APPENDIX V

Analysis of Navigational Conflicts with the Maryland Wind Energy Area

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Prepared for:

UNITED STATES COAST GUARD ATLANTIC AREA

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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).

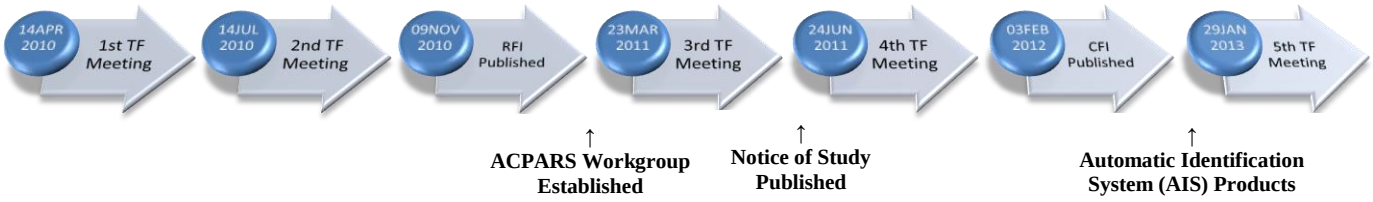

Figure 1: Maryland WEA Timeline

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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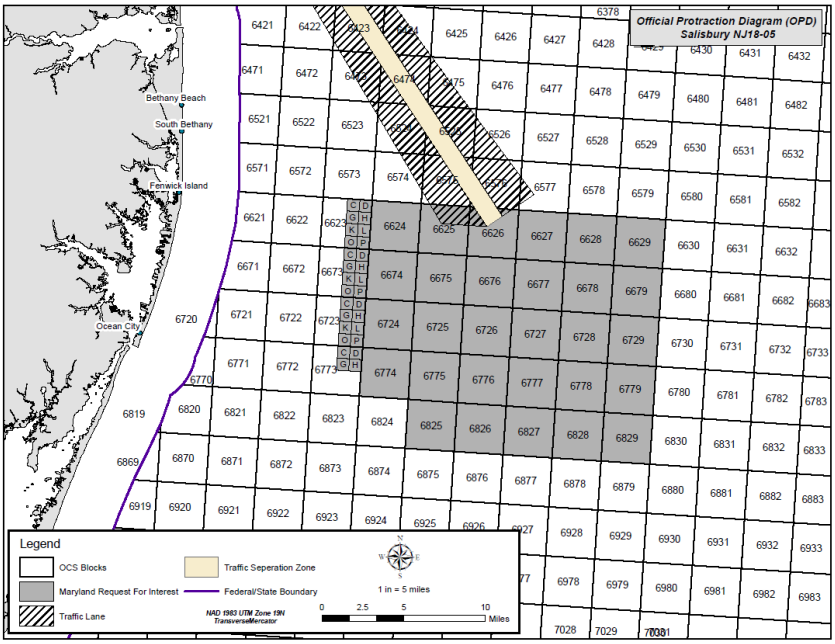

