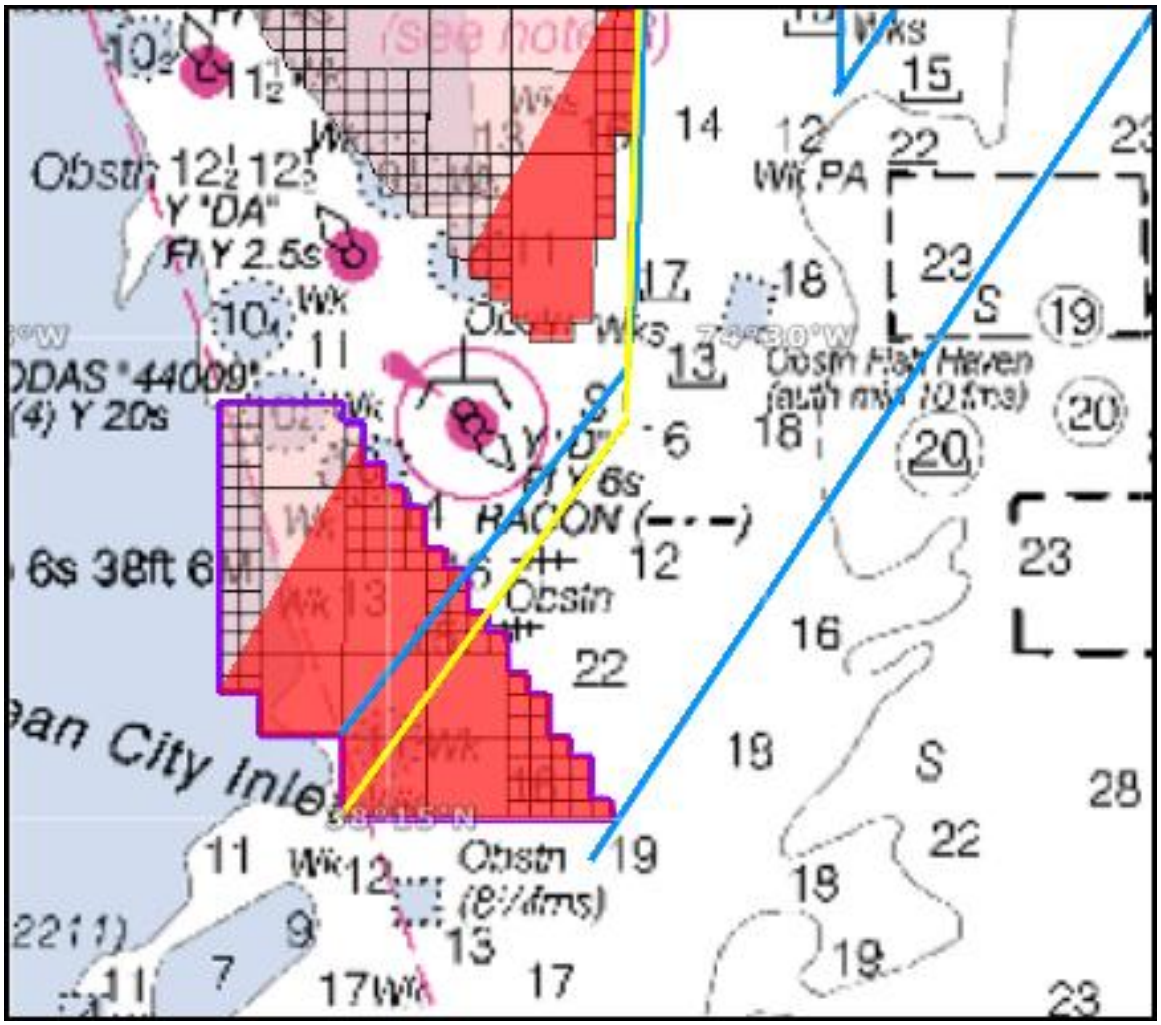

Figure 11: Alternative Routing Scenario #2 (Shown in Yellow)

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Both of these alternatives were analyzed to determine how much "conflict" would be removed by modifying the WEA. Conflict was determined by calculating the number of unique transits through each wind energy area.

Area	Number of Transits	Area sq. miles	Reduction in Area %	Reduction in transits %
Entire Maryland WEA	2,841	125	_	_
Alternative 1	1,206	76	39	58
Alternative 2	1,414	88	30	50

Table 1: Results For All Vessels

Area	Number of Transits	Area sq. miles	Reduction in Area %	Reduction in transits %
Entire Maryland WEA	491	125	_	_
Alternative 1	304	76	39	38
Alternative 2	359	88	30	27

Table 2: Results for Tugs and Towing Vessels (Vessel Types 31, 32, and 52)

	Status Quo	Preserve Existing Alongshore Route	Alternative 1	Alternative 2
Maximum # of potential utility scale projects	3-4	1	2	2
Reduction of conflict- All vessel types	No reduction	>95% (estimated)	58%	50%
Reduction of conflict with Tug and Barges	No reduction	>90% (estimated)	38%	27%
Likelihood tug and barges will be forced inshore* (approx. displacement Offshore)	Highly Likely (13NM)	Not likely (not displaced)	Possibly (4 NM)	More likely (6 NM)
Likelihood additional area would need to be removed at a later stage	Highly Likely	Not likely	Possibly	More Likely
* Rating is based on the further the route is forced offshore, the less likely vessels will be able to utilize the offshore route				

Table 3: Comparison of Alternatives

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E. Conclusions:

1. Leaving the WEA as currently proposed (Status Quo) would most likely result in a significant amount of the area being removed later in the process, and the full impact would likely be to only one of two zones.
2. Preserving the existing tug and barge route would not meet the objective to have a minimum of two zones for leasing.
3. Both Alternatives 1 and 2 would meet the objective of having two zones for leasing and give a good return on reducing conflict when evaluating all vessel types. However, when evaluating tugs and towing vessels the reduction of conflict is not as significant, due primarily to center of the actual tug and barge alongshore route being located west of the alternative routes. This translates to a more significant displacement of tug and towing vessels.
4. Alternative 2 would displace the route further offshore. This will result in a lower probability of vessels being able to transit offshore and the undesired effect of crossing traffic at the entrance to Delaware Bay. This also places the WEA further at risk to having additional area removed later in the process.
5. The effective reduction in the WEA for Alternatives 1 and 2 may actually be much smaller than discussed due to the southeast portion of the WEA having 30-40 meter depths that exceed current technology.

F. Recommendation: Move forward with Alternative 1 by recommending the BOEM consider removing the corresponding area in the southeast portion of the WEA. Alternative 1 provides the best alternative to reduce the navigational safety risk and reduce the likelihood of additional area being removed later in the process, while providing enough area to lease two zones for utility scale projects. The course of action would also lend some credibility to the BOEM process in the eyes of mariners. A full Navigational Safety Risk Assessment (NSRA) will still be required by the developer and may actually find that less of the wind energy is suitable for development due to the conflicts discussed previously.

APPENDIX VI

Analysis of Navigational Conflicts with the North Carolina Wind Energy Areas

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Prepared for:

UNITED STATES COAST GUARD ATLANTIC AREA

Prepared by:

Emile Benard
Lead Associate
Booz Allen Hamilton

Kristie Bailey
Associate
Booz Allen Hamilton

24 JUN 2014

APPENDIX VI

A. Overview

The Bureau of Ocean Energy Management (BOEM) Renewable Energy State Task Force for North Carolina held its first meeting in January 2011. The U.S. Coast Guard (USCG) Fifth District has been involved in the Task Force from its inception. The Coast Guard's initial Red-Yellow-Green (R-Y-G) determination for the Kitty Hawk Call Area determined the majority of the area to be red, (i.e., unsuitable based on existing vessel traffic) with only small areas along the Western edge and Northeast corner determined to be yellow or green. BOEM made a decision to move forward with a Call for Information and Nominations (Call) for the entire proposed area noting the Coast Guard concerns, as well as National Park Service (NPS) concerns with view shed from NPS lands.

As BOEM approached the Area Identification process, BOEM and Coast Guard staffs attempted to work with industry representatives to identify areas within the Kitty Hawk Call Area that would minimize impacts to navigational safety, while still providing sufficient area for wind development. These efforts fell short of identifying areas that were not objected to by the maritime community with the majority of the maritime community opposed to any development in areas initially determined to be "Red" by the Coast Guard.

The modeling and analysis tool (developmed by Pacific Northwest National Lab (PNNL)) was expected to be completed in November of 2013 and was supposed to have the ability to determine the change in risk from the various siting scenarios. However, the modeling and analysis tool was not delivered as expectedd. In lieu of the ability to analytically determine the change in risk and the intention of BOEM to move forward in the Area Identification process, this evaluation was developed to inform any recommendations the Coast Guard may want to make to BOEM at this stage in the process.

B. North Carolina Wind Energy Area (WEA) Timeline[1]

- The first task force meeting was held on January 19, 2011 in Wilmington with the federal, state, local and tribal governments. The goal of the task force was to facilitate intergovernmental communications regarding OCS renewable energy activities. North Carolina presented a study by the University of North Carolina (UNC) to examine the feasibility of wind development.

- The second North Carolina task force meeting was held on May 11, 2011 in Raleigh to discuss potential WEAs and task force member concerns. Many task force members presented their concerns and recommendations for planning areas. The Coast Guard presentation highlighted the conflicts with the traditional shipping routes throughout most of the potential areas.

- A third North Carolina task force meeting was held on October 6, 2011 at the University of North Carolina Wilmington. The purpose of this meeting was to discuss remaining conflicts, including vessel traffic, and discuss next steps of the leasing process for each of the potential areas. The task force decided to move forward with a Call for Information and Nominations for areas 1, 2, and 3; and a Request for Information for areas 4 and 5.

- A fourth North Carolina task force meeting was held on August 2, 2012 in Nags Head. BOEM kicked off the meeting by announcing that they have decided to move forward with a Call for

[1] Documentation from each of the Task Force meetings are posted on the BOEM State Activities website: http://www.boem.gov/Renewable-Energy-Program/State-Activities/North-Carolina.aspx

Information and Nominations for areas 1, 2 and 5. Note: This differed from the course of action recommended by the task force at the previous meeting. They acknowledged that conflicts had not been addressed with shipping or view shed from NPS.

- The North Carolina Call for Information and Nominations was published in the Federal Register on December 13, 2012 under Docket ID: BOEM-2012-0088. In the Call, areas 1, 2, and 5 were renamed Wilmington West, Wilmington East, and Kitty Hawk, respectively.

- On January 7 and 9, 2013, BOEM held public information sessions to provide an overview of BOEM's recently published Call for Information and Nominations and Notice of Intent to solicit public comment and to discuss the next steps in the environmental, planning, and leasing processes in North Carolina.

- BOEM published a notice in the Federal Register reopening the comment period for the North Carolina Call for Information on February 5, 2013 and also announced the Notice of Intent to Prepare an Environmental Assessment (EA) for Commercial Wind Leasing and Site Assessment Activities on the OCS Offshore North Carolina.

- The comment period for the North Carolina Call for Information and Nominations closed on March 7, 2013. BOEM received five expressions of interest from five developers and thirty-seven public comments. Most of the public comments were in favor of WEA development and a few were related to conflicts with existing uses and navigational safety concerns.

- On June 19, 2013 Coast Guard and BOEM staffs met to attempt to identify smaller areas within the Kitty Hawk and Wilmington East areas that may allow for wind development without significant impacts to navigational safety. Through additional analysis of vessel traffic data and discussion with the marine industry, BOEM and the USCG worked collaboratively to develop five alternatives for consideration for the NC WEAs.

- On September 25, 2013, the USCG Fifth District Commander sent a letter and questionnaire to stakeholders asking for their views on the North Carolina options for both Kitty Hawk and Wilmington Call Areas. A summary of the responses from industry are included as Enclosure (1).

- BOEM met with the NPS regarding the North Carolina Call Area view shed on February 10, 2014. The NPS would like to push the minimum distance of the wind farms to possibly to the theoretical line of sight from the Bodie Lighthouse, which is approximately 38 nautical miles.

C. Initial Determination of Suitability

1. Determining Shipping Routes Based on Automatic Identification System (AIS) Data.

AIS data is the primary source of vessel transit data available to determine traditional routes used by commercial vessel traffic. When the “Smart from the Start” Initiative was first launched in January 2011, the AIS products available were very limited due to the extremely long processing times and lack of resources to complete the analyses. As development of the proposed WEAs for North Carolina progressed, the ability to process AIS data and create Geographic Information System (GIS) products had greatly improved.

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Figure 1 is one of the earlier plots showing density at the aliquot level for all vessels over a one year period using 2010 AIS data. These density plots are a good initial look at the conflicts with the proposed wind energy areas.

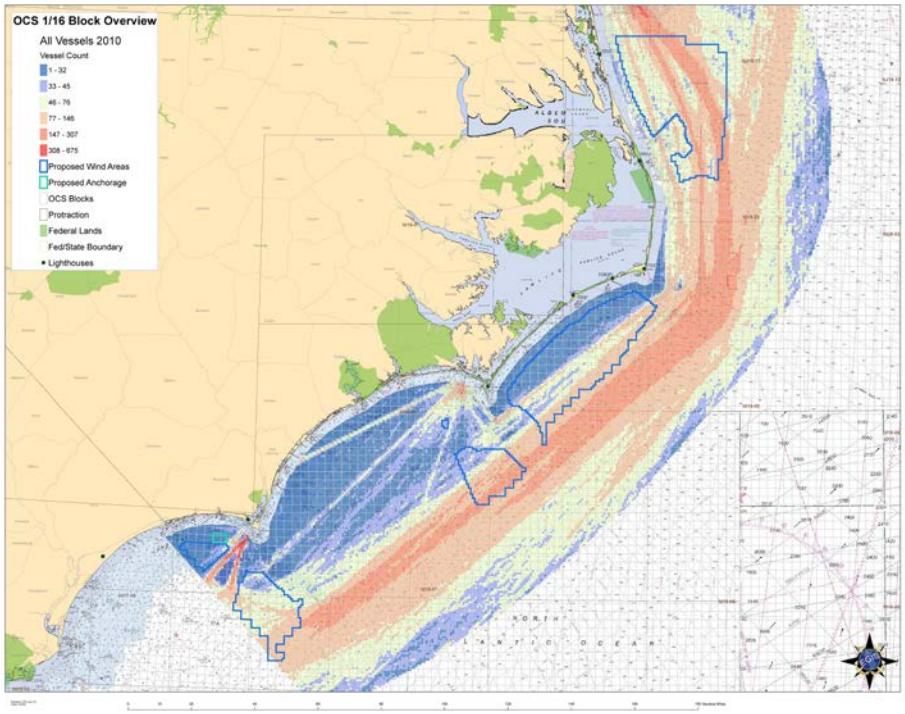

Figure 1: Heat Map of the Initial North Carolina Proposed Wind Areas

"Heat map" is a term used for a depiction of line density or point density where the "hotter" color reflects a higher density.

2. Application of the R-Y-G Methodology.

The initial R-Y-G determination completed by the Coast Guard Fifth District was based on the evaluation of AIS heat maps of all vessels in 2010 to identify existing vessel traffic patterns in or near the areas proposed in the study conducted by North Carolina.

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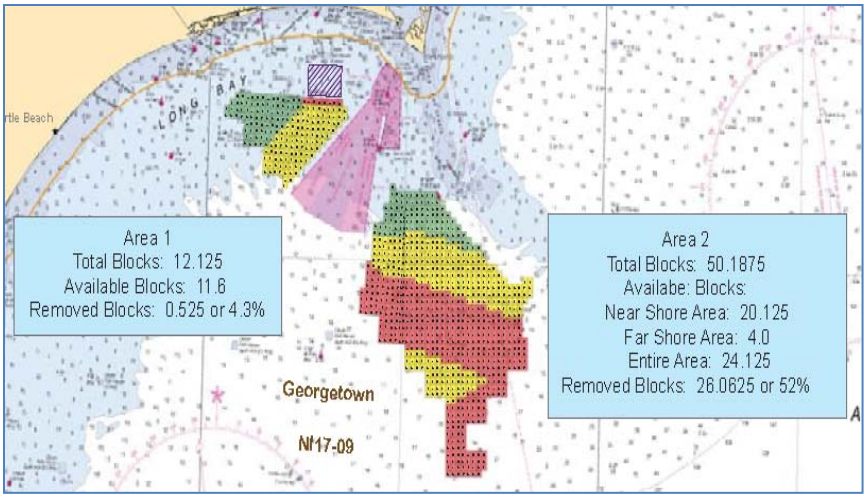

Figure 2: R-Y-G Analysis of the North Carolina Call Areas 1 and 2

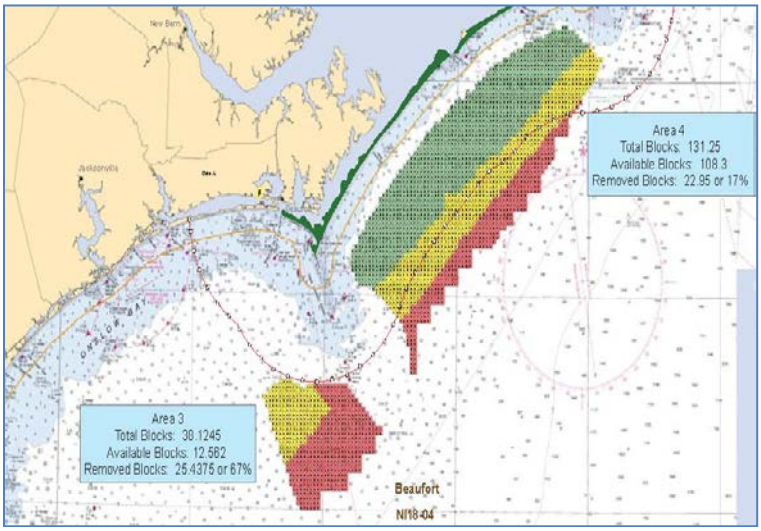

Figure 3: R-Y-G Analysis of the North Carolina Call Areas 3 and 4

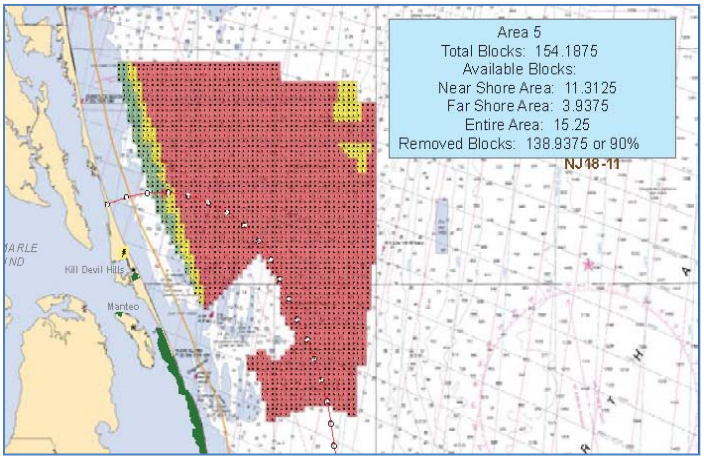

Figure 4: R-Y-G Analysis of the North Carolina Call Area 5

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D. Description of North Carolina Call Areas

1. Kitty Hawk Call Area. The Call Area Kitty Hawk offshore North Carolina contains approximately 138 whole Outer Continental Shelf (OCS) blocks and 36 partial blocks. The boundary begins six miles from the shore and extends roughly 34 nautical miles (nm) seaward at its longest point. It extends from North to South approximately 45 nm. The entire area is approximately 1372 nm^2.

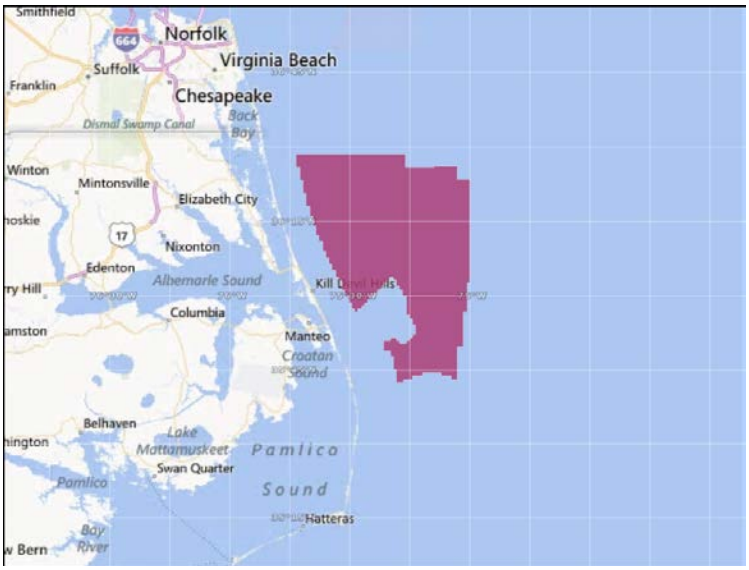

Figure 5: Call Area Kitty Hawk

An analysis of the number and types of vessel transits through the Kitty Hawk Call Area was conducted using one year of AIS data from 2009. The analysis found that there were 7,180 unique transits by 1,553 individual vessels. The majority of the transits were conducted by Cargo vessels accounting for 64% of the total, followed by Tugs and Towing at 13%, and Tankers at 5%. The remaining 19% of transits were by vessels of other categories or unknown.

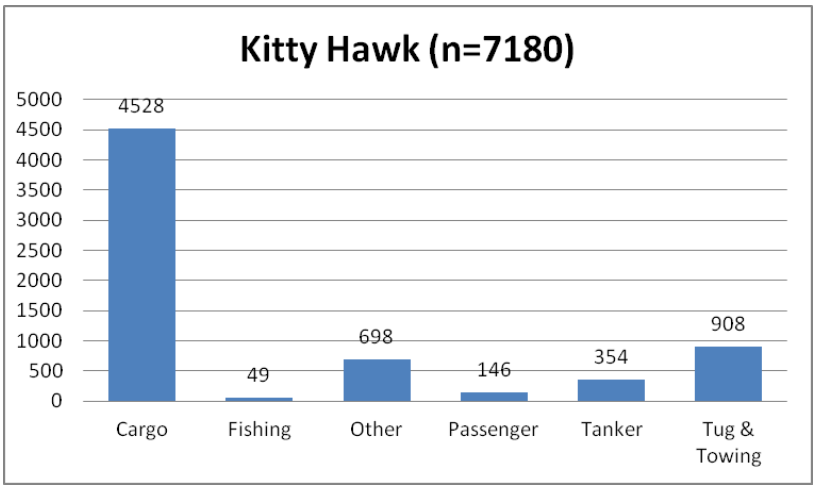

Figure 6: Vessel Transits through Call Area Kitty Hawk by Vessel Type

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In addition to quantifying the transits, visualizations of the AIS data were completed to determine if routes varied by vessel type, draft, or direction of travel. The hypothesis was that the multiple routes shown in the all vessel density plot would prove to vary based on vessel type, draft, and direction. It was known that towing vessels transited closer to shore and assumed that the smaller, shallow draft vessels would do the same to avoid higher sea states and take advantage of the lee (protection from prevailing winds) provided by land. When looking at the density plots of all vessels, there was a common misconception that the two highest density routes through the middle of the Kitty Hawk Call Area were a Northbound and a Southbound route.

The January 2009 data was used to plot tracklines of Northbound and Southbound vessels (shown below). Although the numbers of transits appear to differ, direction (Northbound or Southbound) did not vary for the routes through the Kitty Hawk Call Area.

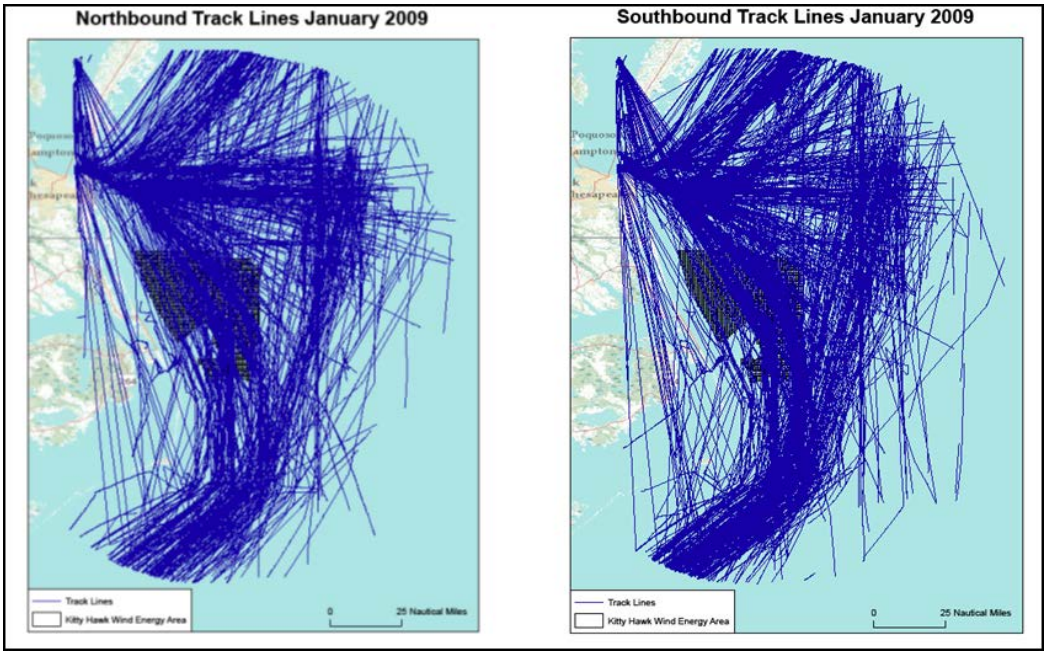

Figure 7: Comparison of January 2009 Tracklines for Northbound and Southbound Vessels

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The separation of vessel traffic was determined to be a result of a series of U. S. Navy structures located in the area resulting in vessels avoiding the towers by 4 nm on average.