Figure 2: Maryland Map Showing the Request for Information

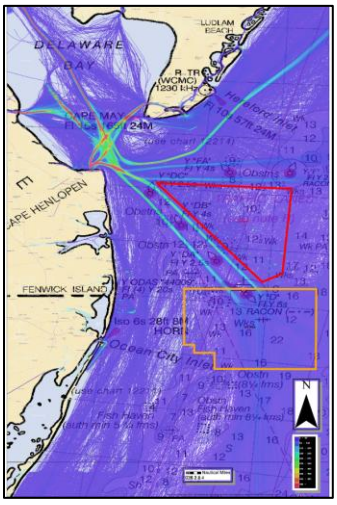

Figure 3: Heat Map with Initial Maryland and Delaware WEAs

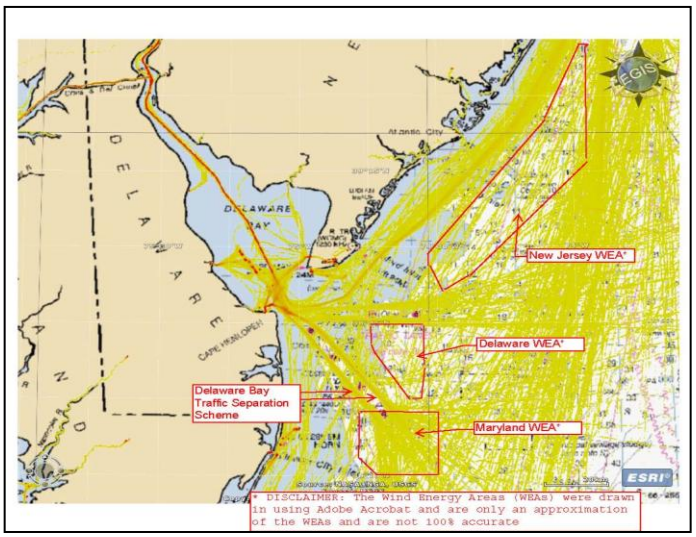

Figure 4: Heat Map with Initial Maryland, Delaware, and New Jersey WEAs Roughly Approximated

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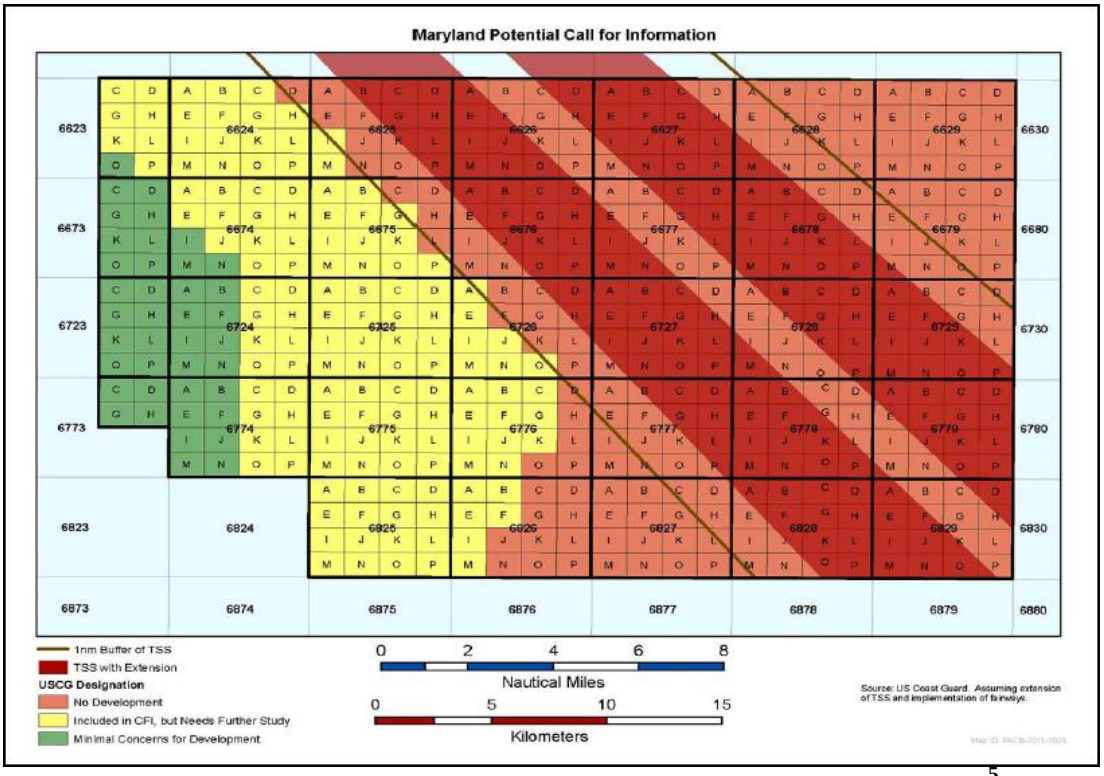

Figure 5: Maryland Call Area with TSS Extension (Red, Yellow, Green) [5]