Figure 8: Navy Air Combat Maneuvering Range Towers Located in the Kitty Hawk Call Area

When looking at "vessel type," there was a clear distinction between Tugs and Towing and Deep Draft vessels. The Tugs and Towing vessels clearly favored inshore routes along the coast. Below is a density plot comparison of the routes for Tugs and Towing and Cargo vessel types using 2010 AIS data. [2] Although not shown, other Deep Draft vessel types followed similar routes to Cargo vessels.

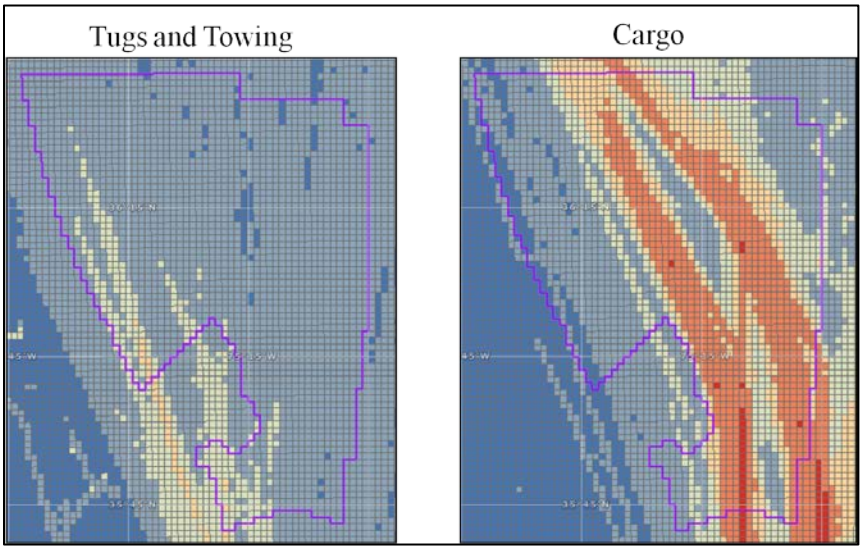

Figure 9: Comparison of Tugs and Towing Routes with Cargo Vessel Routes

[2] Cargo vessels make up the majority of Deep Draft vessels and therefore are a good surrogate for determining routes.

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To explore routes based on draft, trackline plots were created for the month of January 2009 for vessels less than 20 feet, 20-29 feet, and 30-39 feet. Based on this small sample size, there does appear to be some correlation between draft and the distance offshore vessels transit with shallower draft vessels favoring near shore routes.

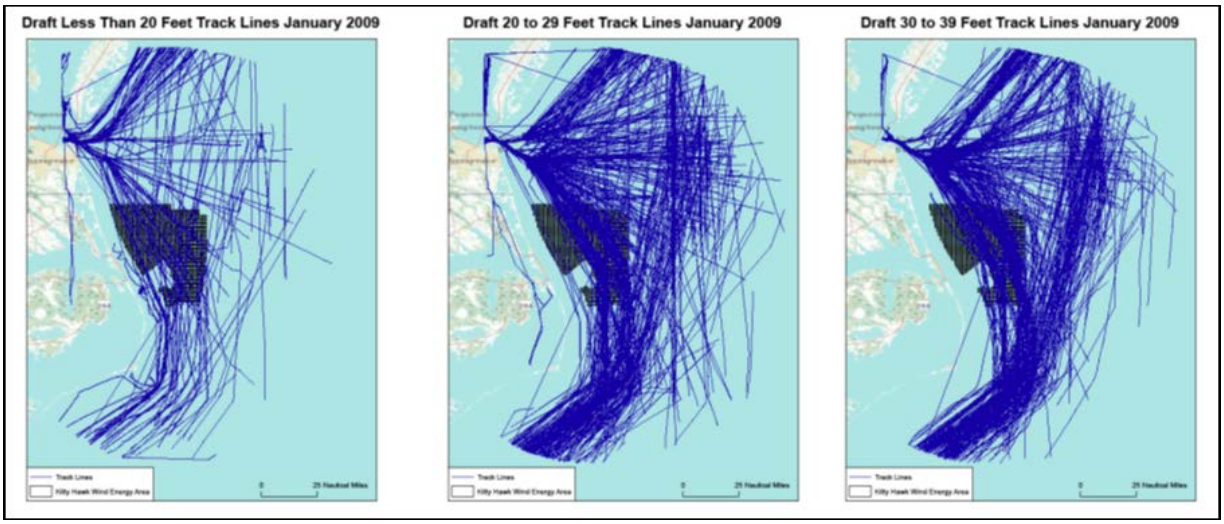

Figure 10: Comparison of January 2009 Tracklines for Vessels of Varying Drafts

2. Wilmington-East Call Area. Call Area Wilmington-East offshore NC contains approximately 51 whole OCS blocks and 15 partial blocks. The boundary begins 13 miles from the shore and extends roughly 28 nm seaward. It extends from east to west approximately 21 nm. The entire area is approximately 432 nm^2.

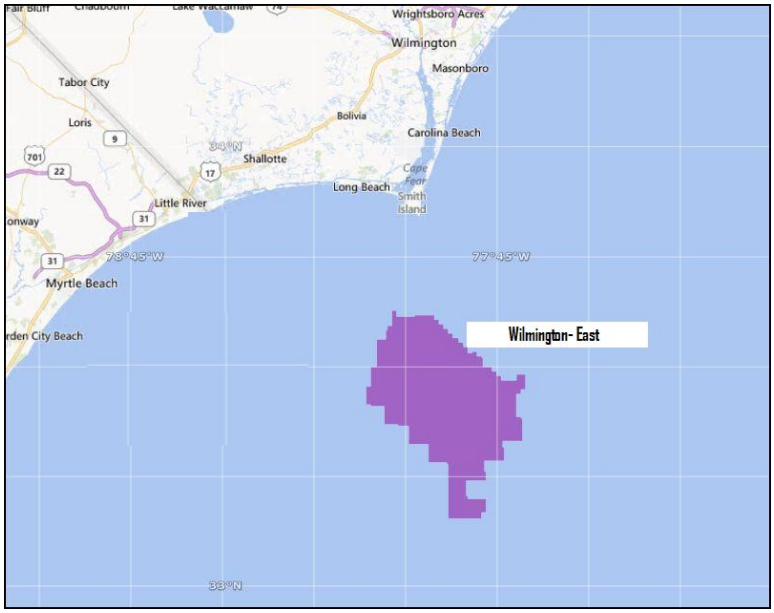

Figure 11: Call Area Wilmington East

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An analysis of the number and types of vessel transits through the Wilmington-East Call Area was conducted using one year of AIS data from 2009. The analysis found that there were 4,119 unique transits by 1,008 individual vessels. The majority of the transits were conducted by cargo vessels accounting for 64% of the total, followed by tankers at 11%, Tugs and Towing at 10%, and. The remaining 14% of transits were by vessels of other categories or unknown.

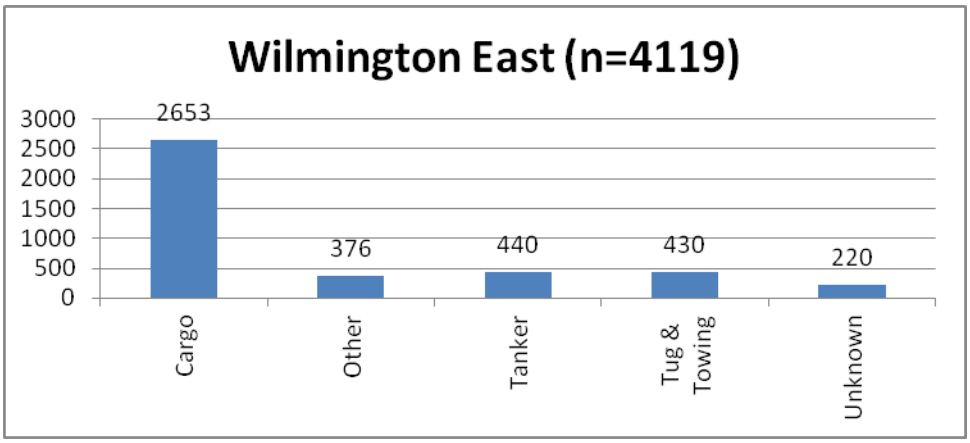

Figure 12: Vessel Transits through Call Area Wilmington East by Vessel Type

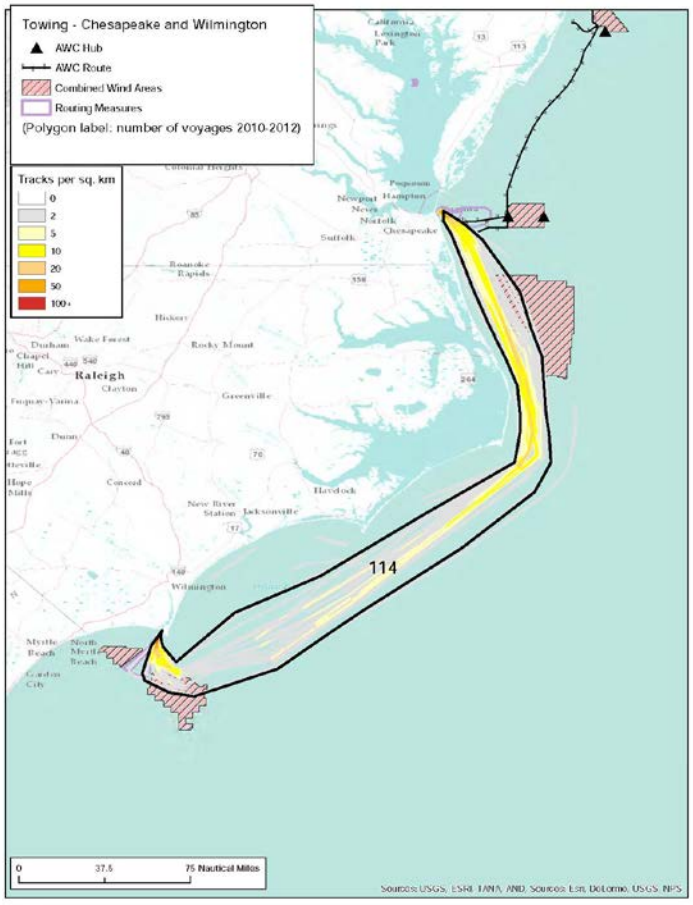

Figure 13: Towing Vessel Transits From Chesapeake to Wilmington

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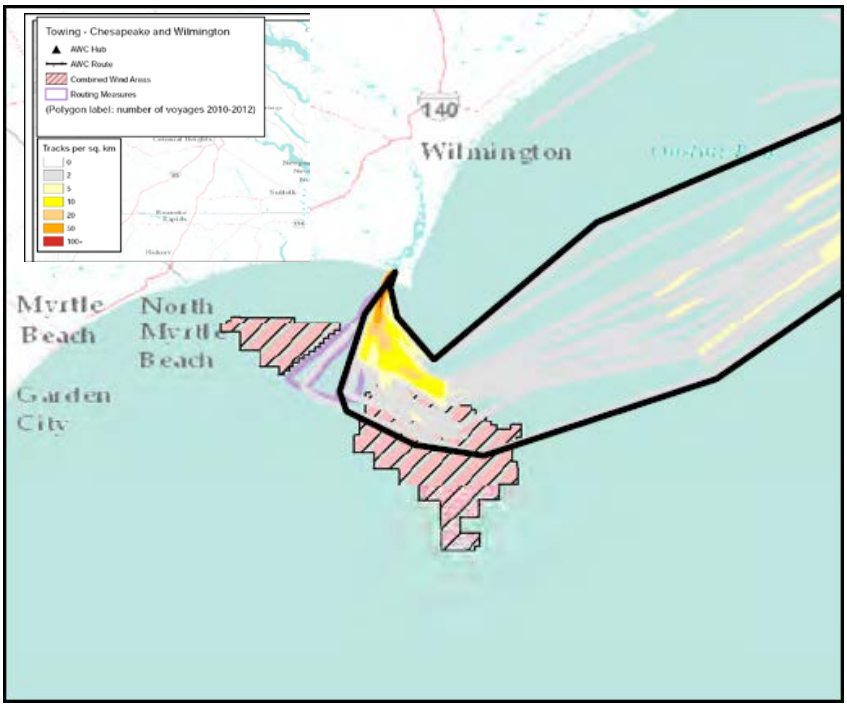

Figure 14: Towing Vessel Transits From Chesapeake to Wilmington

3. Wilmington-West Call Area. Call Area Wilmington-West offshore North Carolina contains approximately six whole OCS blocks and nine partial blocks. The boundary begins seven miles from the shore and extends roughly 11 nm seaward. It extends from east to west approximately 15 nm. The entire area is approximately 103 nm^2.

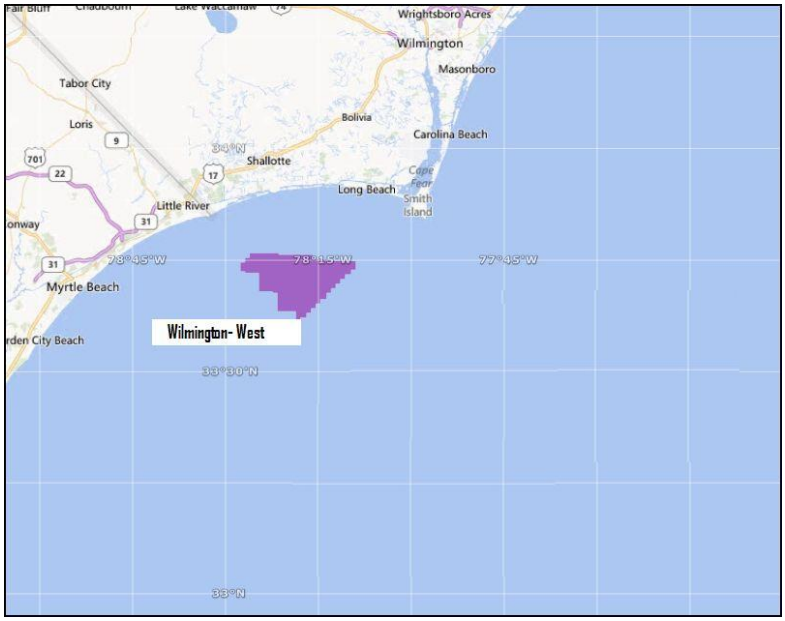

Figure 15: Call Area Wilmington West

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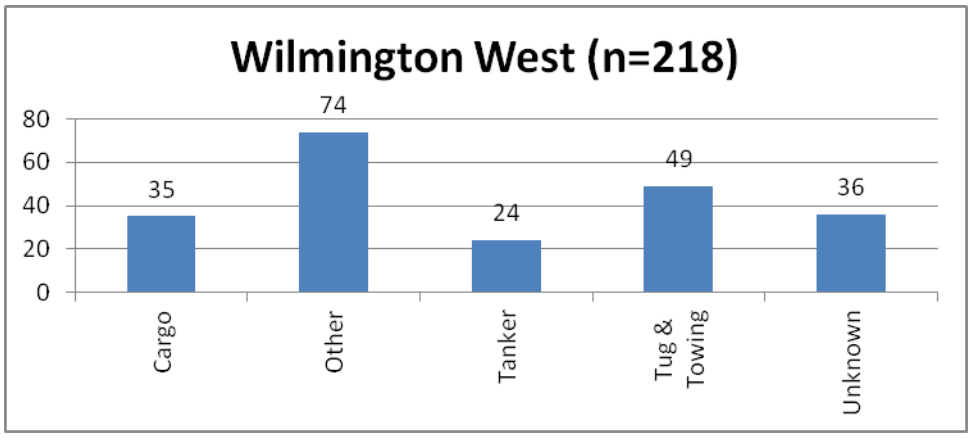

Figure 16: Vessel Transits through Call Area Wilmington West by Vessel Type

An analysis of the number and types of vessel transits through the Wilmington-West Call Area was conducted using one year of AIS data from 2009. The analysis found that there were 218 unique transits by 87 individual vessels. The Other and Unknown categories of vessels accounted for 50% of the total, followed by Tugs and Towing at 22%, Cargo at 16% and Tankers at 11%.

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E. Development of Options for the Kitty Hawk Area Identification Process

Recognizing that vessel traffic had not been addressed in the Kitty Hawk Call Area, BOEM established a Maritime Working Group to explore potential areas that could be developed within the Call Area that would not result in unacceptable impacts to navigation. All options were either in or adjacent to established routes and would impact navigational safety. This effort had trouble gaining traction and was ultimately unsuccessful in identifying suitable areas.

The BOEM and USCG then collaboratively developed a series of five options, all subsets of the original Call area. The options were derived using references, such as distance from shore (12 nm and 15 nm), and also the edges of established routes. There are two clear deep draft routes; one going to the West of the Navy structures and one to the East. These routes will be referred to as Deep Draft West (DDW) and Deep Draft East (DDE) to simplify the descriptions of the options.

By providing concrete alternatives for the maritime industry to contemplate, the hope was that it would stimulate comments that would assist in defining a suitable area. The five options were disseminated with a questionnaire to the maritime industry by the USCG Fifth District Commander. An example of the questionnaire and the summary of the responses are included as Enclosure (1). The majority of responses objected to the development of any areas initially determined to be "Red" by the Coast Guard.

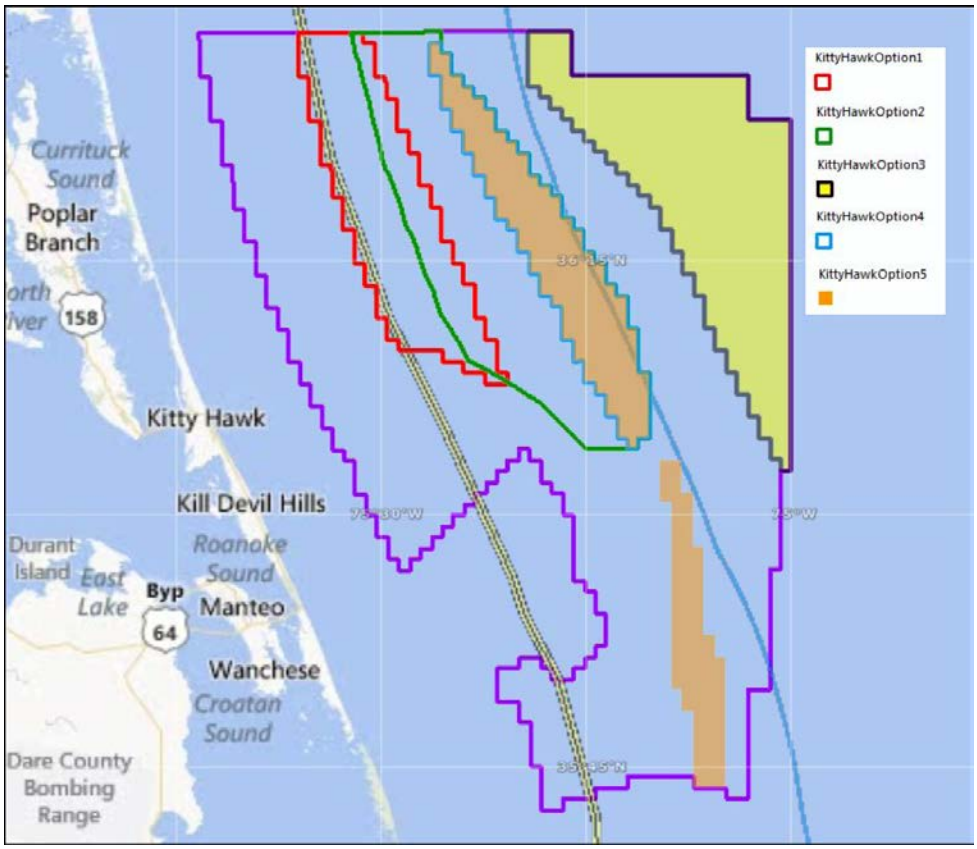

Figure 17: The Five Kitty Hawk Options

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F. Kitty Hawk Analysis of Alternatives

1. Kitty Hawk Option 1 - Near Shore Option.

The Western edge of Option 1, shown in Blue, begins at the Northern extent of the Call Area and parallels the shoreline following the 12 nm line for approximately 20 nm. The Eastern edge of the area goes out to the Western edge of DDW, approximately 17 nm offshore. The entire area encompasses approximately 100 square nm.

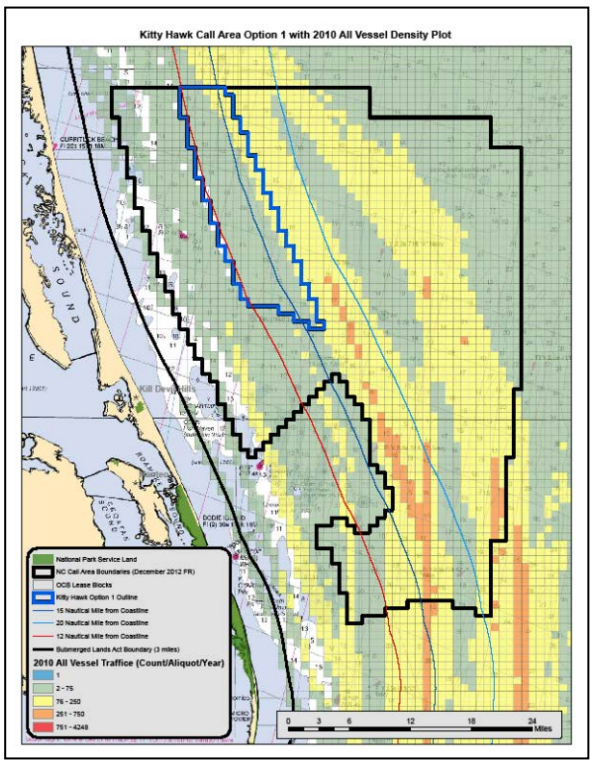

Figure 28: Kitty Hawk Option 1 with 2010 All Vessel Density Plot

Option 1 attempted to maintain both of the existing deep draft routes, but would eliminate a near shore tug/tow route that transits at a distance of 12 nm to 15 nm from shore. This option would compress near shore traffic into a much smaller area with obstructions to both sides limiting the available sea room in the event of an emergency or during meeting, crossing and overtaking situations with other vessels. In addition, it would force some traffic further offshore into deep draft routes and subject them to higher sea states than they would have experienced otherwise. Once a vessel chose to go inshore or offshore, they would be committed to that route for the length of the area (20 + nm). The American Waterways Operators (AWO) stipulated the need for a coastwise shipping route that extends out at least 15 nm from shore.[3]

An analysis of 2010 AIS data showed there were a total of 850 vessel transits through the Option 1 area. A breakdown of vessel transits by vessel type is shown to the right.

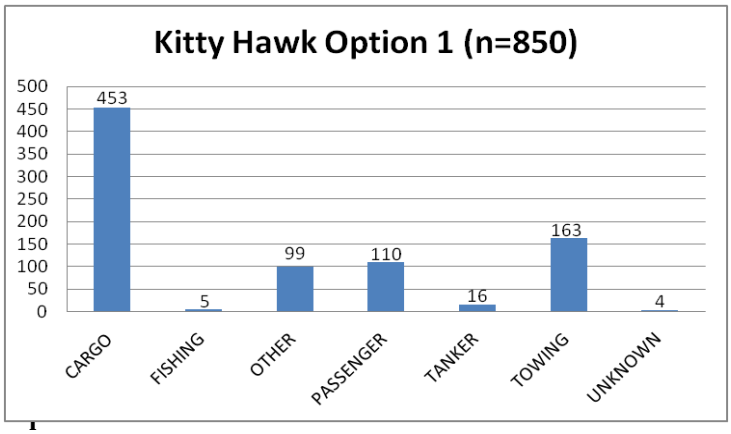

Figure 39: Breakdown of Vessel Transits Through Kitty Hawk Option 1 by Vessel Type

[3] AWO letter to BOEM dated 31 MAY 2013 and AWO letter to USCG dated 31 OCT 2013.

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2. Kitty Hawk Option 2 - Mid Shore Option.

The Western edge of Option 2, shown in Green, begins at the Northern extent of the Call Area and parallels the shoreline following the 15 nm line for approximately 25 nm. The area extends Eastward to the Eastern edge of DDW and is approximately 8 nm wide on average. The entire area encompasses approximately 200 square nm.

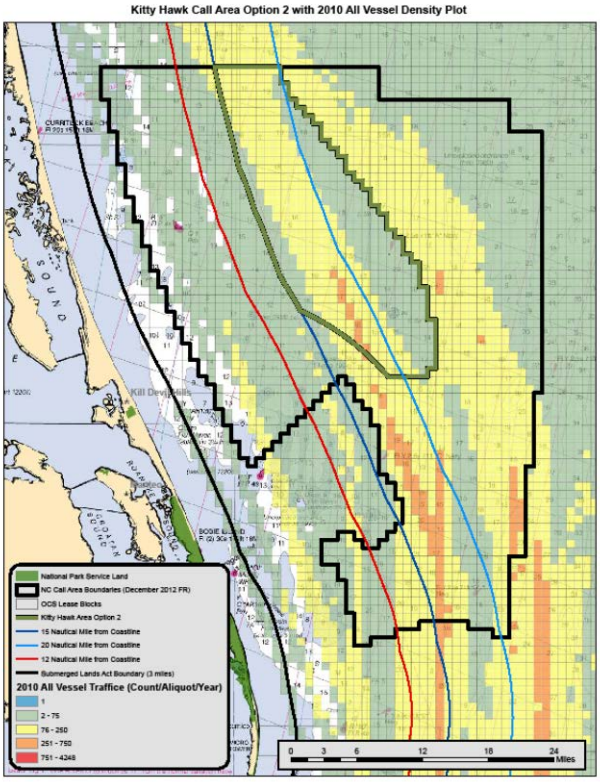

Figure 40: Kitty Hawk Option 2 with 2010 All Vessel Density Plot

With the Western edge along the 15 nm line, it accounts for the alongshore routes used by towing vessels, but eliminates the Western deep draft route. This option would displace a significant amount of deep draft traffic to the East. By providing an additional three miles to the width of the inshore route, sea room is much less of an issue in the event of an emergency or during meeting, crossing, and overtaking situations with other vessels. Option 2 also reinforces the natural segregation of smaller, slower vessels and large deep draft vessels moving at higher speeds.

An analysis of 2010 AIS data showed there were a total of 1931 vessel transits through the Option 2 area. A breakdown of vessel transits by vessel type is shown to the right.

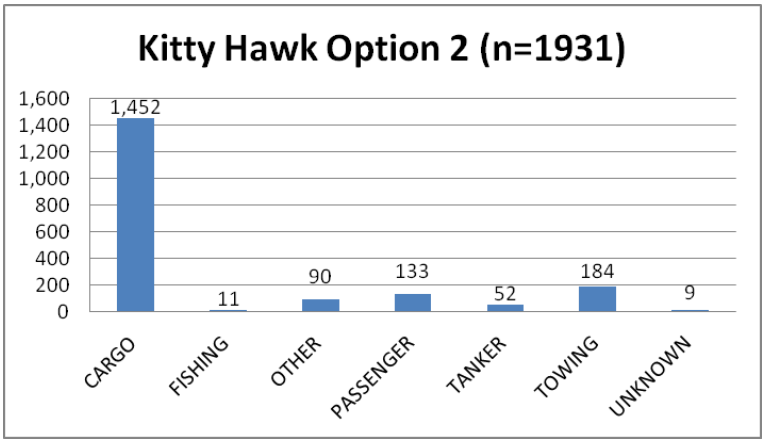

Figure 25: Breakdown of Vessel Transits Through Kitty Hawk Option 2 By Vessel Type

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3. Kitty Hawk Option 3 - Far Shore Option.

Option 3, shown in Light Blue, is the Northeast corner of the Call Area with the Western edge along the Eastern edge of DDE. The entire area encompasses approximately 170 square nm.

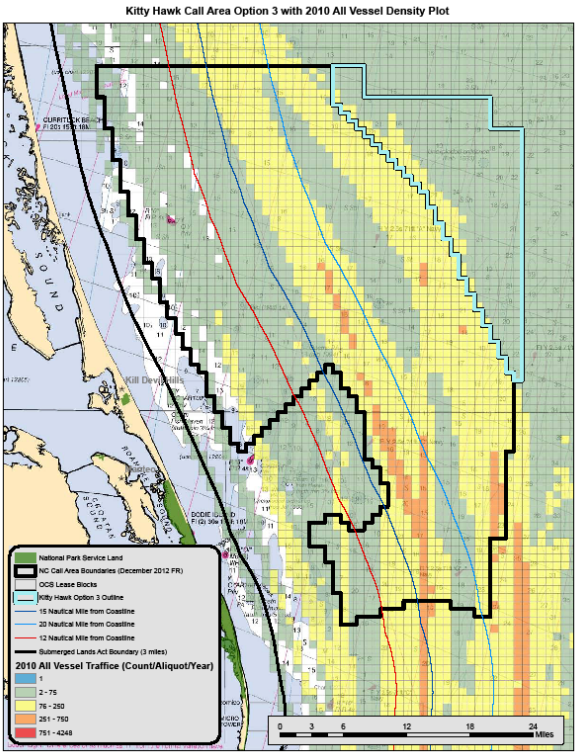

Figure 22: Kitty Hawk Option 3 with 2010 All Vessel Density Plot

Option 3 attempted to avoid all of the high density routes through the Call Area, although a significant number of vessels still transit through the area[4] in a more spread out manner. Although they were opposed to any development within the Kitty Hawk area, a few of the industry comments stated that Option 3 was the least objectionable.

An analysis of 2010 AIS data showed there were a total of 1671 vessel transits through the Option 3 area. A breakdown of vessel transits by vessel type is shown to the right.

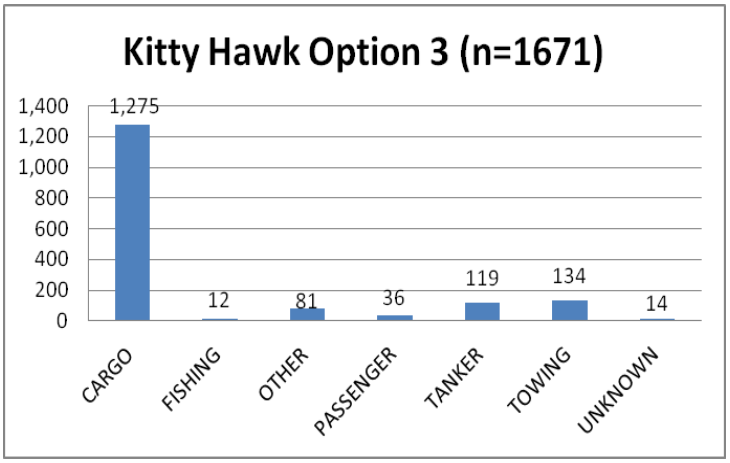

Figure 23: Breakdown of Vessel Transits Through Kitty Hawk Option 3 By Vessel Type

[4] Option 3 had 1,671 transits in 2010, which is 23% of the total transits through the Kitty Hawk Call Area.

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4. Kitty Hawk Option 4 - Island Option.

The Western edge of Option 4, shown in Purple, begins at the Northern extent of the Call Area and parallels the shoreline following the 20 nm line for approximately 27 nm. The area extends Eastward to the Western edge of DDE and is approximately three nm wide on average. The entire area encompasses approximately 75 square nm.

Option 4 included an area of relatively lower density as a result of shipping avoiding a Navy structure located in the Northern half of the Call Area. This option would likely result in two-way deep draft traffic on both sides of this area. Due to the presence of a wind farm, vessels would be expected to provide additional separation distance when transiting along the wind farm, which would force the DDW route further West and closer to the tug/barge and shallow draft vessels routes. There would also be a convergence of routes at both ends of the wind farm, which could increase risk of collision due to potential obstructed views and radar interference as vessels clear the wind farm; however, AIS would mitigate the risk to some extent when all vessels are so equipped.

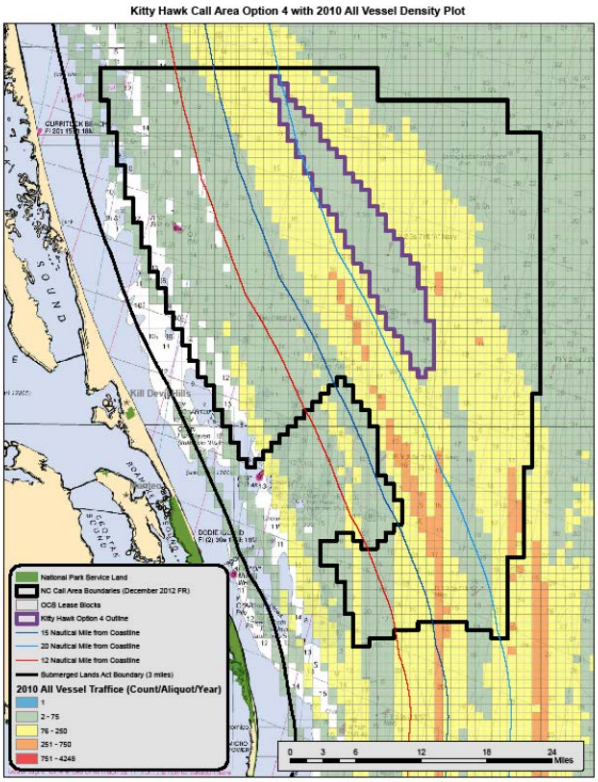

Figure 24: Kitty Hawk Option 4 with 2010 All Vessel Density Plot

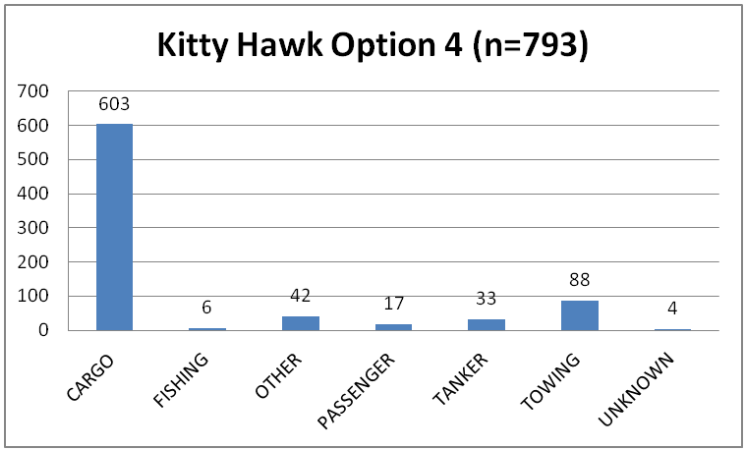

Figure 25: Breakdown of Vessel Transits Through Kitty Hawk Option 4 By Vessel Type

An analysis of 2010 AIS data showed there were a total of 793 vessel transits through the Option 4 area. A breakdown of vessel transits by vessel type is shown to the left.

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5. Kitty Hawk Option 5 - Extended Island Option.

Option 5 is an extension of Option 4 by adding a second area of lower density traffic where vessels are avoiding a Navy structure in the southern portion of the Call Area. The added area is roughly 20 nm long and 2 nm wide on average. The combined areas encompass approximately 115 square nm.

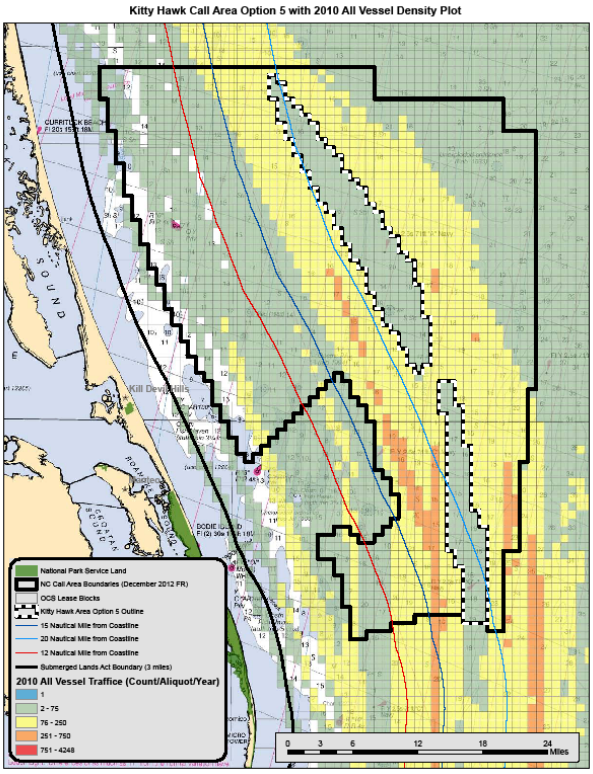

Figure 26: Kitty Hawk Option 5 with 2010 All Vessel Density Plot

Option 5 would result in similar traffic patterns as Option 4, with two way traffic transiting along both sides of the areas. There is currently traffic that transits between the two areas that would be expected to continue and further complicate vessel interactions due to obstructed views and radar interference. With the length of the combined areas being almost 50 nm the "exposure" to the risk posed by the fixed obstructions (wind farm) is significantly increased.

An analysis of 2010 AIS data showed there were a total of 1,484 vessel transits through the Option 5 area. A breakdown of vessel transits by vessel type is shown to the right.

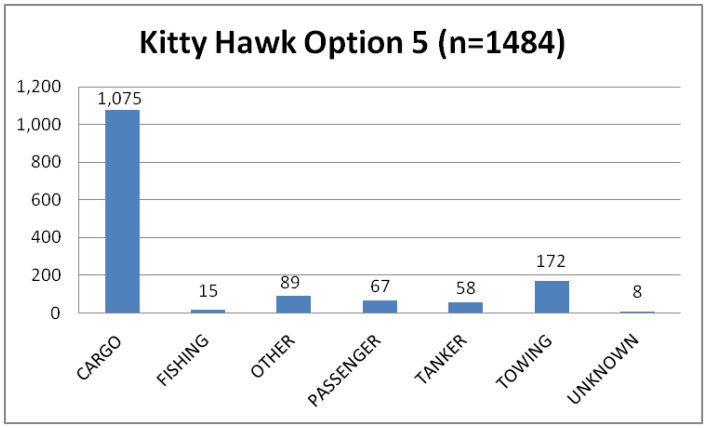

Figure 27: Breakdown of Vessel Transits Through Kitty Hawk Option 5 By Vessel Type

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6. Consideration of Future Trends in Shipping.

In a 2012 U.S. Army Corps of Engineers (USACE) report on the Panama Canal, the container vessel fleet on the East Coast is projected to double both in the number and size of vessels.[5] As the numbers of vessels increase, the density along these routes will also increase. Larger vessels will require additional sea room to maneuver. Routes that may be suitable in size for shipping today may not be suitable in the future. Routes bounded on both sides with obstructions will be even less desirable from a navigational safety standpoint.

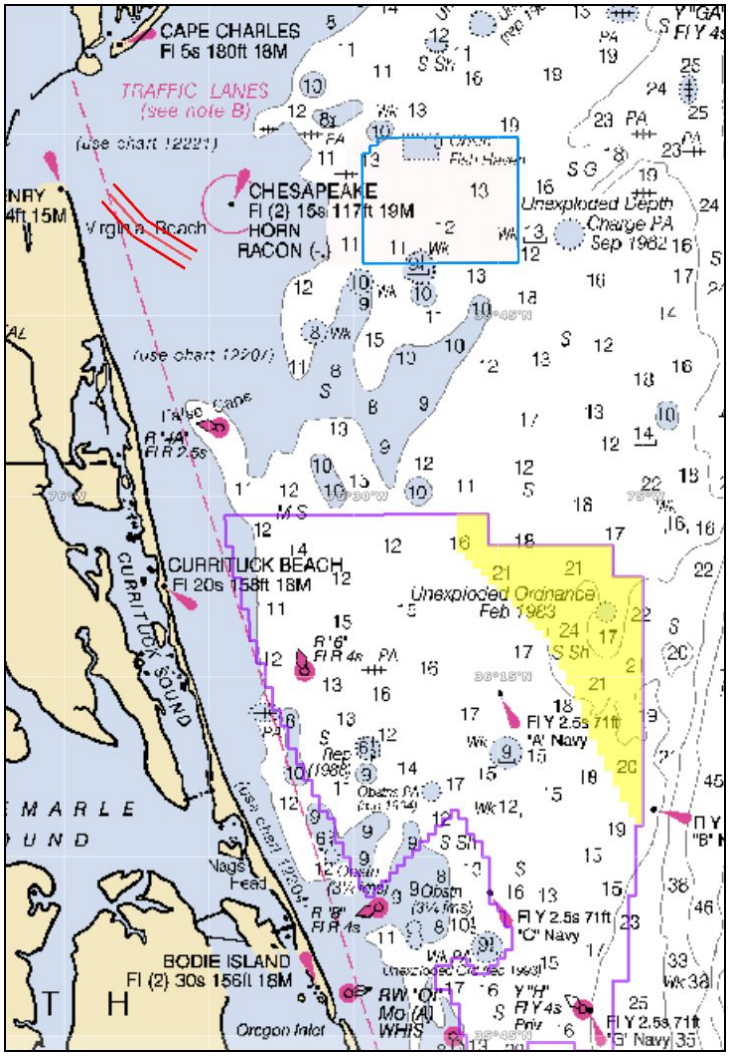

Figure 68: Approaches to Chesapeake Bay Entrance Showing Kitty Hawk Option 3 in Yellow With a Nautical Chart Background

Larger vessels with increased draft will require additional under keel clearance particularly during heavy sea states. Larger vessels will likely shift routes further offshore with deeper water and fewer obstructions. As routes shift to deeper water, the area in Option 3 may become the preferred route for the approaches to Chesapeake Bay despite relatively lower densities of existing vessel traffic.[6]

[5] Derived from Table 3, pg. 19 of "U.S. Port and Inland Waterways Modernization Preparing for *Post-Panamax* Vessels," USACE, Institute for Water Resources, 20 June 2012.

[6] Comments to this effect were submitted by both Wayne Huebschman and Bill Broadley.

APPENDIX VI

G. Comparison of Kitty Hawk Options

Option 1 provides an attractive area for wind development, but the impacts to vessels requiring routes closer to shore would be unacceptable. The compression of the route would not provide the necessary flexibility for tug/barge units to adjust their routes based on varying sea states and weather conditions. Vessels that may prefer a near shore route, but cannot navigate safely in the remaining area, will be forced further offshore and into the routes used by deep draft vessels.

Option 2 provides an additional 3 nm of width to the near shore route; it has the benefit of greater segregation between inshore and offshore routes; and, this option simplifies the interactions of vessel meeting, crossing, and overtaking situations by reducing the number of routes. Option 2 also provides the largest area for offshore wind that should support multiple phases of development well into the future.

Option 3 was the "least objectionable" for many of the maritime interests that commented on the five options, based primarily on the lower traffic densities. As vessels get larger, the area contained in Option 3 will be more important as a route for deeper draft vessels. Option 3 may force these deeper draft vessels and other vessels wishing to keep all obstructions inshore of their route to transit much further offshore than current routes. Although developers responding to the Call for Information and Nominations expressed an interest in this area, the viability compared to other Options is likely far less due to depth of water and distance from shore.

Options 4 and 5 capitalize on areas of lower density, created as a result of vessels avoiding the Navy structures located between the Eastern and Western deep draft routes. Both of these options will likely push routes further East and West to provide additional separation from the wind farms, thus compressing the Western deep draft route. Deep draft vessels who choose to continue using the Western route will have fixed structures to one side, and slower moving tug/barge units and shoals on the other. Vessel interactions at the ends of the wind farms and also between the two farms would be more complicated due to obstructed views and radar interference as the routes converge or cross. The length of the combined areas almost doubles the distance that vessel routes are exposed to fixed obstruction hazards over other options. A summary of the pros and cons of the five options are listed in Table 1.

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	Pros	Cons
Option 1	• Preserves deep draft routes • Viable for wind development due to: ➢ Proximity to shore, ➢ Shallower water ➢ Sufficient size	• Large impacts to tug/barge and smaller vessels: ➢ Severely constricts the inshore route ➢ Displaces some vessels further offshore with higher sea states ➢ Results in mixing of vessel traffic
Option 2	• Allows room for existing inshore routes • Further segregates inshore and offshore routes • Accounts for future trends in shipping by preserving the deepest water approaches to Chesapeake Bay • Largest area for wind development within parameters for existing technology	• Completely eliminates the Western deep draft route with largest displacement of traffic further offshore (primarily an economic impact)
Option 3	• Lower traffic densities • Preserves existing routes	• Eliminates deepest water approach to Chesapeake Bay (important as vessels get larger) • Largest displacement of routes offshore if keeping seaward of all obstructions is desired • Less attractive for wind development: ➢ Water depths exceed current technology for wind development ➢ Furthest distance to shore
Option 4	• Utilizes areas of lower density • Preserves (but impacts) existing routes	• Results in more complicated vessel interactions: ➢ Mixing of traffic ➢ Western deep draft route further restricted with obstructions on both sides • Less total area than other areas • Less room for growth of wind development (unless you move towards shore, which would be the same as Option 2)
Option 5	• Adds additional area for wind development over Option 4	• The same vessel interaction concerns of Option 4, further complicated by having two areas with vessels transiting in between • Greater distance of exposure to fixed obstructions along the vessel routes • Non-continuous area for development

Table 1: Comparison of Kitty Hawk Options

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H. Recommendations

There are many competing interests when it comes to the siting of renewable energy projects. The primary focus of this analysis was to evaluate impacts to navigation. Impacts to navigation fall into two categories: 1) navigational safety impacts; and, 2) economic impacts. There are numerous factors that can affect navigational safety including but not limited to density of traffic, sea room, mixing of vessel types, introduction of fixed hazards, impacts to visibility, impacts to navigational equipment, sea states and complexity of ship interactions. Economic impacts are primarily due to an increase in time and/or distance. Although economic impacts are important to consider, the priority of this analysis was to minimize navigational safety impacts while identifying suitable areas for wind energy development.

Of the options evaluated, Options 2 and 3 appear to have the lowest impacts to navigational safety based on current navigational patterns. Either option taken independently may be suitable for additional study. Option 3 will result in the least displacement of vessel traffic from existing routes, but may be the least suitable for wind energy development due to increased depths and distance from shore. Option 2 has the advantages of simplifying traffic patterns while providing the most suitable routes for larger vessels in the future and also provides the largest area for development of wind energy within current parameters.

Since BOEM intends to move forward with area identification without seeking additional public comment,[7] Option 2 is recommended as the best balance of navigational safety with wind energy development. It is also recommended Option 2 be modified to shift the area 1 nm further to the east to provide for additional sea room for the inshore route, with minimal additional displacement of vessel routes.

[7] Email correspondence between Will Waskes (BOEM) and George Detweiler (CG-NAV-3) dated 07JAN14.

APPENDIX VI

Enclosure (1): Maritime Industry Stakeholder Questionnaire and Consolidated North Carolina Stakeholder Responses to USCG Fifth District Commander Questionnaire

U.S. Department of Homeland Security
United States Coast Guard

Commander
United States Coast Guard
Fifth Coast Guard District

431 Crawford Street, Rm. 100
Portsmouth, VA 23704-5004
Staff Symbol: dpw
Phone: (757) 398-6230
Fax: (757) 398-6349

25 September 2013

Allied Transportation Co.
PO Box 717
Norfolk, Va 23501

NORTH CAROLINA OFFSHORE WIND ENERGY AREA QUESTIONNAIRE

The Coast Guard is a cooperating agency with Bureau of Ocean Energy Management (BOEM) in the offshore renewable energy initiatives process under the provisions of National Environmental Policy Act, and is responsible for ensuring the safety of navigation under the Ports and Waterways Safety Act of 1972.

The Coast Guard, through the BOEM North Carolina Renewable Energy State Task Force, advises BOEM of navigational concerns related to its wind energy call areas. In the Coast Guard's initial evaluation of BOEM's proposed wind energy areas offshore North Carolina, I expressed concern with the potential impacts to navigation safety in the proposed areas to BOEM based upon the existing vessel traffic data available (Federal Register, Vol. 77, No. 240). At that time, no other alternatives were readily apparent. These wind energy call areas may be viewed online at http://www.boem.gov/uploadedFiles/BOEM/Renewable_Energy_Program/State_Activities/NC_Call_Area_Names.pdf.

Through additional analysis of vessel traffic data and discussion with the marine industry, and in the interest of developing wind energy areas that minimize navigation risk, BOEM and the Coast Guard have worked collaboratively to identify six additional alternatives for consideration. These alternatives may be viewed online at: http://www.uscg.mil/lantarea/ACPARS/NC-options.asp.

In order to ensure all waterway users' navigational concerns are considered in the evaluation of these alternatives, I ask that you review each option and provide responses to the enclosed questions. Responses may be sent via email to ACPARS@uscg.mil, or mailed to Commander (dpw), Fifth Coast Guard District, 439 Crawford St, Rm. 100, Portsmouth, VA 23704-5004, Attn: Mr. John Walters. In your response, please clearly denote the specific option and question number. Responses received by October 31 will be shared with BOEM and incorporated into the Coast Guard's Atlantic Coast Port Access Route Study.

Sincerely,

STEVEN H. RATTI
Rear Admiral, U.S. Coast Guard
Commander, Fifth Coast Guard District

Enclosure: North Carolina Offshore Wind Energy Area Questionnaire

APPENDIX VI

1. World Shipping Council, Douglas Schneider, Vice President

"The World Shipping Council (WSC) is a non-profit trade association that represents over twenty-nine liner shipping companies that carry approximately 90 percent of U.S. international containerized trade. Our member lines operate ships that regularly transit along the coast of North Carolina and pass through the proposed wind energy areas carrying U.S. import and export cargo. We appreciate your invitation to comment on the North Carolina Offshore Wind Energy Questionnaire. In addition to our comments below on the questionnaire's options, we also wish to draw your attention to our January 28, 2013 comments (see attachment) to the Bureau of Ocean Energy Management (BOEM) on the proposed wind energy lease areas off North Carolina.