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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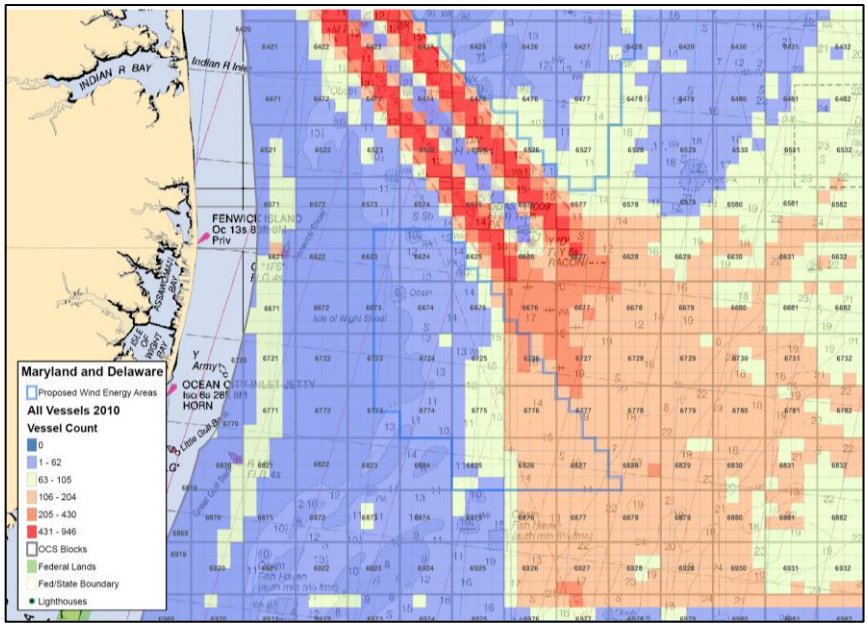

Figure 6: Density Plot of the Maryland "Call" Area Produced by the Coast Guard using 2010 AIS Data

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.

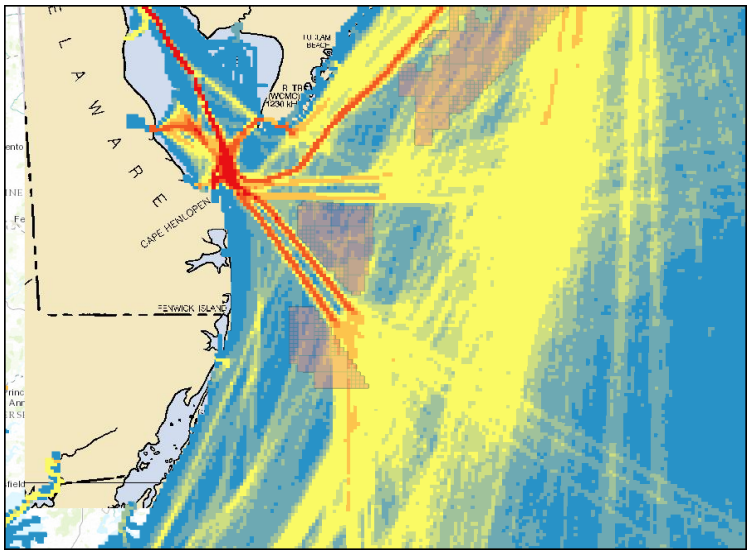

Figure 7: All Commercial Vessel Traffic[6]

[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.