Comments on Kitty Hawk Options

The questionnaire invites comments on whether the placement of fixed wind turbines in five sub-sections of the Kitty Hawk wind energy area would pose any navigational safety or economic impacts. We note that the Coast Guard conducted a "Red-Yellow-Green" (R-Y-G) navigational safety risk assessment of the Kitty Hawk Area that considered, among other things, the number and types of vessels passing through a given block during a given period of time. That assessment then applied risk management criteria to classify blocks within proposed wind energy areas based on the safety risks they posed. The Coast Guard's own R-Y-G analysis of the Kitty Hawk area (shown below) concluded that virtually all of this area should be deemed "red" and excluded from consideration because wind farm development in these areas would pose "very high" to "high" risk. We concur with the Coast Guard's R-Y-G analysis of the Kitty Hawk Area and do not find any of the five options proposed for the Kitty Hawk area to be compatible with safe and efficient commercial navigation. Each of the five options would introduce fixed wind farms into areas of already moderate to high vessel traffic, which would force traffic in a given area to move into other traffic zones thus increasing the navigational safety risks there. We therefore continue to urge BOEM and the Coast Guard to exclude from further consideration any full or partial blocks that the Coast Guard deemed "red" in that analysis. We note that the Coast Guard's R-Y-G analysis classified some sections of the Kitty Hawk Area as yellow or green. We recommend that BOEM and the Coast Guard consider only these yellow or green areas for future wind farm development.

Comments on Wilmington East Option

The questionnaire invites comments on whether the placement of wind farms in the revised Wilmington East area would pose navigational safety or economic impacts. We note that a significant portion of the revised Wilmington East area (comprising approximately the bottom half of the revised area) was deemed "red" in the Coast Guard's R-Y-G assessment of 3 Wilmington East. As already mentioned, the Coast Guard's classification of an area as "red" means that wind farm development in that area could posed high to very high navigational safety risk. We therefore recommend that BOEM and the Coast Guard consider only the yellow and green areas within the revised Wilmington East area for future wind farm development. Thank you for your consideration of these comments."

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2. American Waterways Operators, John Harms, Manager, Atlantic Region

"The American Waterways Operators is the national trade association for the U.S. tugboat, towboat, and barge industry. Our industry's 4,000 tugboats and towboats and more than 27,000 barges safely and efficiently move more than 800 million tons of cargo each year in the domestic commerce of the United States. These vessels transport more than 60 percent of U.S. export grain, energy sources such as coal and petroleum, and other bulk commodities that are the building blocks of the U.S. economy. We appreciate the opportunity to respond to your September 25 letter presenting proposed alternatives for North Carolina Offshore Wind Energy Areas (WEAs). AWO members are proud to be part of an industry that is the safest, most fuel efficient, and has the smallest carbon footprint of any transportation mode. AWO members also have a deep commitment to safety, having adopted in 1994 the Responsible Carrier Program, a code of safe marine practices and environmental stewardship that is a condition of AWO membership. Our commitment to environmental stewardship includes support of developing alternative energy resources. However, it is critical that such projects not produce navigational hazards that put vessels and their crews at risk, or obstruct the movement of goods on which the nation's economy depends.

With this same philosophy, we have evaluated and considered the North Carolina Offshore WEAs, and we do not find any of the five options proposed for a Kitty Hawk Call Area to be compatible with safe and efficient commercial navigation. To different extents, each of the five options would introduce new navigational hazards and impede waterborne commerce. This position is supported by Coast Guard's own "R-Y-G" determination for the Kitty Hawk WEA (copy enclosed), which found that constructing alternative energy projects on any of the five proposed options would pose a "high" risk to mariners. Each option for the Kitty Hawk WEA negatively impacts towing vessel safety by eliminating the safest near-shore or off-shore vessel route, or by disrupting established deep draft vessel routes that will displace towing vessels from their safest routes. AWO is particularly concerned about the impacts these options would have on established routes for traditional tugboats and barges operating close to shore. Traditional tugboats pulling barges on a hawser must operate close to shore where seas are calmer and it is easier to reach a port of refuge when severe weather develops unexpectedly. AWO's letter to BOEM dated May 31, 2013 (copy enclosed) discusses the need for a coastwise shipping route in this area that extends from the shore out to at least fifteen miles. This corridor width accounts for the presence of shoals and other navigations hazards, while allowing safe passing distance for tugboats towing barges headed in opposite directions. Several of the proposed options will also threaten the safety of mariners operating newer articulated tug and barge units (ATBs) that operate farther from shore. While these ATB units are capable of operating farther from shore in rougher waters, their relatively slow speed means that they generally avoid deep draft shipping lanes for safety reasons. In addition, many of these vessels approaching from the south are bound for ports in New York or New England, so their natural route is eastward of the traffic lanes into and out of the Port of Norfolk. Altering deep draft vessel routes in this area will cause vessel congestion that displaces towing vessels from their safest route and pushes them either farther offshore or into deep draft vessel routes. The options presented for the Kitty Hawk WEA would force ATBs to significantly alter course, enter into deep draft traffic lanes, or proceed so far offshore that sea conditions are significantly rougher due to the continental shelf and the Gulf Stream. AWO appreciates the Coast Guard's efforts to incorporate stakeholder input into the citing of offshore WEAs. Unfortunately, AWO is unable to endorse any of the proposed options

for the Kitty Hawk WEA due to their impacts on the safety of tugboat and barge operations. The region being considered for inclusion in the Kitty Hawk WEA poses unique safety concerns due to its location off the coast of Cape Hatteras and its proximity to the Port of Norfolk, a significant maritime destination for towing vessels and deep draft vessels alike. Given these unique safety concerns, AWO recommends that the Coast Guard convene a panel of maritime and navigation experts who can develop and recommend alternative options for the safe citing of the Kitty Hawk WEA. AWO believes that this kind of constructive and expert input is especially important given the absence of a completed Atlantic Coast Port Access Route Study. The towing industry appreciates the Coast Guard's efforts to safeguard the lives of mariners and preserve existing vessel routes. We believe the right next step in this effort is to convene a roundtable of industry stakeholders to propose safe alternatives for WEAs for the region. Thank you for the opportunity to comment. AWO would be pleased to answer any questions or provide further information that is needed."

3. Virginia Port Authority, Heather Wood, Vice President, Government Affairs

"Thank you for the opportunity to comment on the North Carolina Offshore Wind Energy Area (WEA) Questionnaire and the five alternatives for the Kitty Hawk WEA developed by the Coast Guard and the Bureau of Ocean Energy Management (BOEM). As stated in our letter dated January 30, 2012, we support the development of off-shore wind energy along the Atlantic Coast and the USCG's on-going evaluation of the existing shipping routes with regard to competing uses. In addition, we appreciate the BOEM's and the Coast Guard's continued efforts to include the maritime industry in the WEA evaluation process. In response to the questionnaire and the five alternatives, the Virginia Port Authority (VPA) respectfully offers the following for consideration. The Port of Virginia is presently the third largest East Coast container port handling approximate 2.1 million TEU's in 2012. Combined total tonnage through the Port of Virginia (Hampton Roads) exceeds 54 million annually, making the Port a critical asset to our nation's supply chain. Within the Commonwealth of Virginia alone, the direct impact of the Port's operations are estimated at over $1.9 billion in revenue, $566 million in employee compensation, and over 10,000 jobs. We believe that the development of offshore wind areas off the East Coast will provide a much needed source of alternative power and result in additional economic benefits to the Commonwealth and the Nation. However, development of the WEA area proposed for the Kitty Hawk, NC region must not come at the expense of navigational safety or the efficient transport of goods along the East Coast. After evaluating the proposed alternatives and discussing the options with port stakeholders, we do not believe any of the five options proposed for the Kitty Hawk WEA are compatible with safe and efficient commercial navigation. This opinion is supported by the Coast Guard's R-Y-G determination in the Atlantic Coast Port Access Route Study (ACPARS). Accordingly, we respectfully encourage BOEM to follow to the ACPARS determination and consider removing the Kitty Hawk area as a potential lease option. We appreciate the Coast Guard's and BOEM's efforts in this matter. We are confident the Coast Guard's research and outreach efforts will provide for a well informed decision. Should you have any questions or if we can provide further comments, please contact me at (757) 683-2152 or at hwood@portofvirginia.com. Thank you for the opportunity to comment."

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4. Virginia Maritime Association, David White, Vice President

"The Virginia Maritime Association (VMA) is the trade association representing over 400 businesses directly and indirectly engaged in the flow of waterborne commerce through the ports of Virginia. Virginia's ports are a critical link in our nation's supply chain, supporting domestic and international commerce. An economic impact study published by the College of William and Mary revealed the Port of Virginia produced or facilitated total Virginia economic activity of $13.S Billion in employee compensation to 345,000 Virginia employees (9% of Virginia resident employment) and in excess of $41.1 Billion in total revenues. As the "Voice of the Port", representing these interests, we write in response to your letter dated September 25 presenting several proposed alternatives for North Carolina Offshore Wind Energy Areas (WEA). The VMA has demonstrated our support for the development of offshore wind projects and worked cooperatively with responsible government agencies to establish a Virginia Offshore WEA that will be compatible with the current and future needs of commercial navigation. With the same philosophy, we have evaluated and considered the NC Offshore WEA's and we do not find any of the five options proposed for a Kitty Hawk Call Area to be compatible with safe and efficient commercial navigation. To different extents, each of the five options would introduce new navigational hazards and impede waterborne commerce. This position is supported by Coast Guard's own "R-Y-G" determination for the Kitty Hawk WEA (copy enclosed). If a portion of the proposed Kitty Hawk Call Area must be allocated for offshore wind development, some subset of "Kitty Hawk Option 3: Far-Shore Option" consistent with Coast Guard's "R-Y-G" determination would be the least objectionable. It would pose the least risk from a safety perspective and interfere least with current and future shipping routes. We find options 1 and 2 wholly unacceptable because of their impacts to existing tug/tow and deep draft shipping routes. Options 4 and 5 are also unacceptable because they would present new hazards in the center of existing shipping routes and fail to account for the future removal of the Navy structures creating the current areas of avoidance; thereby eliminating those areas of avoidance. The VMA appreciates the efforts of the Coast Guard in this matter. We are confident the Coast Guard's research and outreach efforts will allow for a well informed decision. Please call us if there are any questions or additional information we can provide."

5. Chamber of Shipping of America, Kathy Metcalf, Director, Maritime Affairs

"The Chamber of Shipping of America (CSA) appreciates the opportunity to comment on the North Carolina Offshore Wind Energy Area Questionnaire and in particular the 5 options under consideration for the Kitty Hawk call area. CSA represents 35 U.S. based companies that own, operate or charter oceangoing tankers, container ships, tug/barge units and other merchant vessels engaged in both the domestic and international trades. The Chamber also represents other entities that maintain a commercial interest in the operation of such oceangoing vessels. CSA members operate vessels on voyages to/from US ports including vessels running coastwise and to/from ports on the Atlantic Coast of the United States and will be impacted by decisions taken with respect to siting of offshore wind energy areas. CSA has been engaged from the outset with discussions relating to the National Ocean Policy and issues surrounding marine spatial planning. Further, we appreciate the fact that shipping is but one of the many users of our marine resources and discussions among these many users and the US government agencies with jurisdiction over marine resources are critical to minimize, if not eliminate potential spatial

conflicts. We support the development of offshore wind projects as part of our national energy policy but only within the context of assuring that the current levels of navigational safety are maintained.

With these fundamental concepts in mind, we have evaluated and generally agree with the R-Y-G analyses approach as utilized in the first phase recommendations in the ACPARS interim report. In addition we have reviewed the North Carolina Offshore Wind Energy Area Questionnaire developed by your office. We offer the following points and recommendations which we respectfully request you consider as this process moves forward. These points are based on graphical depictions for Options 1 through 5 in the questionnaire as compared to a slide in the presentation made at the 2 August 2012 BOEM North Carolina Renewable Energy Task Force Meeting (Slide 14 entitled "R-Y-G Determination for North Carolina Area 5") which reproduces the R-Y-G analysis found in the ACPARS Interim Report at Appendix VII, Figure 27.

- CSA cannot support any of the five options proposed for the Kitty Hawk Call area as none are compatible with the fundamental need for safe and efficient marine navigation as evidenced by the fact that each of the 5 proposed options includes areas assessed as "red" in the ACPARS Interim Report.
- In our view, each of the 5 options proposed would introduce new navigational safety issues based on traffic density patterns in the subject area.
- CSA could support an option that incorporates the green and yellow areas as contained in the ACPARS Interim Report at Appendix VII, Figure 27 and would recommend that this "option 6" be included in future discussions.
- Of the five options proposed, Option 3 (Far Shore Option) would be the least objectionable as it would result in the least dislocation of vessels from current routes though the area; however, as noted above, the red areas should be removed from this option to align with the recommendations in the ACPARS Interim Report.
- Options 1 and 2 are unacceptable in that they represent the most significant and severe impacts to current vessel routes in the area due to the dislocation of tug/barge routes (Option 1) and deep sea shipping southbound routes (Option 2),
- Options 4 and 5 are equally unacceptable because of the impacts to deep sea shipping routes in that they could introduce new hazards in the center of existing routes not unlike a situation where obstructions were allowed to be placed in the separation zones of existing traffic separation schemes.

CSA appreciates the opportunity to provide comments to the USCG on these very significant issues and supports the continuation of the informed data based approach the USCG is using to resolve these issues in a manner that fully accounts for the need for safe navigation in this and other areas under consideration for offshore wind energy development. Please contact us if you have any questions or require any additional information on the points made above."

6. Maryland Port Administration, Shawn Kiernan

"The Maryland Port Administration (MPA) has reviewed the North Carolina Wind Energy Area (WEA) Kitty Hawk Call Area Options referenced in a letter dated September 25, 2013. We respectfully provide the following comments. The MPA does not directly influence decisions made by shipping lines as to routing and operations, however siting of structures which may incur additional transit time for ships or result in unsafe navigation conditions are of concern to

MPA. The MPA continues to encourage the safe and adequate separation between existing shipping routes and future installed commercial wind turbines. In review of each of the proposed Kitty Hawk WEA area options (near-shore, mid-shore, far-shore, island and extended island), we have identified the continued potential for impacts to existing inbound and outbound navigation routes of commercial shipping from the Chesapeake Bay. While the MPA recognizes that the questionnaire is specific to the review of the Kitty Hawk options, we nevertheless recommend that the total, cumulative effect of all offshore turbine installation on existing commercial navigation, in and around the other lease areas, continue to be considered as part of any future assessments. Thank you for considering our comments. The MPA appreciate our continued coordination with the US Coast Guard to safely site offshore wind energy operations along the East Coast."

7. Express Marine Inc., Wayne Huebschman

"My name is Wayne Huebschman. I am the Port Captain for Express Marine Inc. I have held a License as a Merchant Marine Officer (tugboat operator & 500T Master) since 1978. The majority of my seatime has been coastal towing and pushing in the Northeast. I have been following the wind energy proposals from the beginning. The thing that troubled me the most was the way things were being handled before the ACPARS slowed things down a bit. Before then many states were making plans without looking at the navigation/commerce issue with the respect it deserves. The proposal from Maryland was a prime example of a complete disaster, due to placement issues. Another issue is the lack of understanding as to how commerce moves up and down the coast and why vessels do what they do. As I said, the ACPARS has slowed the process down a bit and is asking questions concerning these very issues. Now I am seeing a little more unity and groups are forming to look at the East Coast of the U.S. as regions rather than individual states, MARCO etc. The potential to reroute commerce is very real and very troubling for quite a few different reasons. For example just look what will have to change by rerouting a vessel 12 miles out of its regular route. Let's say it's a smaller tugboat that is twin screw towing a barge with a length overall of 1800 + feet long, and burns a total of 190 gallons an hour and is moving along at 10 knots. If you consider transit both ways we are talking about 24nm added to the trip. To cover that it will take the tug 2.4 more hours to make the trip. That means he will burn 456 gallons additional fuel for the trip and will emit exhaust gases for 2 hours and 24 minutes longer. Keep in mind this is only one transit and a unit of this configuration could make many trips in a year's time. This is only one vessel and one that is in the minimal part of the problem. If you start looking at large container ships that make regular runs, all the numbers will be exponentially larger and much more of a problem. Now we can add fishing vessels, military vessels etc. Tugs and tows are getting bigger all the time with ATB'S (articulated tug/barge units) that act as one unit and are much less weather sensitive, being able to move in more direct routes for fuel and emissions savings.

Also a problem for vessels at sea is the biggest unknown factor, weather. Smaller vessels are much more susceptible to it than larger ones. With easterly weather it is better to stay farther to the east than normal to avoid shallow water and bottom configuration for a smoother ride. In westerly weather, it is better to stay closer to the west to lessen the fetch of wind. All of these considerations depend on where you are on the coast and the configuration of the coastline. The best trip offers many options for making it as good as possible with all the right choices and planning. Traditionally we have not had to worry about much in the way of stationary

obstructions, however now it will become another factor as to how vessels move along their routes, and ultimately remove some very important options for trip changes that can only be done "on the fly" due to changing conditions. We also need to realize that whatever routes we are talking about there has to be enough room for it to be a "two way street."

It looks as though the wind farms are being considered in the areas where vessel traffic is at a minimum and that's good, however we must realize that vessels will not be moving right along the edges of these areas for many different reasons. Most Masters require a CPA (closest point of approach) of at least 2 miles and in times of limited visibility, and in proximity of other vessels, that will increase considerably. So even though we consider these areas to be acceptable to put wind generators, in reality an area considered to be right on the edge of navigation may not be so after all. This is evident by the size of the area of separation caused by the navy offshore structures, a relatively small obstruction compared to an area full of wind turbines. The larger the area of obstructions, the more area is needed to avoid it. Short sea shipping is becoming ever more important as time goes forward. The major roads today are operating at the maximum right now and will not stand much more commerce before they will be jammed every day. I can only see marine commerce increasing in the future with the new larger Panama Canal and Marad's highway program increasing in scope. Having said that, I am not by any means opposed to wind energy and realize it will be in our future, but we must look at this closely when considering where to put our windfarms.

Looking over the 5 options for the Kitty Hawk area here are my thoughts:

- Kitty Hawk option 1 – Ok, but I would like to see more room for the inshore route.
- Kitty Hawk option 2 – My first choice - it still leaves room inshore, gives the most area for wind turbines, incorporates the Navy Platforms and isn't too far offshore. My thinking is that as time goes on, larger units will be coming online and would use the offshore area proposed in option 3 to leave all shallow water and obstructions to the West. By increasing the amount of deep draft vessels to the East of everything I don't think that will affect navigational safety any more or less than the other options, once the paradigm shift is established.
- Kitty Hawk option 3 – I think this option, although clear of present traffic, would be right in the area that modern commerce would most likely chose to leave all the obstructions to the West anyway.
- Kitty Hawk option 4 – To me is too small and puts commerce in a position to choose to go around the outside anyway.
- Kitty Hawk option 5 – More of the same as option 4 but spread out over a much longer area. I would rather see a wind farm concentrated in one area as much as possible as opposed to spread out.

As far as answering the questions posed in the questionnaire, the first is, if the alternatives pose any navigational safety impacts. I feel the answer is the same for whatever option you look at. Anytime you put stationary objects in proximity with moving ones you have decreased the safety of both. Mariners will look at what's in front of them and act accordingly taking into account all the relative factors at the time, and limitations of their equipment. There is no one answer to a question that pertains to so many different aspects of a real time decision. The second question refers to economic impact. Again, the answer is the same for all options. Yes, there is going to be economic and environmental impact on all of the options. The relevance of an answer to my one

particular situation falls so short of the question that the answer may be misleading to the rest of the industry as a whole. The chance of an economic impact being so large and unknown to me is a very real possibility. The last problem we face is the fact that most of the people who can give relative answers in their particular field have jobs and can't devote the time needed to accurately answer questions and take time to try and figure out what, where and when to do so."

8. **The Vane Brothers Company, Captain Bill Meekins, Port Captain**

"I am responding to the Questionnaire for Offshore Wind Energy. It is in my professional opinion after spending many years transiting the areas of discussion Towing petroleum barges safely, that the best option would be #3 Far Offshore this would preserve the near shore transit for Tugs and Barges, and keep the deep draft routes intact. The other options I feel could cause navigation issues if an emergency would arise. For instance, Tug towing a barge and loses the Tow with a strong west wind. If the Barge is not recovered in time the Barge would be blown into the wind farm and would cause damage to the wind farm and the barge. As where if everything would be further Offshore as in option #3 this would not be an issue."

9. **Vane Line Bunkering Inc, Capt. Mason Keeter, General Manager Port of Hampton Roads**

"In response to the questionnaire regarding the North Carolina Offshore Wind Energy Area; Option# 3 in my opinion is the best of the 5 presented if one had to pick one. The option 3 area is less invasive and will allow towing vessels to use establish routes as well as some of the establish routes for deep draft vessels. Option #3 allows the towing vessels the option of running closer to shore to make use of the lee of the land and to escape the effects of the Gulf Stream when headed south or a little further off shore especially during periods of heavy weather; where the swells are a little more predictable and more spaced. Most importantly it allows more room to maneuver in the event of unforeseen problems. The coastal waters of the outer banks of North Carolina are unpredictable due to the close proximity to the Gulf Stream. The Gulf Stream is ever shifting and the weather is ever changing and so towing vessels and deep draft vessels not having to luxury of plotting the best course to protect the crews, equipment and environment in order to avoid a windmill farm is ludicrous. I have in depth reviewed all of the options that were presented and found Option #3 is the safer option for both towing and deep draft vessels."

10. **Captain Rodolph Mouchotte, Fleet Navigation Center, CMA Ships, CMA-CGM Group**

Kitty Hawk Option 1: Near-Shore Option

1. Does the alternative pose any navigational safety impacts? If so, please list and describe all impacts (quantify if possible). For CMA CGM no impact according ship's size and draft.
2. Does the alternative pose any economic impacts? If so, please list and describe all impacts (quantify if possible). For CMA CGM no impact, no change with actual passage planning.

Kitty Hawk Option 2: Mid-Shore Option

1. Does the alternative pose any navigational safety impacts? If so, please list and describe all impacts (quantify if possible). For CMA CGM poor impact result of East deep draft route suppression.
2. Does the alternative pose any economic impacts? If so, please list and describe all impacts (quantify if possible). For CMA CGM no impact, no change with actual passage planning.

3. This option would displace some deep draft traffic into the deep draft vessel traffic route east of the Navy structures, thereby increasing the number of transits through this route. Would the increase in the number of transits significantly affect navigational safety? For CMA CGM impact resulting of East deep draft route suppression will be poor.

Kitty Hawk Option 3: Far-Shore Option

1. Does the alternative pose any navigational safety impacts? If so, please list and describe all impacts (quantify if possible). For CMA CGM no impact, no change with actual passage planning.
2. Does the alternative pose any economic impacts? If so, please list and describe all impacts (quantify if possible). For CMA CGM no impact, no change with actual passage planning.
3. Although fewer vessels transit this area currently, is it important to preserve this area for potential future large vessel use instead of some of the existing, more direct routes? For CMA CGM no impact, no change with actual passage planning.

Kitty Hawk Option 4: Island Option

1. Does the alternative pose any navigational safety impacts? If so, please list and describe all impacts (quantify if possible). For CMA CGM no impact, no change with actual passage planning.
2. Does the alternative pose any economic impacts? If so, please list and describe all impacts (quantify if possible). For CMA CGM no impact, no change with actual passage planning.

Kitty Hawk Option 5: Extended Island Option

1. Does the alternative pose any navigational safety impacts? If so, please list and describe all impacts (quantify if possible). For CMA CGM no impact according ship's size and draft.
2. Does the alternative pose any economic impacts? If so, please list and describe all impacts (quantify if possible). For CMA CGM no impact, no change with actual passage planning.
3. Is an opening/corridor between the Northern and Southern extents of this option area needed or preferred? If so, how much distance is needed for this opening/corridor? For CMA CGM no need.

Wilmington-East Option

1. Does the alternative pose any navigational safety impacts? If so, please list and describe all impacts (quantify if possible). For CMA CGM no impact according ship's size and draft.
2. Does the alternative pose any economic impacts? If so, please list and describe all impacts (quantify if possible). For CMA CGM no impact according ship's size and draft.

11. Self Representing, Bill Broadly

"I agree with Wayne and his excellent letter. I also like the approach of using AIS traffic density to determine areas available to wind energy development. Options 1 and 2 are both OK provided they allow for an inside 1 mile wide "Two Way Route" similar to my proposal along the NJ coast. Option 3 with the offshore area will not be good. MY concern is that as ships get bigger with the new Panama Canal class of vessels that will be approaching the Chesapeake Bay Entrance from the South, they will most likely be wanting to approach using this area which is to the East in deeper and less obstructed waters which is through this area. Not only that but this area may be too deep for wind turbine development with present technology. Option 4 may be OK if allows for enough blocks to be viable for wind farm development. Option 5 has possibilities, however, it will make a long area. It is workable but with some routing measures

established. If there is going to be a wind turbine area using any of these proposals, I would suggest establishing appropriate routine measures in this areas. The reason for this is to channel marine traffic around the wind turbines obstructions. If possible, if I could have the Lat, Long, coordinates of the final proposal, then I could plot with some suggestions as to appropriate routing measures, etc. Also, I can write this up as a more formal letter if you desire."