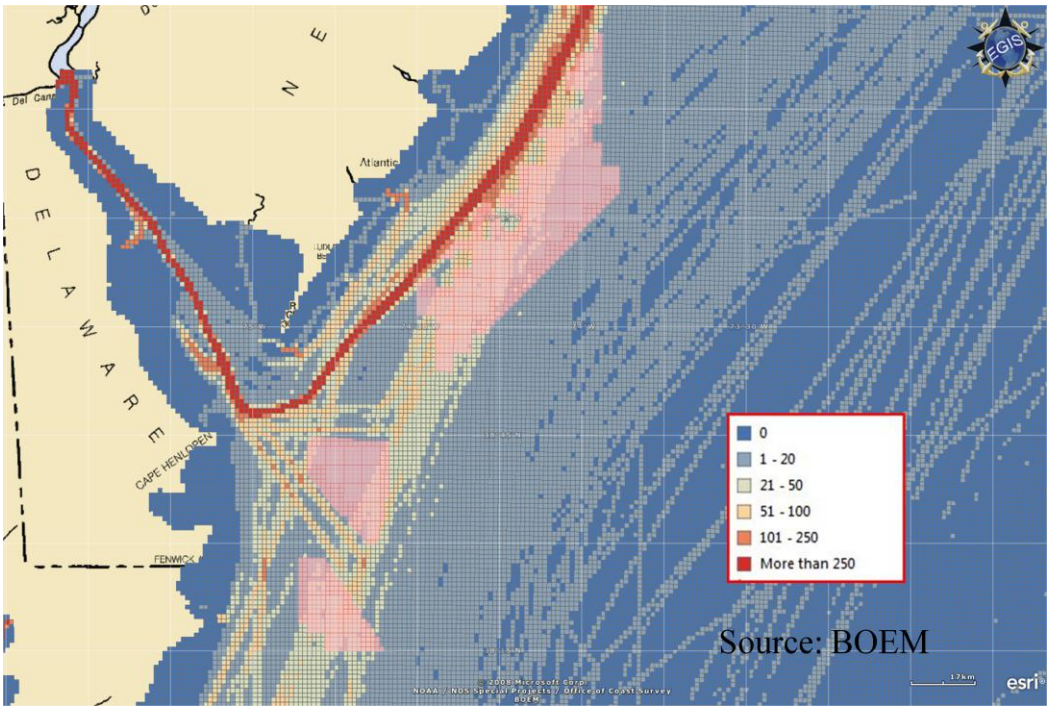

Figure 8: Density Plot of Tug and Barge Routes Through NJ, DE, and MD WEAs Using 2010 AIS Data

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.

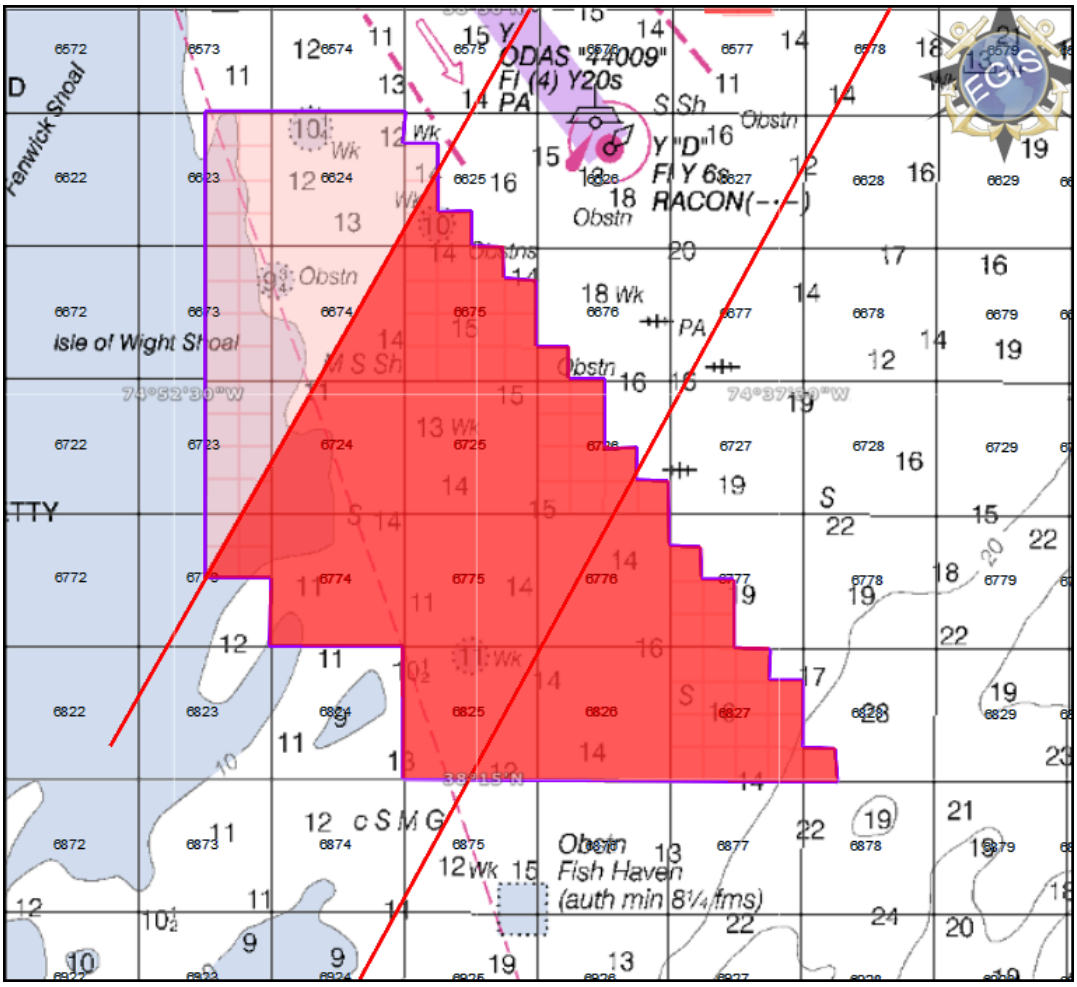

Figure 9: Representation of DE and MD WEAs if Existing Tug and Barge Routes Were Preserved. The Red Lines Represent the Edges of the Tug and Barge Route

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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.