12. Stephen Walker, Sallaum Lines USA

"In response to referenced questionnaire, please be advised that Sallaum Lines USA has reviewed the information provided and determined that there are no issues identified for which the company could provide comments which could benefit the studies. Although we cannot contribute in this matter, we appreciate any opportunity to assist in the future."

Appendix VII

Identification of Alongshore Towing Vessel and Major Deep Draft Routes

Appendix VII

Identification of Alongshore Towing Vessel and Major Deep Draft Routes

A. Purpose –

To identify traditional routes used for towing vessel operations along the Atlantic Coast and identify appropriately sized navigation safety corridors necessary for future safe navigation. Where conflicts exist with Wind Energy Areas (WEAs) or lease areas, alternate routes will be considered.

B. Background –

Through the Atlantic Coast Port Access Route Study (ACPARS), the ACPARS Workgroup (WG) has gathered data and information regarding traditional uses of the offshore waters along the Atlantic Coast. The WG has also used Automatic Identification System (AIS) data to display historic vessel routes. These routes have been analyzed in conjunction with proposed WEAs to assess conflicts. The WG found that significant conflict existed between towing vessels and identified WEAs. A review of public comments for each of the WEAs indicated that the conflicts had been identified from the beginning of the process. Initial displays of AIS data were plots of all vessel types and the relatively lower number of towing vessels were overshadowed by the significantly higher numbers of deep draft vessels. As AIS data was further divided into categories of vessel types, the resultant maps more clearly identified the historic routes of towing vessels and also clearly identified the conflicts with WEAs.

C. Discussion –

The WG developed draft Planning Guidelines, attached as enclosure (2), that were applied to towing operations along the Atlantic Coast by a Quality Action Team (QAT) sponsored by the Coast Guard and American Waterways Operators (AWO) Atlantic Region Quality Steering Committee (ARQSC). The report produced by the QAT is contained in enclosure (3).

The report identified navigation route boundaries which include the necessary sea space for towing operations to transit alongshore. In addition, navigation safety corridors were identified that included the necessary sea space between the navigation route and fixed structures to maneuver safely under emergency situations.

The result was an identification of a navigation route width of 5NM and a navigation safety corridor width of 9NM.

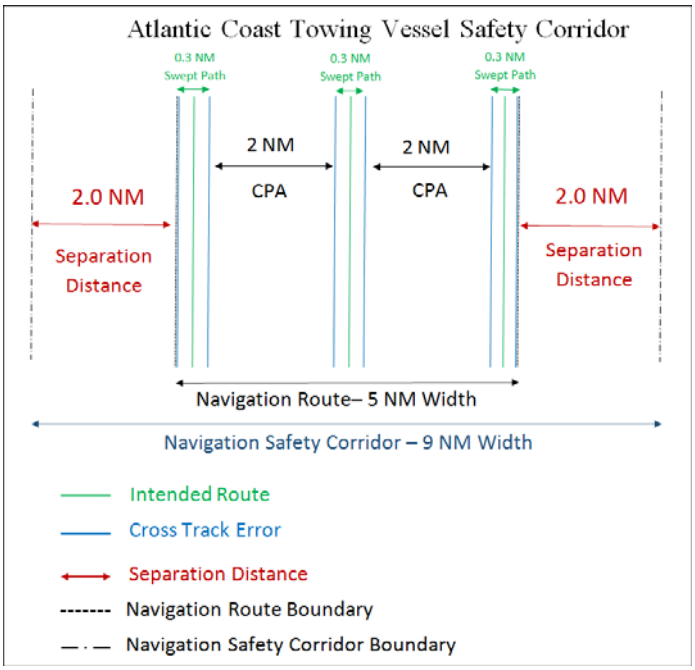

Figure 1- Atlantic Coast Towing Vessel Safety Corridor

Appendix VII

Using AIS to identify historic routes of towing vessel operations along the Atlantic Coast, the appropriate route and safety corridor widths were then applied.

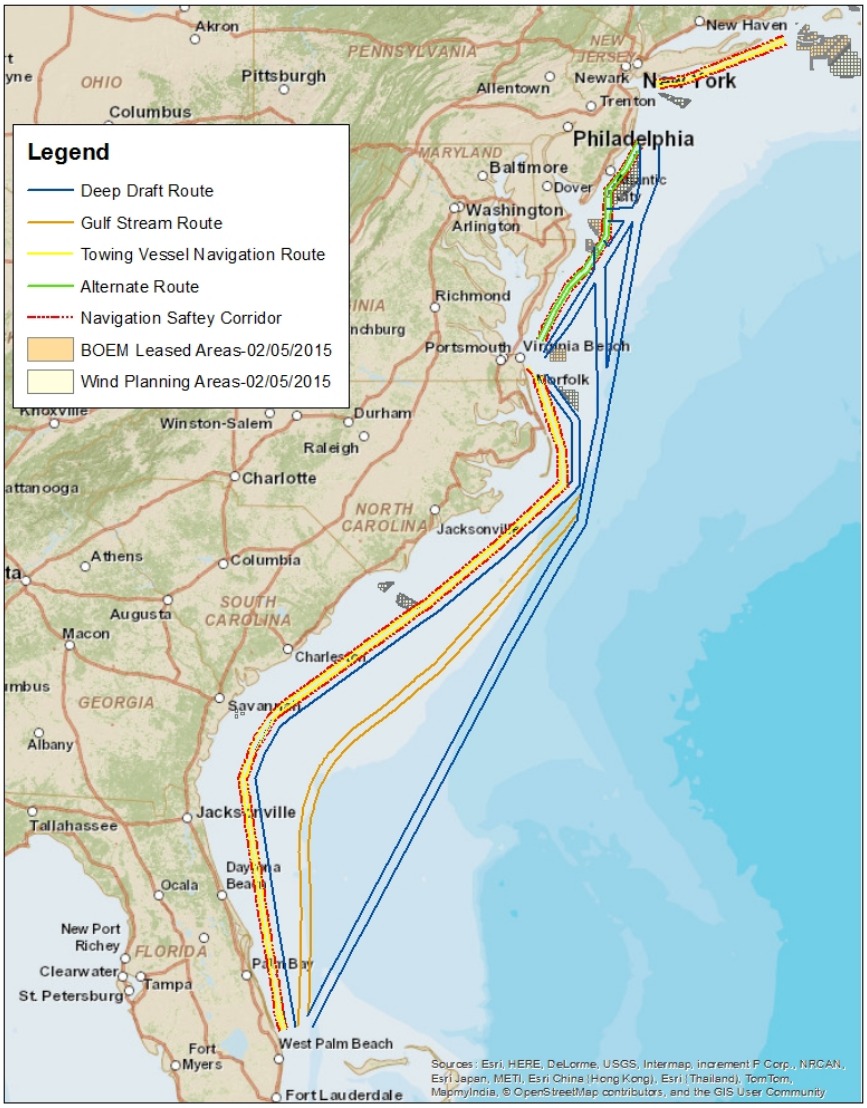

Figure 2- Towing Vessel and Deep Draft Corridors

Major deep draft routes were also identified using AIS, but a comparable effort to determine the appropriate width of corridors has not been undertaken. A safety corridor width of 10NM has been used which would equate to route size of 6NM with an additional separation of 2NM on either side.

Appendix VII

D. Towing Vessel Route in the Mid-Atlantic from New York/New Jersey to Chesapeake Bay –

Towing Vessel Density in the Mid-Atlantic is displayed in Figure 3. An examination of the routes indicated that the primary alongshore route followed the coastal buoy line

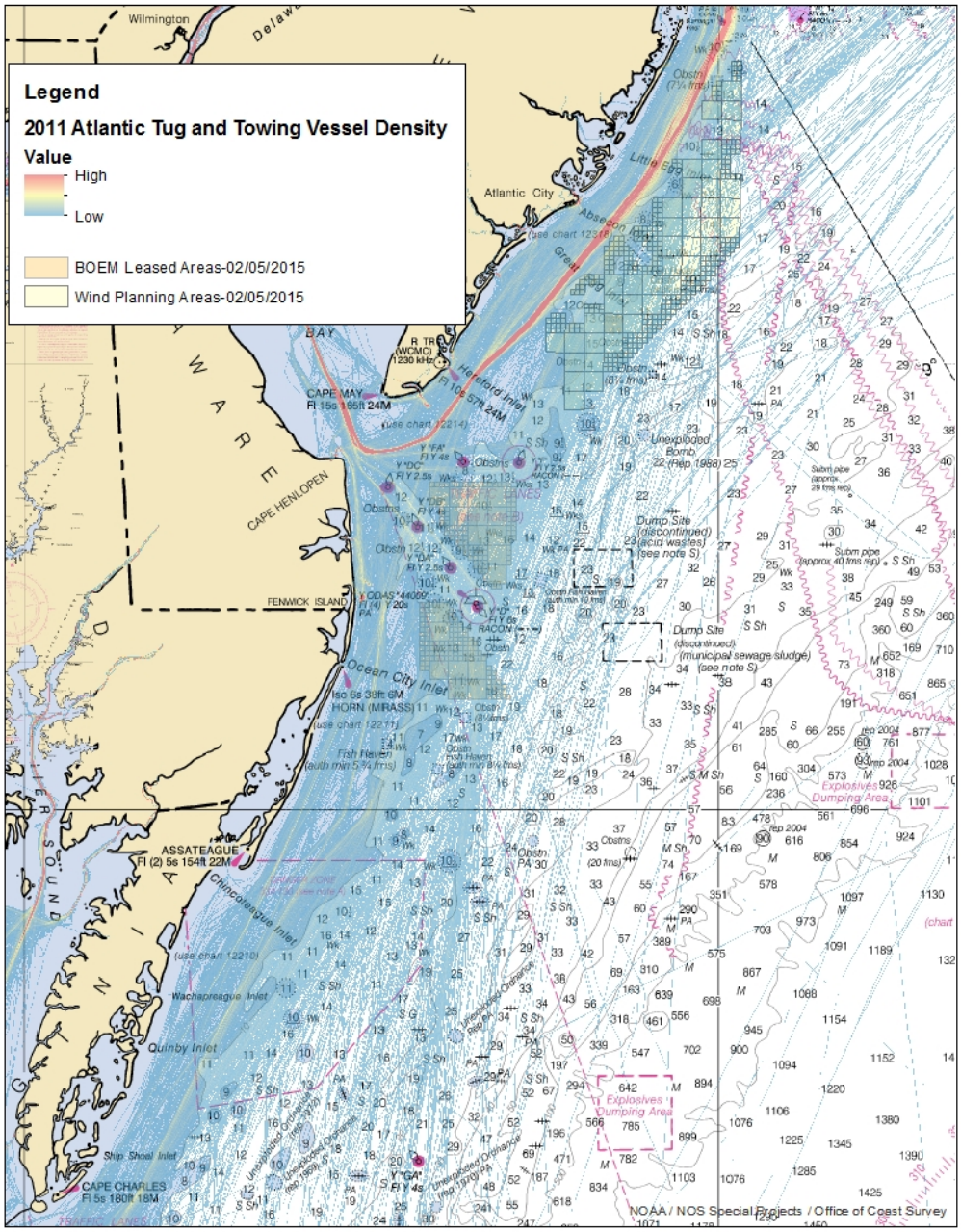

Figure 3- 2011Towing Vessel Density in the Mid-Atlantic

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. The line of coastal buoys was used as the inner boundary of the navigation route. A parallel boundary 5NM seaward of the buoy line formed the outer boundary of the towing vessel navigation route. Figure 4 below depicts the historic towing navigation route with a display of the 2011 towing vessel density.

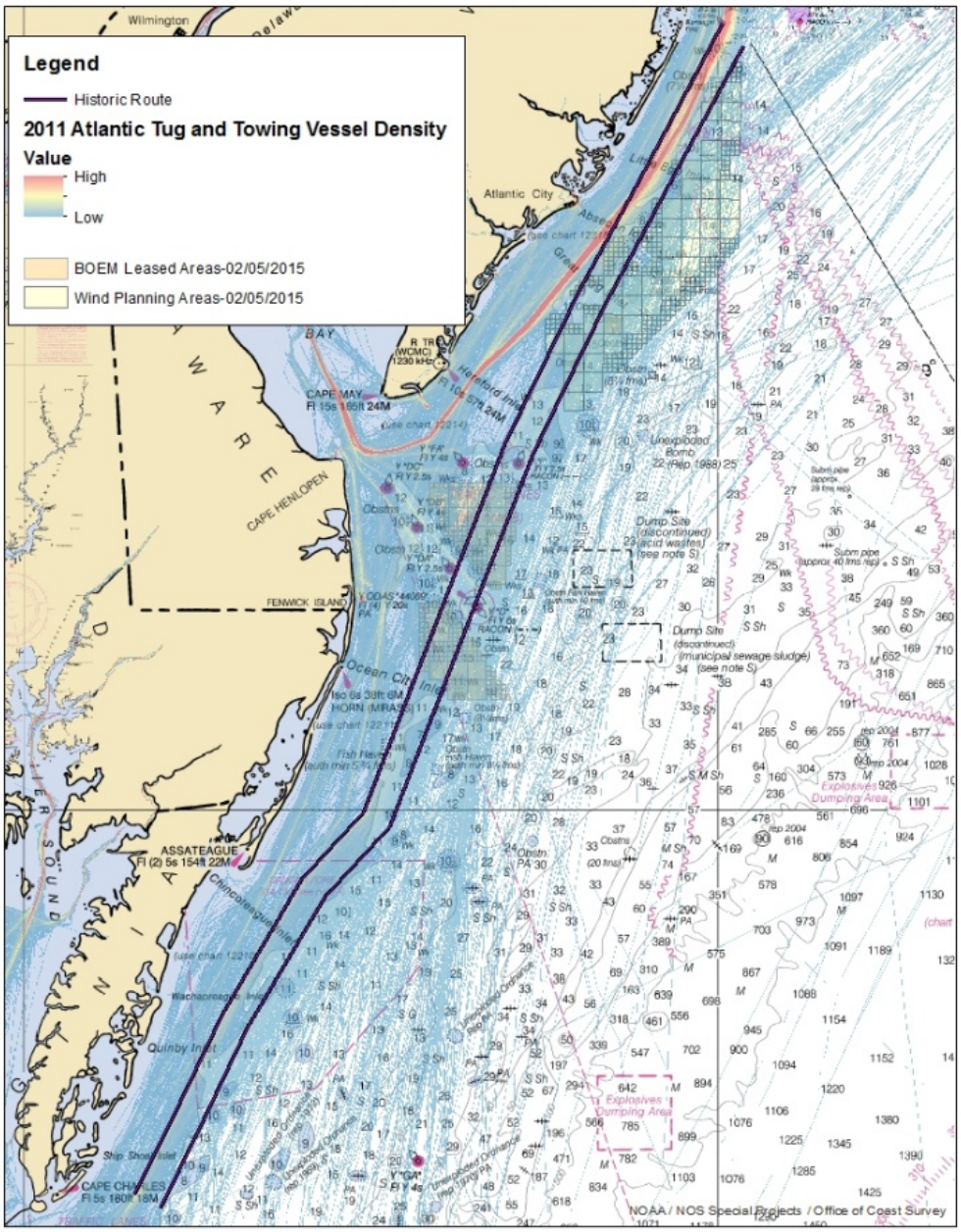

Figure 4 - Historic Towing Vessel Navigation Route with 2011 Tugs and Towing Vessel Density

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The towing vessel navigation safety corridor extends 2NM to either side of the navigation route as depicted in Figure 5 below along with the existing Wind Energy Areas and lease areas. As previously documented, existing towing vessel routes have significant conflicts with areas proposed for wind energy development. Previous recommendations to avoid impacting the areas resulted in displacing vessel routes approximately 35 NM from the coastline. Feedback from the towing industry indicated that distance offshore would not be suitable for many towing operations to operate safely.

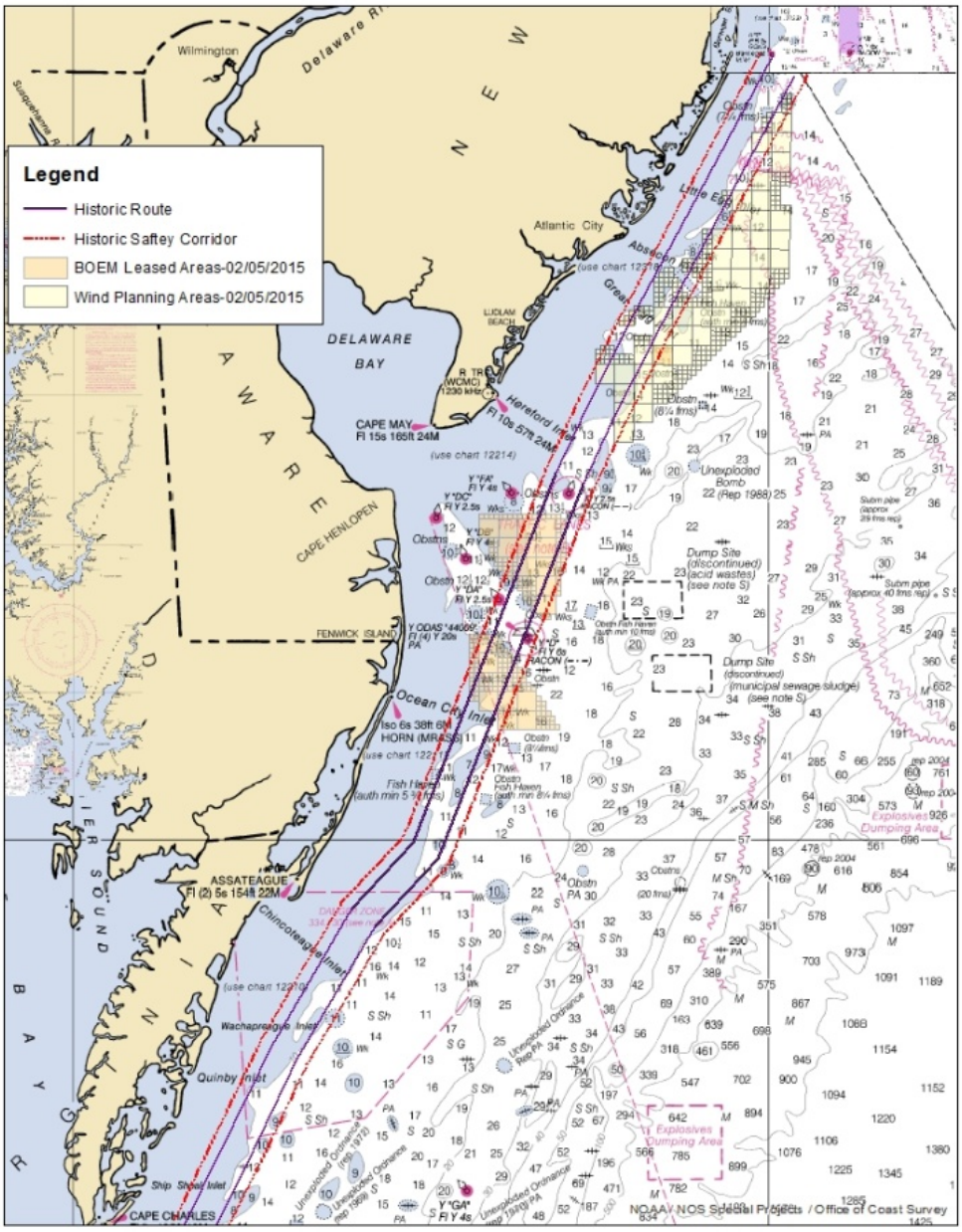

Figure 5- Towing Vessel Navigation Route and Navigation Safety Corridor

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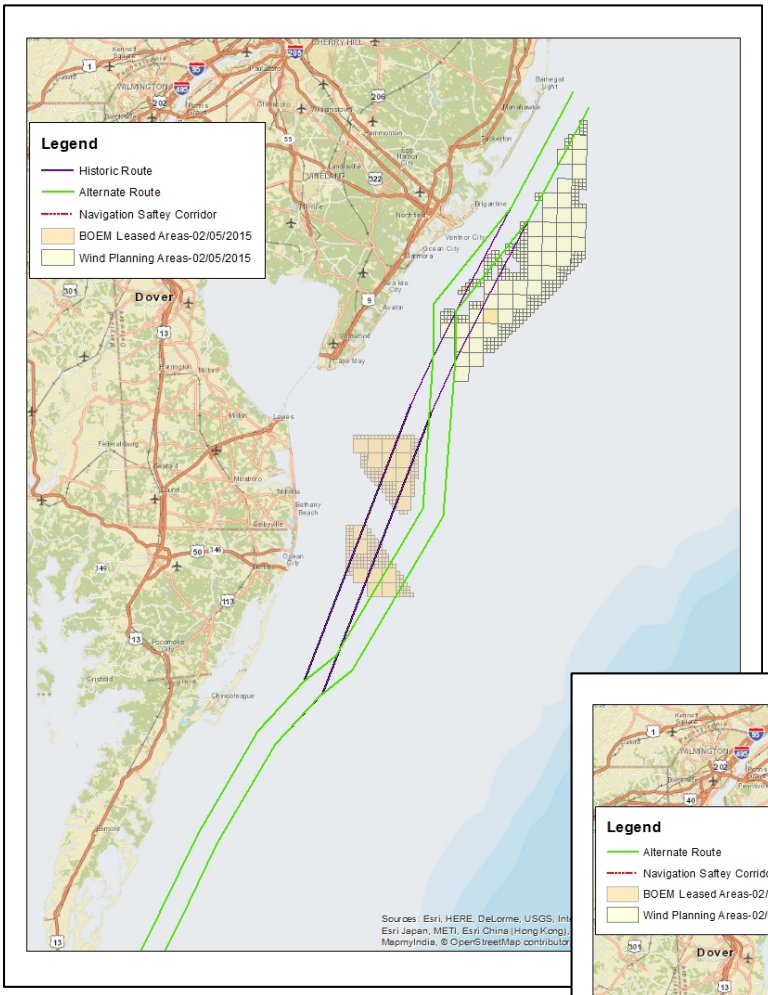

Figure 6 – Comparison of the Historic and Alternate Alongshore Towing Vessel Routes

An alternate route was explored that followed the criteria in the planning guidelines and corridor width recommendations, with the goal of minimizing conflicts with the areas proposed for development. The resulting alternate towing vessel navigation route is displayed in Figure 6 along with the historic route.

The resulting alternate route significantly reduced the areas of conflict.

With the addition of the navigation safety corridor to the alternate route, the remaining area for development was greatly improved and would support large scale commercial development.

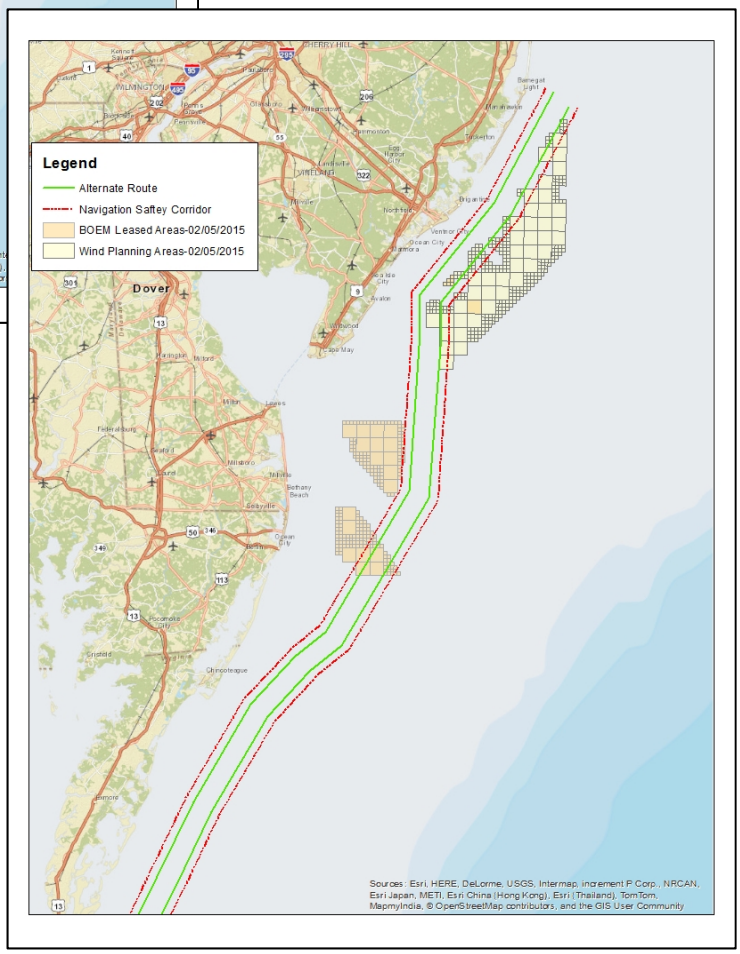

Figure 7 – Alternate Towing Vessel Route Displayed with the Corresponding Navigation Safety Corridor

Appendix VII

E. Alongshore Towing Vessel Routes from Chesapeake Bay to the Florida Straits and from New York to Rhode Island Sound

A similar process was followed to identify the towing vessel navigation routes using AIS data and applying the recommended navigation route and navigation safety corridor widths for the areas to the North and South of the Mid-Atlantic Routes. The resulting navigation routes and safety corridors are depicted along with the 2001 Towing Vessel Density. in Figures 8, 9 and 10.