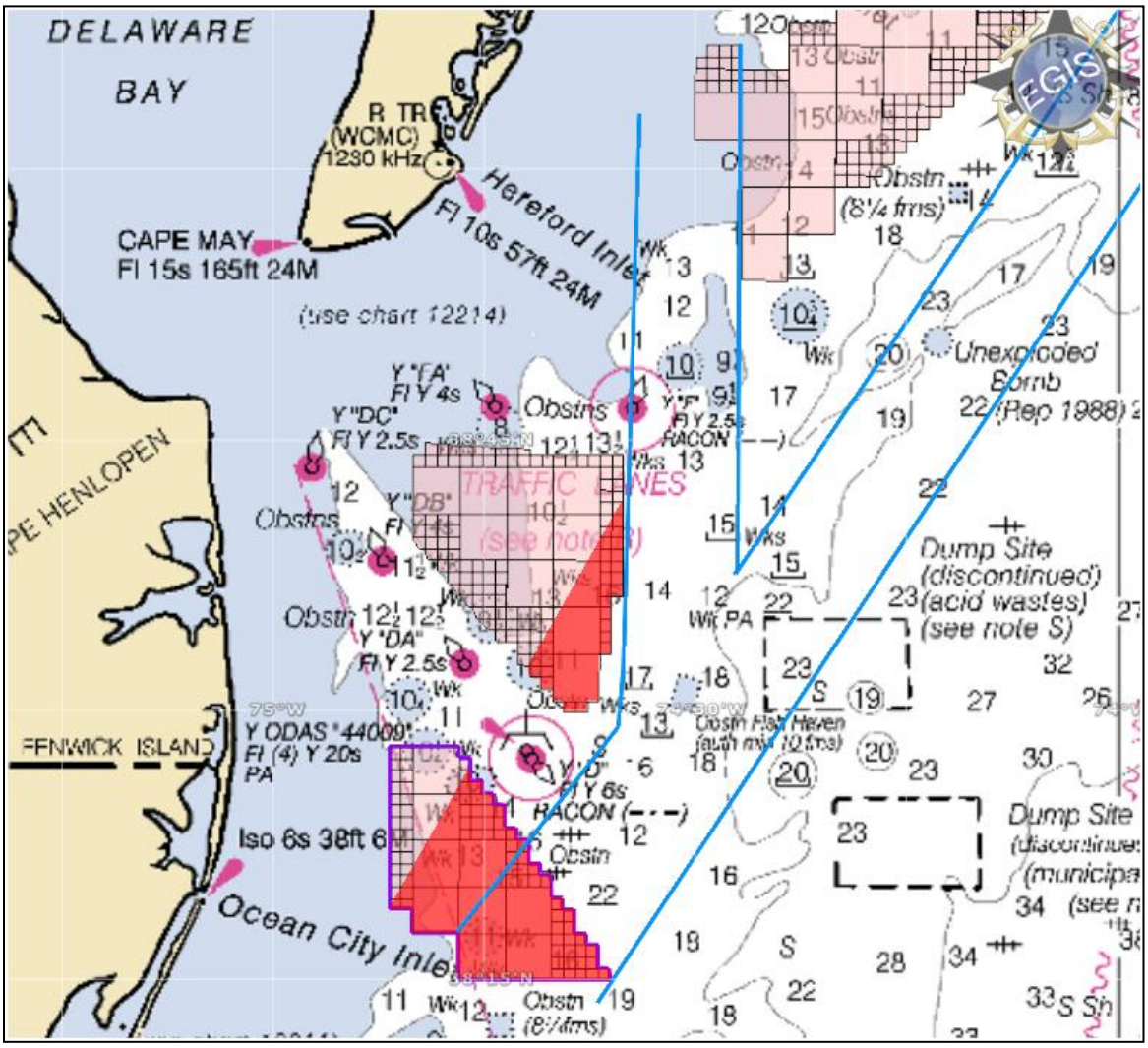

Figure 10: Alternative Routing Scenario #1 (Shown in Blue)

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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.

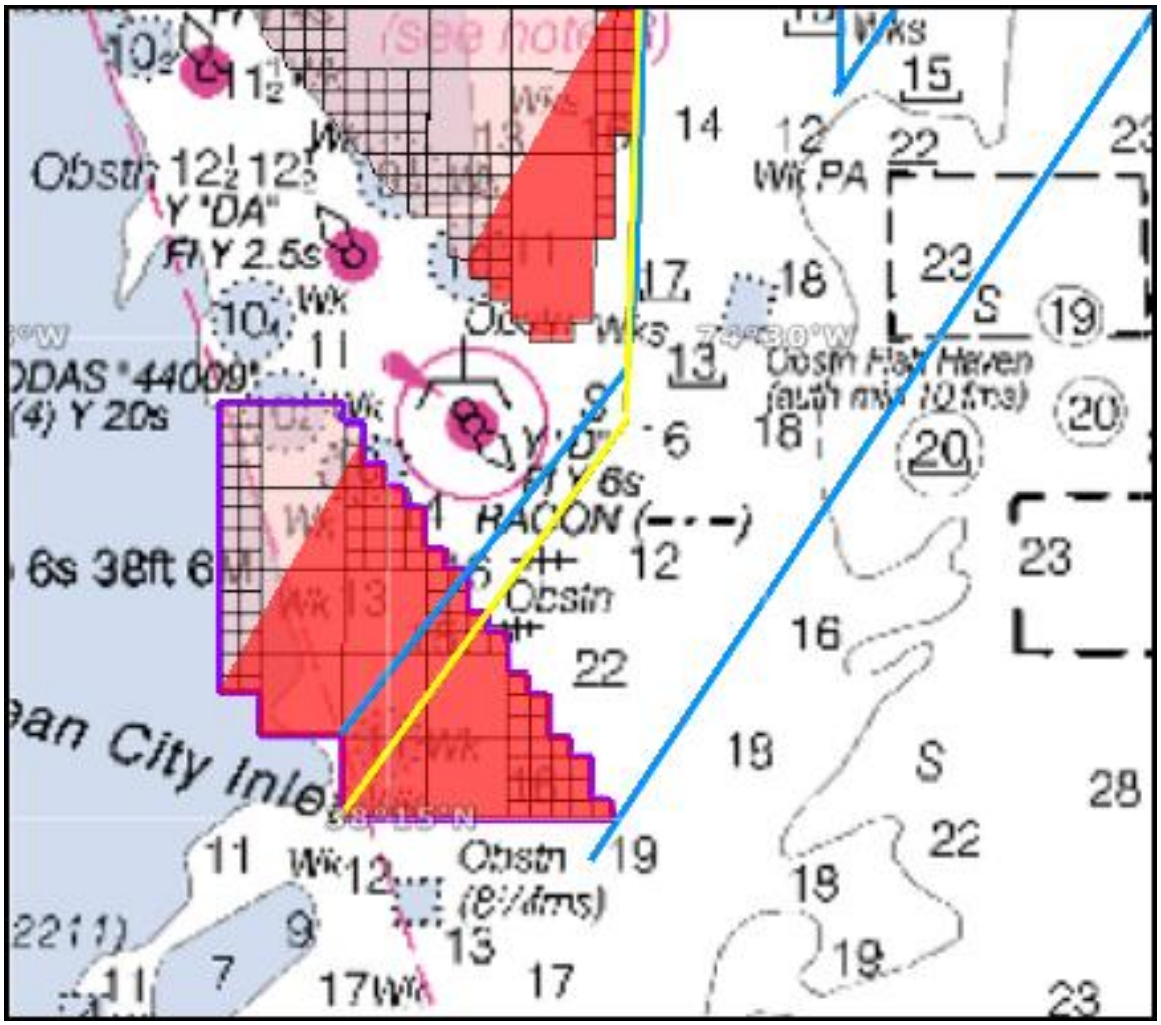

Figure 11: Alternative Routing Scenario #2 (Shown in Yellow)

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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.