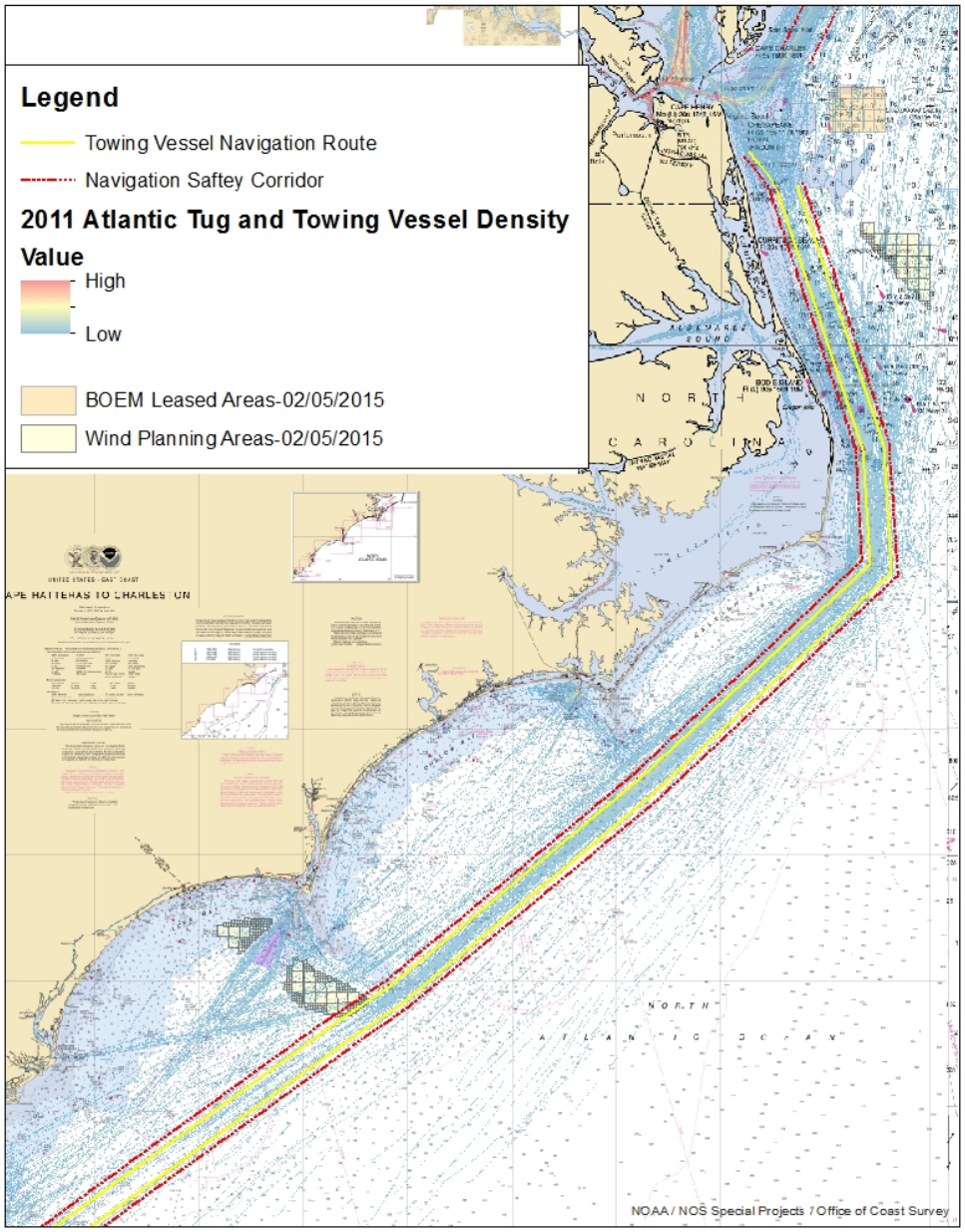

Figure 8 - Towing Vessel Route and Safety Corridor Compared to 2011 Towing Vessel Density Offshore of North Carolina

Appendix VII

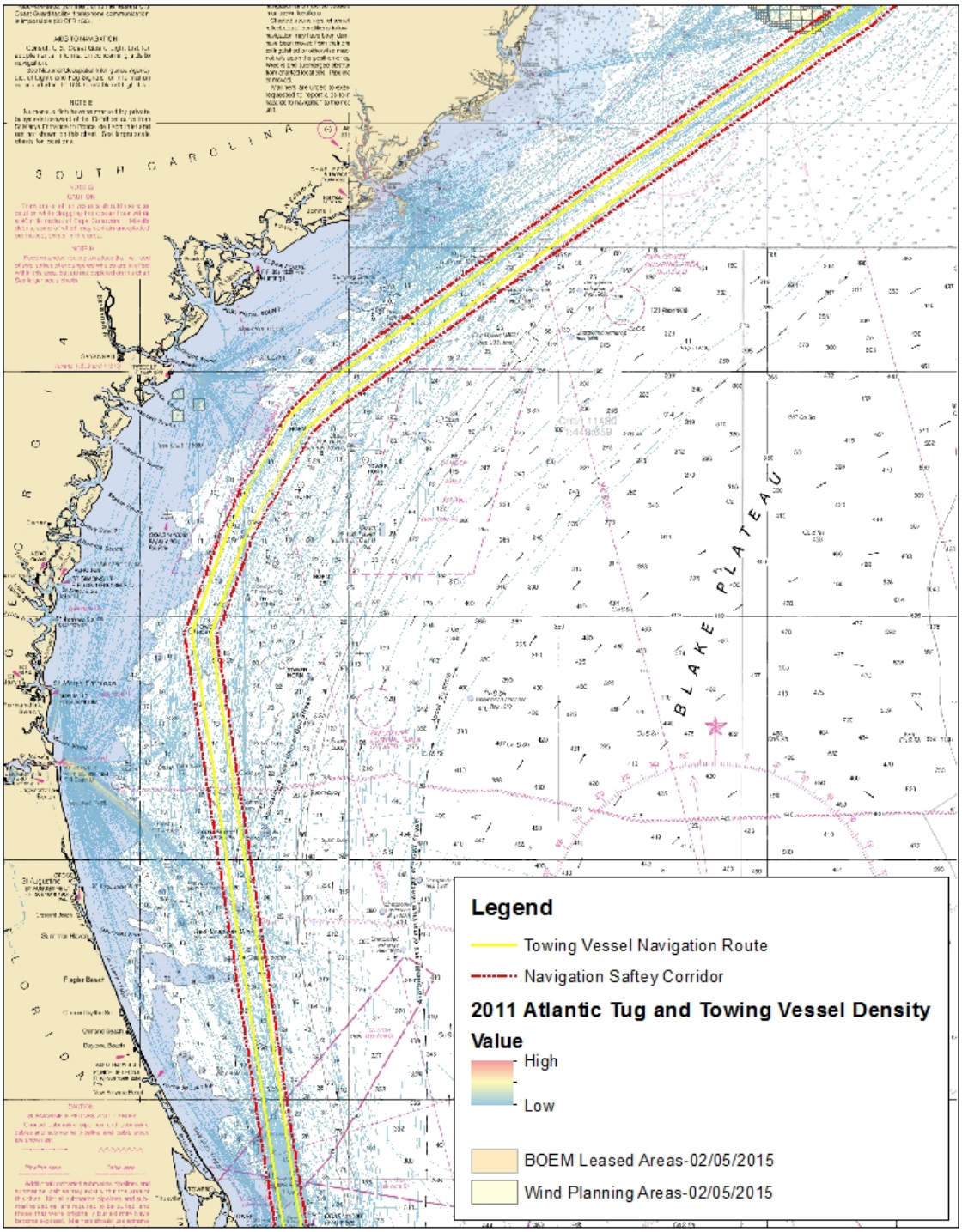

Figure 9 - Towing Vessel Route and Safety Corridor Compared to 2011 Towing Vessel Density for the Southeast

Appendix VII

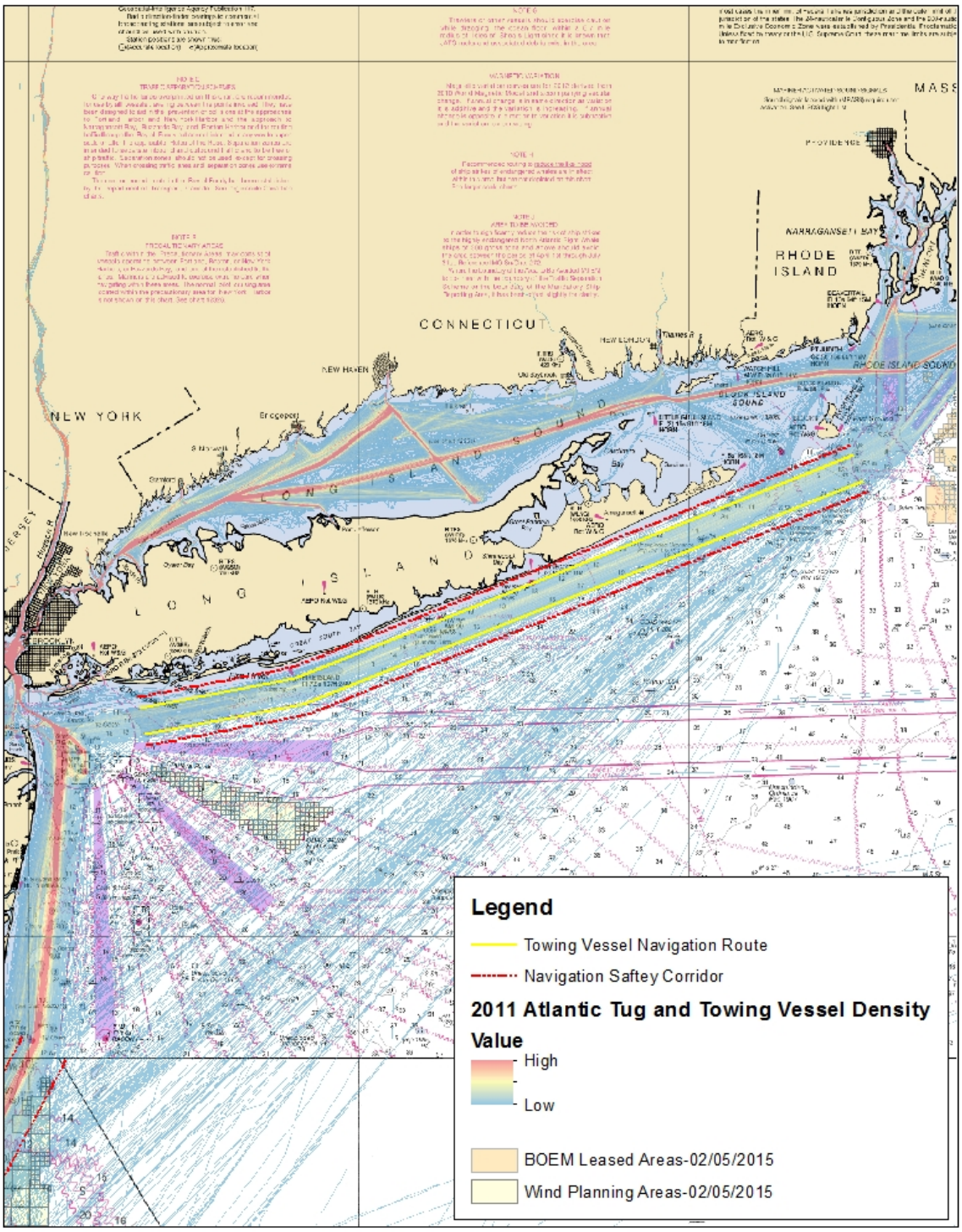

Figure 10 - Towing Vessel Route and Safety Corridor from New York to Rhode Island Sound Compared to 2011 Towing Vessel Density Offshore of New York and New Jersey

Appendix VII

F. Deep Draft Routes off the Atlantic Coast

The focus for deep draft vessel routes was for identifying major routes between ports. A safety corridor width of 10NM was chosen as a reasonable width to represent shipping routes for planning purposes based on the increasing size and numbers of vessels combined with the higher speeds when transiting offshore. Due to the increased sea room and flexibility for vessel to avoid structures, navigational safety becomes less of a concern when displacing vessel traffic. The following deep draft navigation safety corridors capture a few of the major offshore routes and are recommended to be used as an indication of vessel conflicts when conducting marine planning activities in addition to AIS data and other resources.

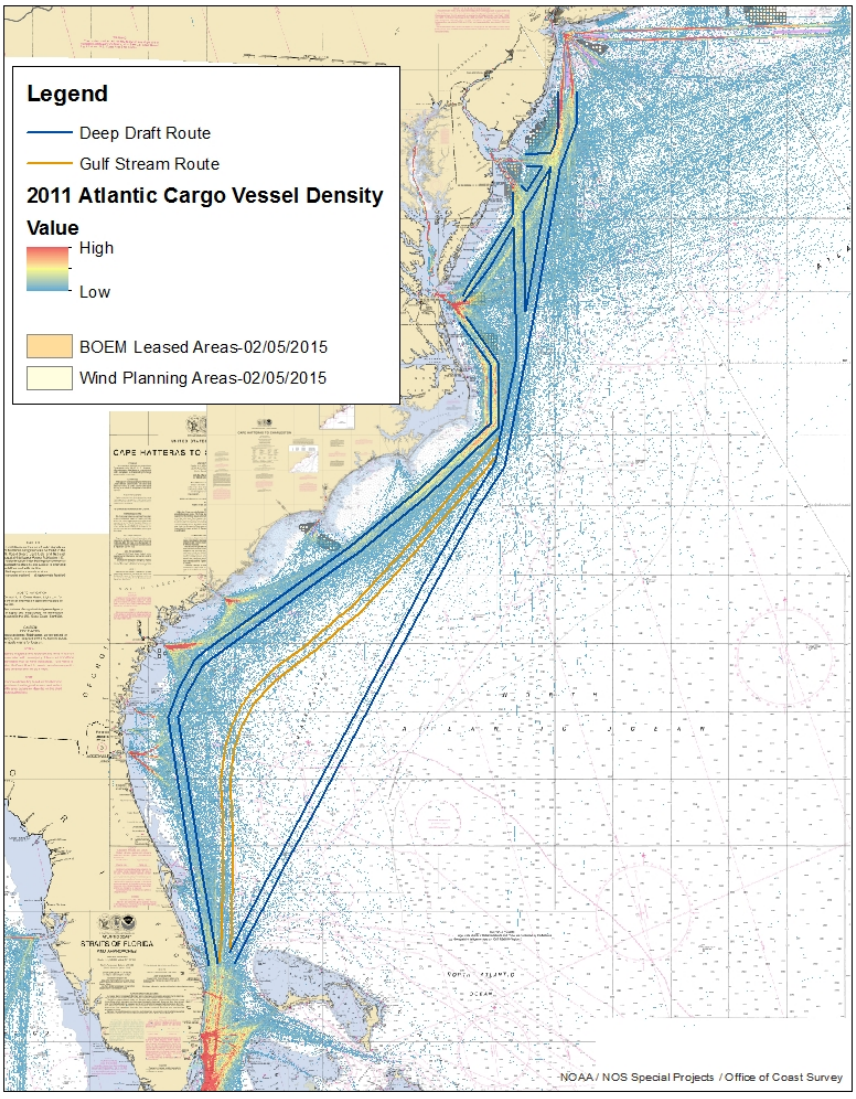

Figure 11 depicts the deep draft vessel navigation safety corridors along the Atlantic Coast from New York to the Florida Straits along with the 2011 Cargo Vessel Density as a surrogate for deep draft vessels.

Figure 11 - Deep Draft Navigation Safety Corridors with 2011 Cargo Vessel Density

Appendix VII

The following series of maps provide a more detailed view of the Deep Draft Navigation Safety Corridors.

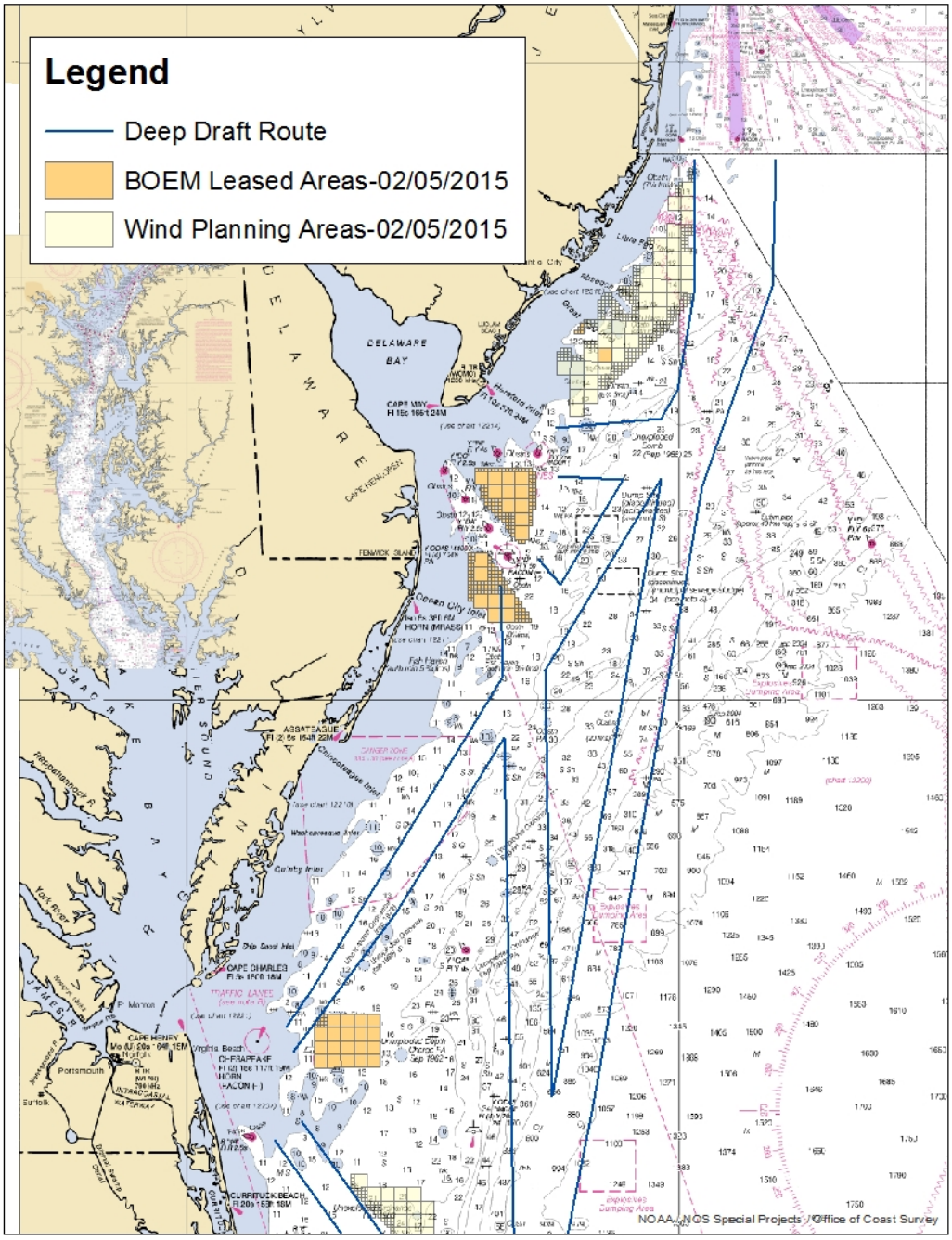

Figure 12 - Deep Draft Navigation Safety Corridors in the Mid-Atlantic

Appendix VII

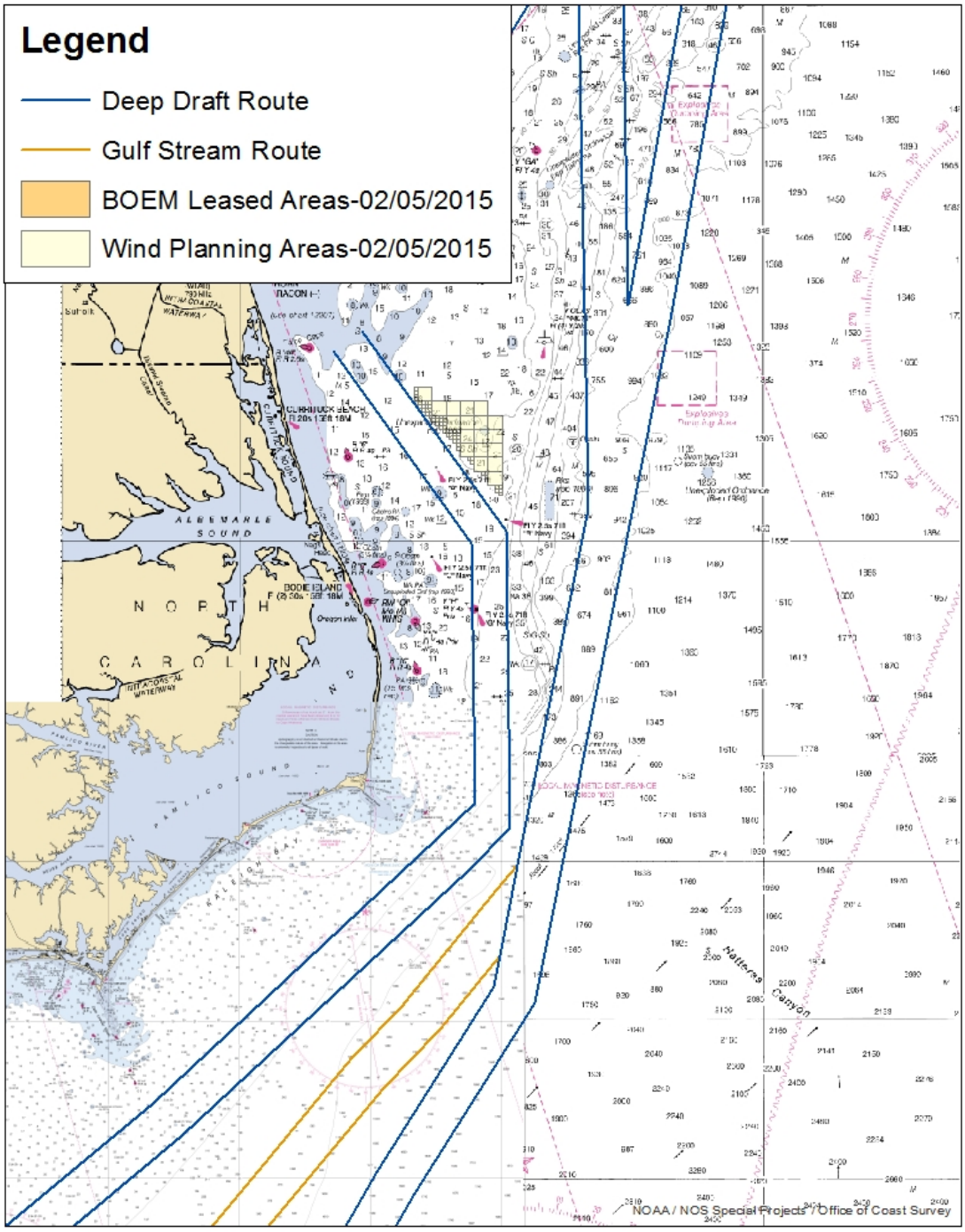

Figure 13 - Deep Draft Navigation Safety Corridors in the vicinity of Cape Hatteras

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Figure 14 depicts the deep draft routes in the southeast including a route that follows the Gulf Stream current in the Northbound direction shown in yellow.

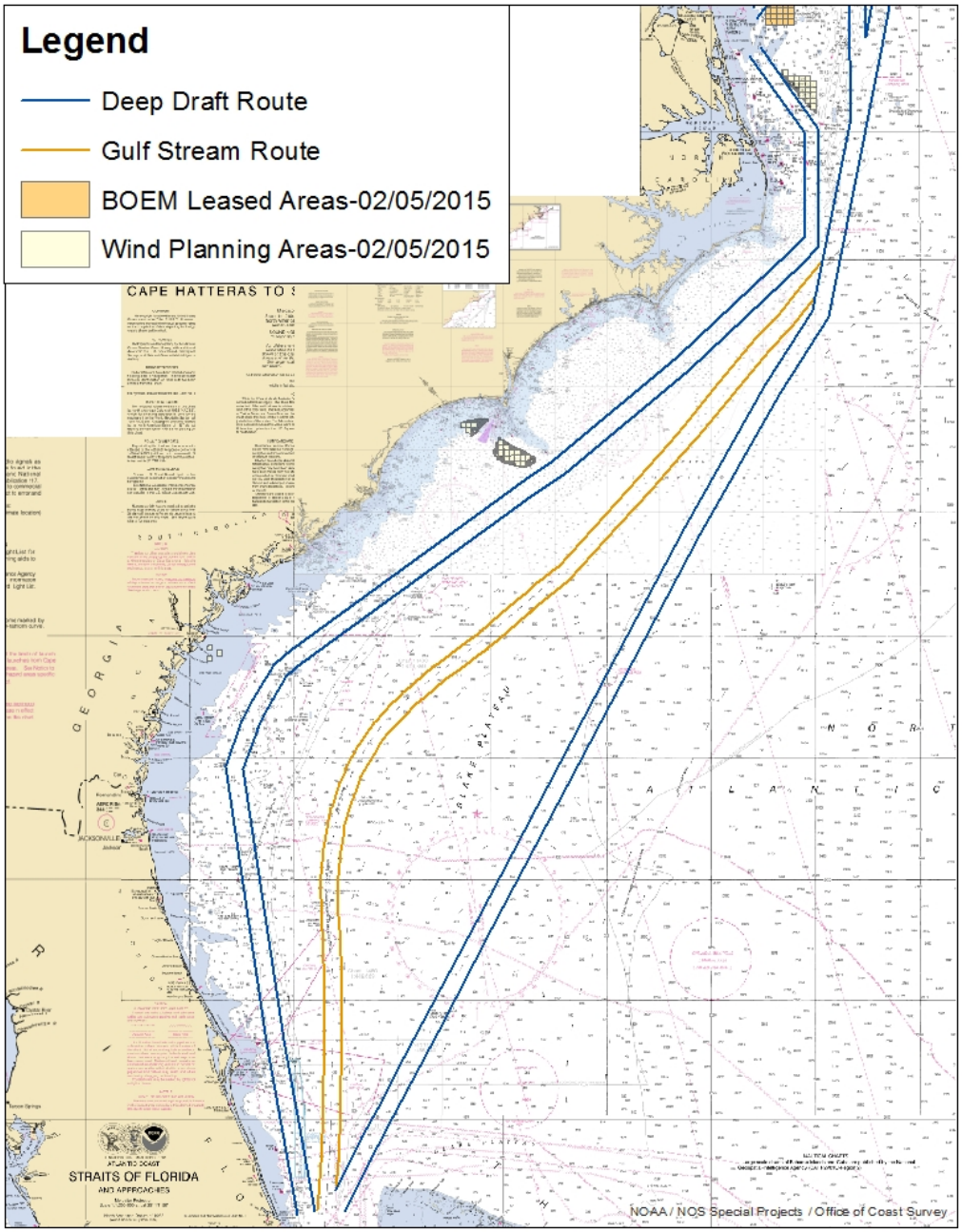


Figure 14 - Deep Draft Navigation Safety Corridors in the Southeast

Appendix VII

An overlay of 2011 Cargo Density with deep draft routes in the Southeast clearly demonstrates that there are significant number of routes that have not been captured with the navigation safety corridors that have been identified. In particular, special consideration needs to be given for routes into and out of major port areas.

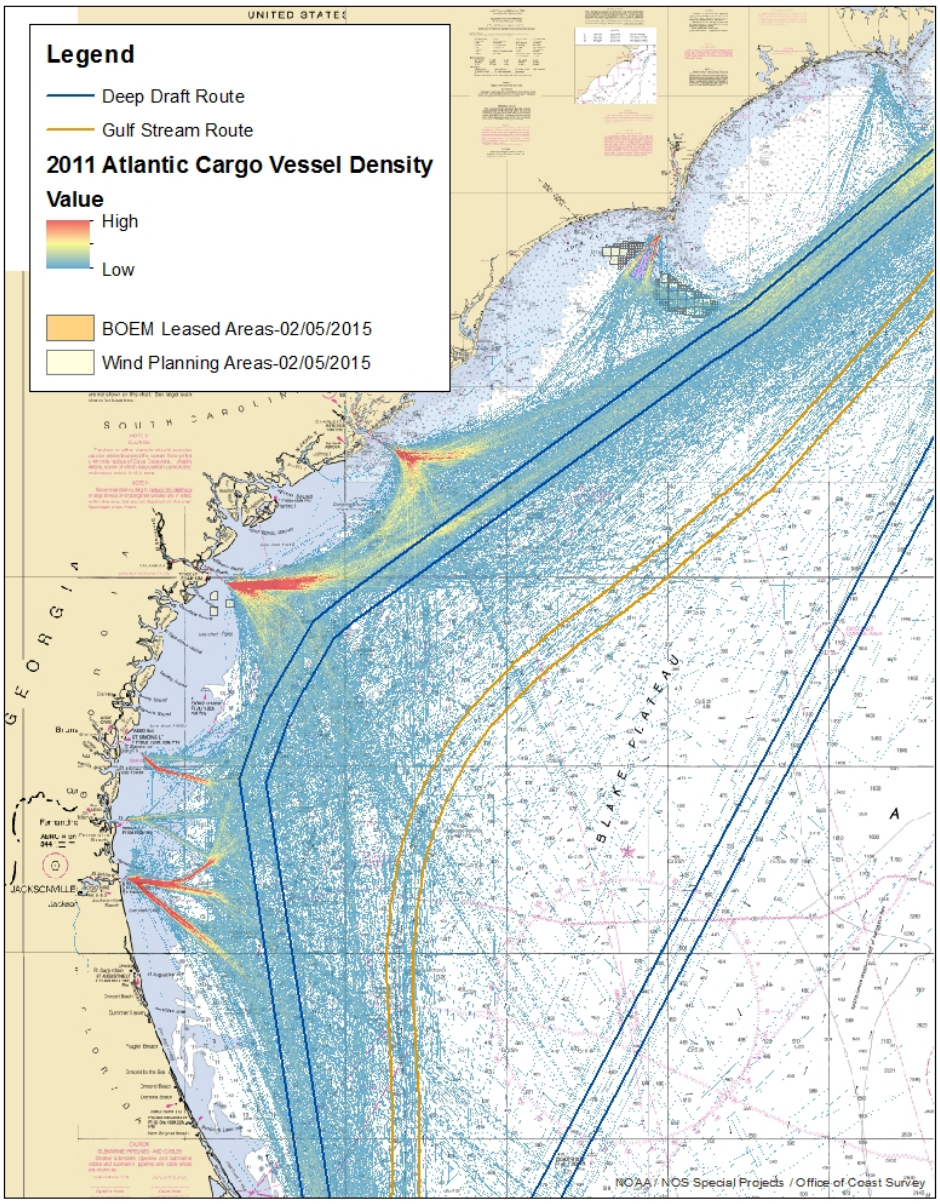


Figure 15 - 2011 Cargo Vessel Density and Deep Draft Routes in the Southeast

Appendix VII

G. Combination of Towing and Deep Draft Navigation Safety Corridors

Figure 16 depicts a combination of the towing and deep draft navigation safety corridors from Rhode Island Sound to the Florida Straits.

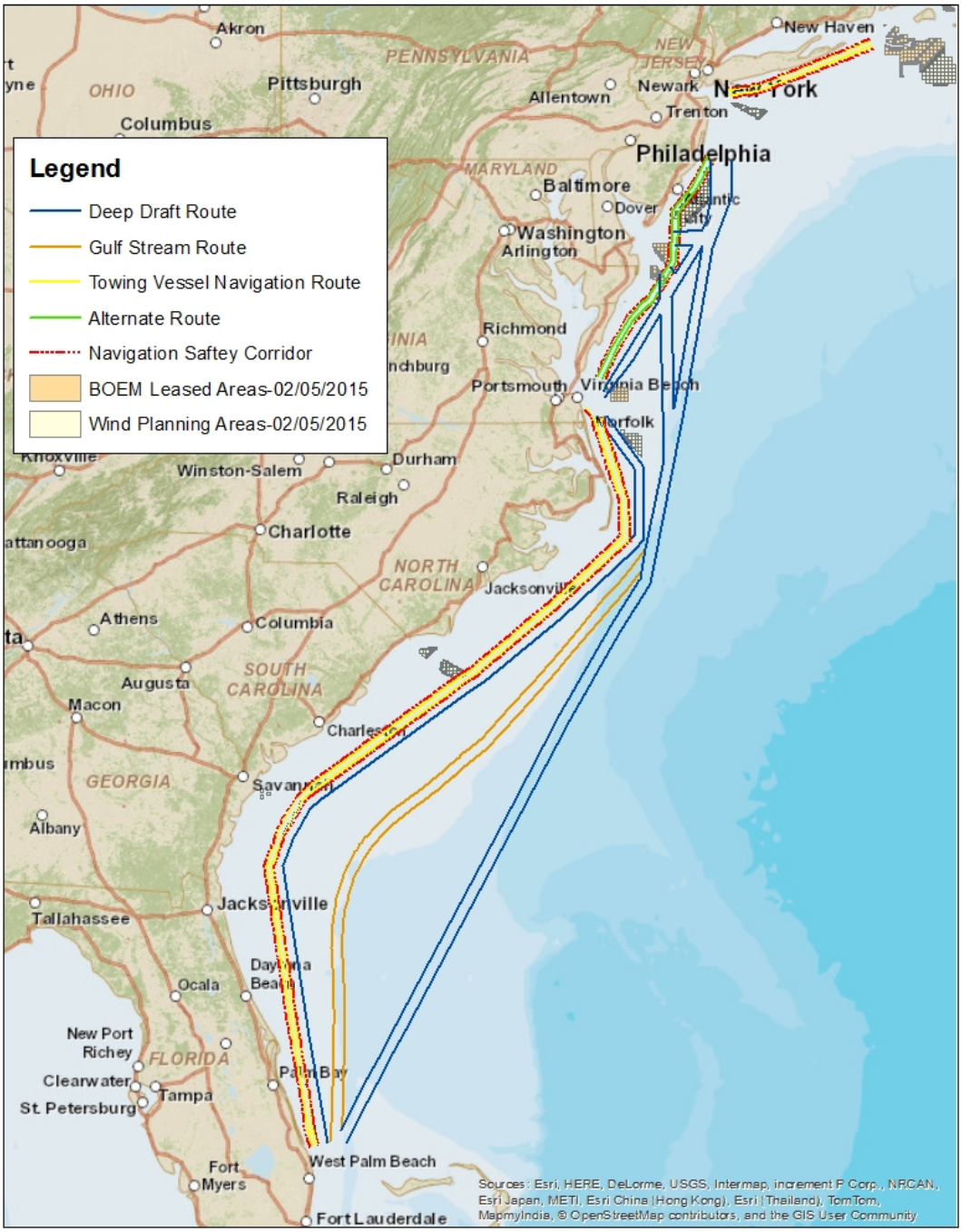
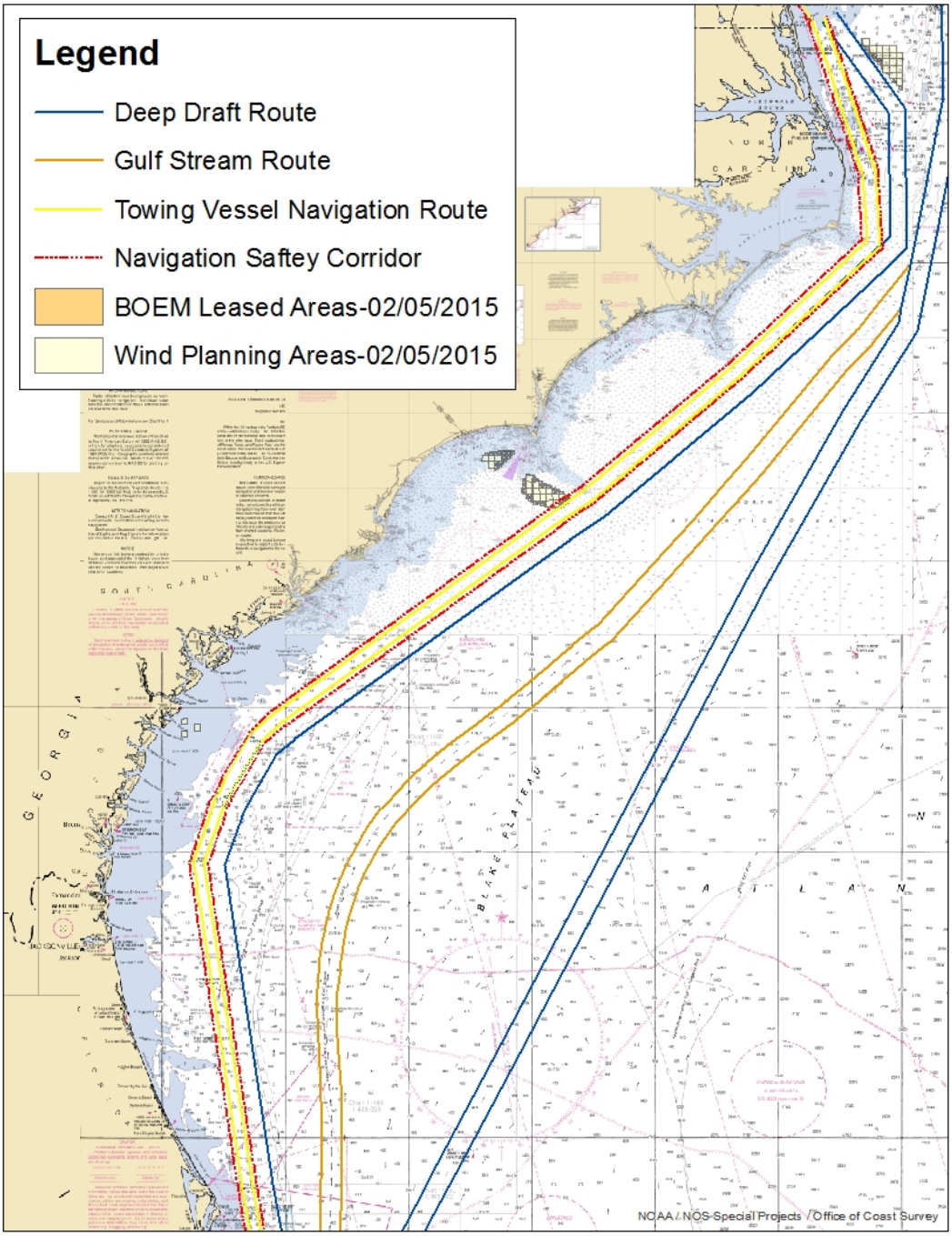


Figure 16 - Combination of Towing Vessel and Deep Draft Navigation Safety Corridors

Appendix VII

A side by side depiction of the towing vessel and deep draft corridors in the Southeast shows the two overlap. The inshore boundary of the deep draft navigation safety corridor matches the offshore boundary of the towing vessel navigation route resulting in an overlap of 2NM.



ENCLOSURE 1

Atlantic Coast Port Access Route Study Team Charter

U.S. Department of Homeland Security
United States Coast Guard

Commandant
United States Coast Guard

2100 Second St. S.W.
Washington, DC 20593-7581
Staff Symbol: CG-5533
Phone: (202) 372-1566
Fax: (202) 372-1991

16650

MAY 04 2011

MEMORANDUM

From: B. M. Salerno, VADM, DCO
R. C. Parker, VADM, LANTAREA

Reply to Attn of: Mr. George Detweiler (202) 372-1566

To: Distribution

Subj: ATLANTIC COAST PORT ACCESS ROUTE (ACPARS) STUDY TEAM CHARTER

Ref: (a) Ports and Waterways Safety Act (PWSA)(P.L. 95-474, 33 U.S.C. 1223(c))

1. Purpose: To charter the Atlantic Coast Port Access Route Study (ACPARS) team and identify its objectives, membership, and responsibilities.

2. Background: The Bureau of Ocean Energy Management Regulation and Enforcement (BOEMRE) has preliminarily identified numerous locations on the Atlantic continental shelf for potential development of wind energy. These proposed locations have the potential to impact maritime traffic along the entire Atlantic coast. The Deputy Commandant for Operations (DCO) and Commander, Atlantic Area have determined that a Port Access Route Study (PARS) for the entire Atlantic Coast should be performed to examine the impact of the proposals on vessel traffic and help balance the multiple uses of these waters. A study of this magnitude will far exceed the scope of a typical port access route study that focuses on a single port and its associated routes. Commander, Atlantic Area is leading this effort which will be executed by the matrix team described in this charter.

3. Objectives: Using enclosure (1) as a guide, the team will conduct the ACPARS within the limits of available resources to:

a. Determine whether the Coast Guard should initiate actions to modify or create safety fairways, Traffic Separation Schemes or other routing measures;

b. Provide data, tools and/or methodology to assist in future determinations of waterway suitability for proposed projects; and

c. In the near term, develop AIS products and provide other support as necessary to assist Districts with all emerging coastal and offshore energy projects.

4. Membership:

a. LANTAREA (09) - Chair workgroup

b. CG-55 – Co-Chair and Headquarters coordination

c. CG-761- Provide technical assistance and AIS support.

d. D1 (dp)

e. D5 (dp)

f. D7 (dp)

5. Action: The organizational elements identified above shall place a high priority on the ACPARS effort to ensure objectives are met.

6. Meetings: The ACPARS workgroup will meet as scheduled by the workgroup Chair. However, the Chair shall maximize the use of e-mail, online collaboration and teleconferences to achieve the required objectives. The Chair may identify and invite subject matter experts, visiting observers, and advisors to participate in the workgroup.

7. Funding: CG-55 will fund travel and meeting support for the workgroup and articulate additional funding requirements for conducting the study to DCO.

8. Deliverables:

a. Weekly briefings to LANTAREA (09) and CG-55

b. Monthly progress updates to DCO by the last Friday of the month.

c. Publish a Notice of Study by 15 May 2011.

d. Provide AIS products to the Fifth and First Districts for existing Wind Energy Areas by 31 May 2011.

e. Submit final ACPARS report by 01 May 2012.

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Encl: Atlantic Coast PARS White Paper

Distribution: LANTAREA (00), (09), (P), (3P), CG-5, CG-6, CG-7, CG-094, CGD1, CGD5, CGD7

Enclosure 2

Marine Planning Guidelines

Marine Planning Guidelines -
Recommended Navigational Safe Distances

Purpose: These guidelines are provided to assist offshore developers and marine planners with their evaluation of the navigational impacts of any projects with multiple permanent fixed structures. The coastal areas include multiple users such as commercial shipping, tug and barge operations, commercial and recreational fishing, research vessels, offshore support vessels and aquaculture apparatus. The guidelines consider sea space necessary for ships to maneuver safely, and discuss other factors to be considered when determining appropriate separation distances for the siting of offshore structures near shipping routes and other multiple use areas.

These guidelines are not regulatory. They do not impact the boundaries of any existing leases for site characterization and site assessment activities, but do inform suitability of siting structures within a lease area. These guidelines should be considered during the area identification phase for both unsolicited and solicited development areas and when determining the siting of structures within existing areas. These guidelines also serve as one of the references to inform the Navigation Safety Risk Assessments (NSRA) conducted by developers.

Background: More than 90% of the world's trade is carried by water, making a safe and efficient marine transportation system critical to the Nation's economy. The shipping industry is dynamic as vessel size grows and newer designs meet the ever-changing maritime industry's ambitions. Understanding these changes and the future needs of the maritime transportation system are critical to marine planning efforts. Information such as that identified by a 2012 U. S. Army Corps of Engineers (USACE) study which estimated that the number and size (capacity) of container vessels calling on East Coast ports will double by 2030 is just one example of changing conditions that must be considered.[1] Marine planning has become increasingly important, and more complex with the size and density of vessels increasing and emerging uses of the waterways competing for space.

The United Nations Convention on the Law of the Sea (UNCLOS), Article 60, Paragraph 8 states "Artificial islands, installations and structures and the safety zones around them may not be established where interference may be caused to the use of recognized sea lanes essential to international navigation." A similar provision is found in U.S. Law – The Outer Continental Shelf Lands Act (OCSLA) as amended by the Energy Policy Act of 2005 (EPAct), provides that the Secretary of the Interior shall ensure that any leases, easements or rights-of-way are carried out in a manner that prevents interference with reasonable uses of the exclusive economic zone, the high seas and the territorial seas; and in consideration of any other use of the sea or seabed, including use for a fishery, sealane, a potential site for a deepwater port, or navigation.[2]

[1] U.S. Army Engineer Institute for Water Resources (IWR) report, *U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels*, June 20, 2012.
[2] Energy Policy Act, Section 388- Alternative Energy-Related Uses on the Outer Continental Shelf

Both UNCLOS and the International Maritime Organization- General Provisions on Ships' Routeing (GPSR) express intent for the ability of vessels to fully comply at all times with the International Regulations for Preventing Collisions at Sea, 1972, as amended (COLREGS). The GPSR is the IMO standard used when considering vessel maneuvering risk assessment. Impacting the ability of a vessel to fully comply with COLREGS constitutes "interference" in accordance with UNCLOS and the Energy Policy Act of 2005.

The Department of Interior's (DOI) Smart from the Start initiative[3] for promoting large scale, offshore renewable energy development, raised significant concerns from the U.S. and international shipping communities regarding the harmful impacts to navigation posed by large arrays of offshore structures. The Bureau of Ocean Energy Management (BOEM) created Renewable Energy State Task Forces to help BOEM identify priority areas for development, known as Wind Energy Areas or WEAs. While participating in this process, the Coast Guard has been repeatedly asked what the minimum required buffer or separation distance was for wind farms from shipping routes. As a Cooperating Agency, the Coast Guard was also asked to evaluate proposed areas for development.

To accomplish this task, the Coast Guard leveraged the United Kingdom (UK) Maritime Guidance Note MGN-371[4] to develop a RED-YELLOW-GREEN (R-Y-G) methodology to classify lease blocks as an initial recommendation concerning the potential impact to safe navigation, with the understanding that recommendations would be updated as additional information and analyses became available. The R-Y-G methodology assigned Red, Yellow or Green colors to chart aliquots[5] of the proposed WEA by applying risk-distance concepts from MGN 371. However, the methodology did not adopt the UK guideline of 5 NM as the minimum distance to the entry/exit of a traffic separation scheme (TSS), primarily due to the concern that the requirement would have eliminated the majority of proposed wind energy areas already announced as part of the Smart from the Start initiative.

Red aliquots were areas of high conflict and were not recommended to be considered for development. Yellow aliquots were areas that were moderate to high conflict which would require further study and analysis. Green aliquots were areas of lower conflict and considered as likely acceptable for development based on available information. On a case by case basis some areas of high conflict were classified as Yellow in order to allow further study if alternative routing and potential mitigations were being explored. The intent was to leave as much area available for further study and analysis to determine if risk could be lowered to within acceptable levels. Both Yellow and Green areas

[3] http://www.doi.gov/news/pressreleases/upload/02-07-10-wea-fact-sheet.pdf

[4] United Kingdom Maritime and Coastguard Agency (MCA) Marine Guidance Note MGN-371, Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response Issues.

[5] Aliquots are generated from full OCS blocks by sub-dividing each block into 16ths and allow for more detailed boundary delineation in offshore energy leasing. The aliquots use a letter designation in addition to their parent protraction number and OCS block number (ie. NK-1802, 6822F). A full OCS block is 4800 x 4800 meters, while an aliquot measures 1200 x 1200 meters.

remained as part of a WEA in BOEM's notices to developers moving through the leasing process

The R-Y-G methodology resulted in de facto standard distances and left some with the incorrect assumption that the resultant WEAs had addressed all significant conflicts with navigation. However, the majority of blocks were classified as Yellow and conflicts still remained that required analysis to determine if risk could be lowered to within acceptable levels, before being considered suitable for development. Additionally, for certain areas, there was strong resistance to further reduce areas as additional information became available, resulting in areas being leased with significant conflicts remaining.

To address these concerns, more comprehensive guidelines similar to those promulgated by European countries were deemed necessary. The goal of these guidelines is to minimize interference with shipping routes such that the safety of navigation is not compromised, while providing the flexibility to evaluate site specific conditions to maximize area considered for development. In situations where achieving a low risk is not possible, the goal would be to mitigate risk to as *"Low as Reasonably Practicable*[6]*"*. The remaining level of risk would need to be weighed against other factors by the Lead Permitting Agency to determine whether the project should proceed or not.

Discussion: There is no international standard that specifies minimum distances between shipping routes and fixed structures; however, it is widely accepted internationally that fixed structures in the offshore environment should not interfere with navigation. In developing guidelines for the U.S., criteria established by international shipping organizations and standards published by other nations were considered. Some of these are summarized below.

The Confederation of European Shipmasters' Associations (CESMA) has endorsed a document provided by the Shipping Advisory Board Northsea. The document recommends a minimum distance of 0.3 NM + 6 ship lengths + 500 m to the Starboard side of a route and 6 ship lengths + 500 m to Port. Most self-propelled ships, by propeller design, tend to make tighter turns to port than to starboard. These recommendations are based on the minimum space needed by normal deep sea self-propelled ships to comply with the collision regulations.[7] This would equate to a distance of 1.9 NM to Starboard of a route with 400m vessels.

The World Shipping Council (WSC), which represents over twenty-eight liner shipping companies that carry approximately 90% of U.S. international containerized trade, has recommended a minimum buffer distance of 2 NM. They also recommend the buffers be increased in areas where vessels travel at higher speeds than in port approaches.[8]

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[6] MGN-371

[7] The distance is based on local conditions and may vary for other locations. Most self-propelled ships, by propeller design, tend to make tighter turns to port than to starboard. http://www.cesma-eu.org/MSP.pdf

[8] World Shipping Council Comments on USCG ACPARS, August 2011. http://www.worldshipping.org/public-statements/regulatory-comments/unitedstates

The WSC also submitted additional information from vessel masters, providing the distances they believe are required for maneuvers that may occur when a vessel encounters an emergency or a collision avoidance maneuver while operating in a maritime traffic route (all values are approximate):

- Crash Stop (backing the vessel from full speed): ~ 1.75 - 2.4 nm
- Complete Stop (letting the vessel stop on its own from full speed): ~3 to 3.5 nm
- Emergency Anchoring: ~1.5 to 1.75 nm
- Width (i.e. tactical diameter) of a 180° turn (starting at full speed): ~0.9 nm

The United Kingdom (UK) combined radar results from the North Hoyle electromagnetic trials with published ship domain theory to determine the inter-relationship of marine wind farms and shipping routes.[9] The template developed was then offered to maritime stakeholders and wind developers for comment. The resulting guidelines are contained in the Maritime Guidance Note MGN-371.

Some of the key distances from the MGN-371 shipping route template include:

- 1NM is the minimum distance to the parallel boundary of a TSS (HIGH/MEDIUM risk).
- 2NM is the distance where COLREGS become less challenging. (MEDIUM risk)
- >2NM risk becomes LOW, except near a TSS where risk would be higher. (MGN-371 does not state a distance where risk becomes LOW near a TSS.)
- 5NM is the minimum distance from the entry/exit of a TSS. (Assumed to be MEDIUM risk)

The German Waterways and Shipping Directorate North West and North guidelines recommend a separation distance of at least 2 NM plus a 500 m safety zone between shipping lanes and wind generators.[10] In actual practice the German Spatial Plans for the North Sea and Baltic Sea have identified priority areas where structures cannot be built and also reservation areas as a supplemental measure in which the needs of shipping are given special consideration. In many cases the priority areas have fully addressed minimum requirements and the reservation areas are additional separation areas far exceeding the minimum requirements. Some reasons listed for the additional separation areas included hazardous cargo transits or heavily trafficked areas.

[9] United Kingdom Maritime Guidance Note MGN-371 - Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response Issues, 2008.

[10] Guidelines for the Design, Marking and Operation of Wind Generators in the Area of Responsibility of the Federal Waterways and Shipping Directorates North-West and North to Guarantee the Safety and Efficiency of Vessel Traffic. http://www.wsd-nordwest.de/schifffahrt/Windparks_auf_hoher_See/PDF/Guidelines_for_the_Design,_Marking_and_Operation_of_Wind_Generators_in_the_Area_of_Responsibility_of_the_Waterways.pdf

Planning Guidelines- The enclosure provides the general guidelines for the siting of multiple structures near shipping routes and established ships routing measures. The guidelines would typically result in a medium level of risk as they are based on minimum distances for the largest vessels to maneuver safely. Additional mitigation measures should be considered to achieve a low level of navigational safety risk. As a cooperating agency in the NEPA process, the Coast Guard will request, through the Lead Federal Agency, that the developer complete a Navigation Safety Risk Assessment (NSRA) to evaluate potential impacts to navigational safety.

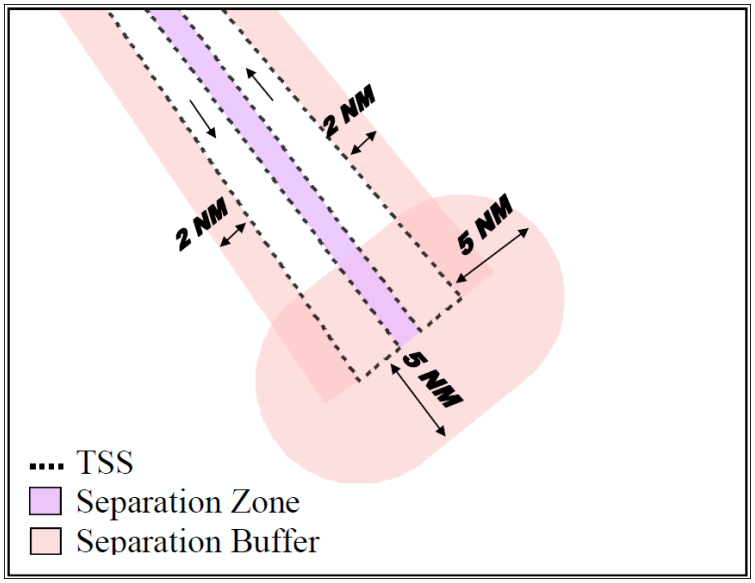
Recommended Guidelines for General Assessment of Areas for Potential Development

1. Port Approaches and Traffic Separation Schemes:

Planning Guidelines

- 2NM from the parallel outer or seaward boundary of a traffic lane. (Assumes 300-400m vessels)
- 5NM from the entry/exit (terminations) of a TSS

These recommendations are based on generic deep draft vessel maneuvering characteristics and are consistent with existing European guidelines. They account for the minimum distances for larger vessels to maneuver in emergency situations.



The 5 NM mile 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.

2. Coastwise or Coastal Shipping Routes:

Vessels that tend to follow the coastline are typically smaller vessels and vessels that cannot safely transit too far offshore due to sea state limitations. The necessary sea space for vessels to safely maneuver is determined by the size and maneuverability of vessels, and density of vessel traffic. When determining routes near shore the depth of water and location of underwater obstructions must be considered, especially if vessel routes will be displaced by the introduction of fixed structures. Vessels of particular concern are towing vessels towing astern on a wire. In this configuration their footprint is large,

maneuvering ability is constrained, and the catenary of the tow wire will dictate significantly larger water depths than the drafts of the tug or barge.

Planning Guidelines-

- Identify a navigation safety corridor to ensure adequate sea area for vessels to transit safely.
- Provide inshore corridors for coastal ships and tug/barge operations.
- Minimize displacement of routes further offshore.
- Avoid displacing vessels where it will result in mixing vessel types.
- Identify and consider cumulative and cascading impacts of multiple offshore renewable energy installations (OREIs), such as wind farms.

3. Offshore Deep Draft Routes:

Offshore deep draft routes can be more flexible in terms of the location of the routes. It is still necessary to have adequate sea area for safe navigation, but less critical to preserve existing routes to achieve safe conditions.

Planning Guidelines-

- Avoid creating an obstruction or hazard on both sides of an existing route.
- If not practicable to avoid structures or hazards on both sides of a route, a navigation safety corridor should be of sufficient size to provide for the safe transit of the largest vessels. Large ocean-going ships often operate a high speeds that effect maneuvering response time. This should be accounted for when making the determination.

4. Navigation safety corridors: Navigation safety corridors identify the amount of area necessary for vessels to safely transit along a route under all situations. These corridors are not considered routing measure by the Coast Guard or the IMO, but are only in this report to delineate areas where no offshore development should be considered. These corridors should not be confused with fairways, two-way routes or Traffic Separation Schemes which are routing measures that identify specific inshore traffic areas. Heat maps (density plots) of Automatic Identification System (AIS) information are useful in determining the location of a route, but are less useful in determining the appropriate size of a route where multiple vessels may be required to pass one another safely. Navigation safety corridors should be given priority consideration over other potential uses of the same water space.

In determining the appropriate size of navigation safety corridors, the following factors must be considered for the largest and least maneuverable vessels expected to use a route.

- Cross Track Error - indicates the difference between the vessel's intended and actual track.
- Closest Point of Approach - the safe distance at which a vessel can pass a fixed or moving hazard accounting for existing conditions.

- Density of vessel traffic - indicates the number of vessels that can be expected to meet, overtake or cross in the same general area.

The factors to be considered are interrelated and should be considered in the context of the maximum most probable weather and sea state conditions. The types of operations requiring the most sea space for maneuvering under normal and emergency situations should be used as the reference point.

Cross Track Error. Cross track error (CTE) is the difference between the intended and actual track. Factors leading to a vessel deviating from intended track include:

- Environmental Forces - include wind, currents and sea state.
  - Wind forces can set a vessel in the downwind direction. The impacts of the wind will vary according to the size and shape of the vessel.
  - Currents, particularly cross currents, can significantly affect the maneuverability of a vessel and space required to navigate safely.
  - Sea state, including size and direction of waves, can cause vessels to pitch, heave and roll. Yawing motions could result in the vessel drifting off course. Following seas can impact the ability of the vessel to steer a steady course.

- Swept Path - (the sum of various factors to determine the total width of the tug and barge path) will depend on the abilities of the vessel operator and the maneuvering characteristics of the vessel and are a secondary cause of cross track error.
  - Vessel Operator Response - consists of the vessel operator's ability to recognize a deviation from an intended track and the time to take corrective action.
  - Vessel's Response - the speed at which the vessel responds to rudder and main engines.

Closest Point of Approach (CPA). In complying with the COLREGS, the Captain of a vessel is required to consider all dangers of navigation and collision and any special circumstances, including limitations of the vessels involved, which may make a departure from the COLREGS necessary to avoid immediate danger.[11] When determining an appropriate CPA, all factors of weather, maneuvering capability, visibility, etc. must be considered, as well as potential emergency situations. Under ideal conditions with low sea states, good visibility and good communications between vessels to arrange a passing agreement, a CPA of ½ to 1 NM may be acceptable. Under less ideal weather and sea conditions and/or higher vessels speeds, a CPA of 2 NM or more may be necessary to ensure safe passage. By increasing the planned CPA, the chance of a collision or allision will be decreased.

[11] COLREGS - International Regulations for Preventing Collisions at Sea - International Regulations for Preventing Collisions at Sea, 1972 - Rule 2 Responsibility.

Density of Traffic. The amount of traffic along a route will dictate the likelihood of vessels sharing sea space in meeting, overtaking or crossing situations. With good communications and early actions, vessels can make arrangements to limit the number of vessels interacting with each other. However, there will be times when multiple vessels converge on the same location, such as in a cluster of OREIs, and additional sea space is necessary to maneuver safely and maintain appropriate CPAs for all vessels. The longer the route is constrained, the more likely multiple vessels will meet along a route. Crossing traffic such as fishing vessels or offshore support vessels transiting to/from offshore installations will further complicate vessel interactions. A navigation safety corridor should be designed to accommodate an appropriate number of vessels passing abeam of one another and other vessel operations in the area. In low density situations such as offshore, a minimum of two vessels may be appropriate. For moderate vessel density situations a minimum of three vessels should be used for planning purposes.

5. Other site specific considerations**:**

Potential contributions to risk

- **High density traffic areas with converging or crossing routes.** Similar to port entrances, areas where vessels are approaching from different directions into a smaller area will produce complex vessel interactions and increase navigational safety risk. This could occur in natural choke points or off shore of a cape, peninsula or other obstruction that vessels must go around.
- **Obstructions/hazards on opposite side of a route.** If hazards or obstructions are present on the opposite side of a route from a development area, the impact will be the constriction of vessel traffic and elimination of collision assessment time and avoiding action of vessels in an emergency situation.
- **Severe weather/sea state conditions.** Predominant severe weather and sea state conditions can impact visibility, maneuverability and navigation, all of which would negatively impact navigational safety.
- **Severe currents.** Severe currents will impact maneuverability of a vessel and ability to maintain intended track, thus negatively impact navigational safety.
- **Mixing of vessel types.** Vessels of differing types will naturally segregate not only due to vessel requirements for a safe transit, such depth of water or sea state limitations, but also to avoid each other for safety reasons. Smaller or slow moving vessels will tend to avoid major shipping lanes containing larger, faster moving vessels. When these vessels are displaced into the routes of other vessel types the number of overtaking situations will increase, thereby increasing risk, particularly if sea space is limited.
- **Complexity of vessel interactions.** In areas where interactions are more complex, impacts due to new obstructions could be amplified. Complexity can be driven by a number of factors, such as those previously discussed above where routes are converging/crossing or mixing of vessel types. Complexity could also be driven by other operations being conducted in the area such as fishing, recreational traffic or pilot boarding areas.

- **Large distances along a route.** The longer the distance of obstructions along a route, the greater the risk. Increased distance equates to increased exposure to the hazard.
- **Undersized routing measures.** If an existing TSS or other routing measure was not designed to accommodate existing or future density and size of vessels, additional separation may be appropriate.

Potential mitigations of risk

- **Mitigating factors such as pilotage areas, vessel traffic services, precautionary areas, areas to be avoided, anchorages, limited access areas, and routing measures.** Mitigating factors can be used to lower risk in many ways, such as increasing predictability of vessel traffic, increasing local knowledge and expertise, increasing situational awareness, or improving navigation. Proper marking and lighting of the structures of a wind farm can be used for navigation purposes improving the ability to fix a vessel's position.
- **Low traffic density.** Low traffic density will decrease vessel interactions and allow for more space for transiting vessels to maneuver.
- **Predominantly smaller vessels.** If only smaller vessels call on a port or if large vessel transits are very infrequent, smaller planning distances may be appropriate; especially if other mitigations are in place for the large vessel transits, such as tug escorts or moving safety zones.
- **Distance from ports, shoals and other obstructions.** If there are large distances to other hazards vessels will be able to adjust their route to ensure safe transits.
- **Aids to Navigation.** Enhanced Aids to Navigation may assist vessels in more accurately determining their position as well as identifying potential hazards.

Other Critical routes- Refers to routes that may not be obvious when looking at regular traffic patterns and may involve specific or unique requirements of particular vessels.

- **Natural Deepwater Approaches.** Natural deep water approaches may not be used by the majority of vessels but may be necessary for some vessels to enter or depart port at present or in the future.
- **Unique Transits.** Other requirements such as sea space, draft, etc. necessary for the safe transit of infrequent, but important vessel transits, such as periodic provisioning of remote communities.

Enclosure 3

U. S. Coast Guard/ American Waterways Operators Quality Action Team Report

U. S. Coast Guard/ American Waterways Operators Quality Action Team Report

Coastwise Towing along the Atlantic Coast

Tug and barge operations are more complex than other commercial vessel operations and require additional considerations when evaluating the spatial requirements necessary for safe navigation. The maneuvering characteristics of towing vessels not only varies significantly from other commercial vessels, but also varies greatly based on the tug and barge involved and the method of towing, such as pushing ahead or towing astern. There are also specially designed tug and barge units where the tug fits into a notch of the barge and is mechanically connected either rigidly in the case of Integrated Tug and Barges (ITB) or with a hinged connection in the case of Articulated Tug and Barge units (ATB). These tug and barge units maneuver more like a single vessel, but typically have lower sea state limitations than a comparable size ship.

For traditional towline tugboats with barges, operating by pushing ahead or towing alongside (towing on the hip) while connected with ropes or wires is generally reserved for inshore operations in more protected waters. When transiting coastwise or in the open ocean, higher sea states typically dictate that the barge is towed astern on a towline. Towing astern adds several additional dimensions to be considered in navigation. Varying sea states and weather conditions will require changes to the towing operation. When winds are from the northwest or west, the tug and barge(s) may operate closer to shore to maximize the protection in the lee of the land. Higher sea states may cause the tug and barge to slow down or lengthen the tow wire, increasing the total footprint of the tugboat and barge. Both of these actions would result in a deeper catenary of the tow wire and may require a transit further from shore to ensure adequate depth to prevent dragging the wire on the ocean floor where it can become snagged on obstructions or break. Slower speeds also amplify the effects of wind and currents. Limiting the maneuvering area available to towing operations will reduce captains' flexibility to vary operations and achieve the safest and most efficient route.

Marine Planning Considerations

In determining the appropriate size and location of alongshore routes to accommodate coastwise towing operations, the following factors must be considered.

- Cross Track Error - indicates the difference between the vessel's intended and actual track.
- Closest Point of Approach - the safe distance at which a vessel can pass a fixed or moving hazard accounting for existing conditions.
- Density of vessel traffic - indicates the number of vessels that can be expected to meet, overtake or cross in the same general area.
- Sea state limitations - will impact the furthest acceptable distance from shore.
- Depth of water - sufficient depth necessary to account for tug and barge draft and the catenary of the towline.

The factors to be considered are interrelated and should be considered in the context of the maximum most probable weather and sea state conditions. The types of operations requiring the

most sea space for maneuvering under normal and emergency situations should be used as the reference point.

Cross Track Error

Cross track error (CTE) is the difference between the intended and actual track. Factors leading to a vessel deviating from intended track include:

- Environmental Forces - include wind, currents and sea state, and are the primary cause of cross track error.
  - Wind forces can set the tug and barge in the downwind direction. The impacts of the wind will vary according to the size and shape of the barge being towed and whether it is loaded or empty. An empty barge will ride higher in the water and be more affected by wind.
  - Currents, particularly cross currents, can significantly affect the maneuverability of the vessel and space required to navigate safely.
  - Sea state, including size and direction of waves, can cause vessels to pitch, heave and roll. Yawing motions could result in the vessel drifting off course. Following seas can impact the ability of the vessel to steer a steady course.
  - Tugs towing barges in heavy weather may be unable to make headway. In these cases, tugs may elect to steer into the wind or waves in an effort to hold their current position until conditions improve.

- Swept Path - will depend on the abilities of the vessel operator and the maneuvering characteristics of the vessel and are a secondary cause of cross track error.
  - Vessel Operator Response - consists of the vessel operator's ability to recognize a deviation from an intended track and the time to take corrective action.
  - Vessel's Response - the speed at which the vessel responds to rudder and main engines.

CTE is further complicated when towing astern. The swept path can vary greatly based on the characteristics of the barge and how well it tracks behind the towing vessel. The length of the towline and the environmental forces acting on the barge will impact the degree of sheer experienced by the barge. The actions of the barge will also transfer forces back to the towing vessel through the towline, further impacting the maneuverability of the towing vessel.

Tugboats involved in dredging operations present their own set of challenges. These vessels will regularly have several units towed astern and tows of four or more units occur regularly along the Atlantic Coast. Each trailing unit will have a separate, additional hawser that is approximately 600-900 feet long. Each hopper barge, dump scow, or section of pipeline will have unique handling characteristics due to its load and hull characteristics. These tows will have significantly larger footprints than traditional tugs towing astern due to their long length and unique yaw characteristics.

In general, however, the swept path for towing a large 600-700' barge astern with 2,000' wire could easily be up to a ½ NM or more under typical adverse crosswind and crosscurrent conditions. For average tugboat and barge operations, the swept path would range from ¼- ½ NM.

Closest Point of Approach (CPA)

In complying with the COLREGs, the Captain of a vessel is required to consider all dangers of navigation and collision and any special circumstances, including limitations of the vessels involved, which may make a departure from the COLREGS necessary to avoid immediate danger.[1] When determining an appropriate CPA, all factors of weather, maneuvering capability, visibility, etc. must be considered, as well as potential emergency situations such as a Not Under Command situation or loss of tow. Under ideal conditions with low sea states, good visibility and good communications between vessels to arrange a passing agreement, a CPA of ½ to 1 NM may be acceptable. Under less ideal weather and sea conditions, a CPA of 2 NM or more may be necessary to account for prevailing conditions.[2] By increasing the planned CPA, the chance of a collision or allision will be decreased.

Density of Traffic

The amount of traffic along a route will dictate the likelihood of vessels sharing sea space in meeting, overtaking or crossing situations. With good communications and early actions, vessels can make arrangements to limit the number of vessels alongside each other. However, there will be times when multiple vessels converge on the same location and additional sea space is necessary to maneuver safely and maintain appropriate CPAs for all vessels. The longer the route is constrained, the more likely multiple vessels will meet along a route. Crossing traffic such as fishing vessels or service vessels transiting to/from offshore installations will further complicate vessel interactions. At a minimum, a route should be designed to accommodate three vessels passing abreast of each other, a situation which occurs regularly during normal operations. In addition, when towing in the vicinity of faster, deeper draft vessels, tugboats will attempt to stay clear of deep draft vessels by navigating along the edge of an established navigation lane, Traffic Separation Scheme, or other navigation corridor. Therefore, additional sea room may be required at the entrances to harbors, or in other areas traversed by deep draft vessels.

Sea State Limitations and Depth of Water

Most towing operations are restricted to operating within certain sea state limitations. Weather along the intended route will be considered prior to departing port and may dictate when the transit is scheduled. The lee provided by the shore provides some protection from westerly

[1] COLREGS - International Regulations for Preventing Collisions at Sea - International Regulations for Preventing Collisions at Sea, 1972 - Rule 2 Responsibility.

[2] A CPA of 2 NM or greater was identified by towing industry captains at a Captains Meeting on February 5, 2015 in Portsmouth, VA, as the distance necessary to minimize the chance of collisions and allisions during adverse weather conditions.

winds by reducing the fetch and therefore sea state. However, if winds are easterly, the only option may be to pay out additional wire or slow the vessel. Both of these actions will increase the catenary and may require additional depth. Ultimately, confined offshore navigation routes that reduce tug captains' discretion in planning a voyage will restrict vessels to departing only during the most ideal circumstances. Canceled and delayed trips will have a significant, negative impact on the flow of interstate commerce. When considering the location and width of a route, these factors need to be considered for the range of towing operations that may occur.

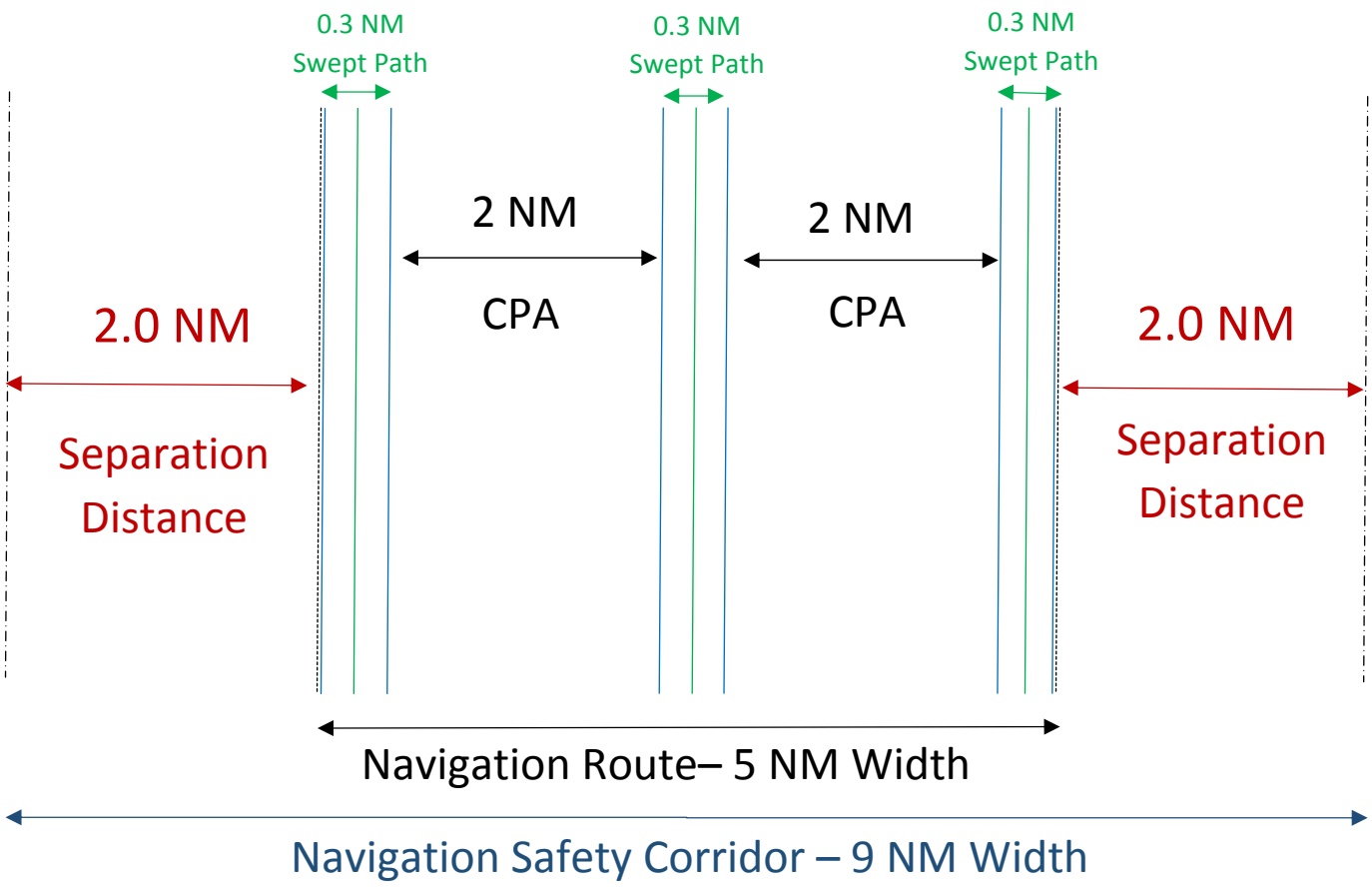
Conclusion

Based on the navigation challenges described above, a coastwise sea lane along the Atlantic Coast would need to accommodate three towing vessels abreast of each other under adverse weather conditions. The below scenario assumes 2 NM as the minimum acceptable CPA under adverse conditions. A ⅓ NM CTE for each tugboat and barge combination was chosen as a reasonable distance based on the range of actual towing vessel operations, knowing that it is unlikely that all three of the tugboat and barge operations would be the maximum size.

Under these assumptions, the resulting navigation route would be 5 NM wide and the total navigation safety corridor width, accounting for separation distances from hazards or obstructions would be 9 NM.[3] In addition to the necessary width, the corridor must also be located an adequate distance from shore so that water depth is appropriate for the range of towing vessel operations expected.

[3] A scenario of two maximum size tugboat and barge operations in a meeting situation, assuming 2.5 NM CPAs and a CTE of 1.0 NM would also result in a total navigation safety corridor width of 9 NM (with a navigation route width of 4 NM).

Atlantic Coast Towing Vessel Safety Corridor



Intended Route

Cross Track Error

Separation Distance

Navigation Route Boundary

Navigation Safety Corridor Boundary