New England Wind

AVANGRID RENEWABLES

Construction and Operations Plan

Lease Area OCS-A 0534

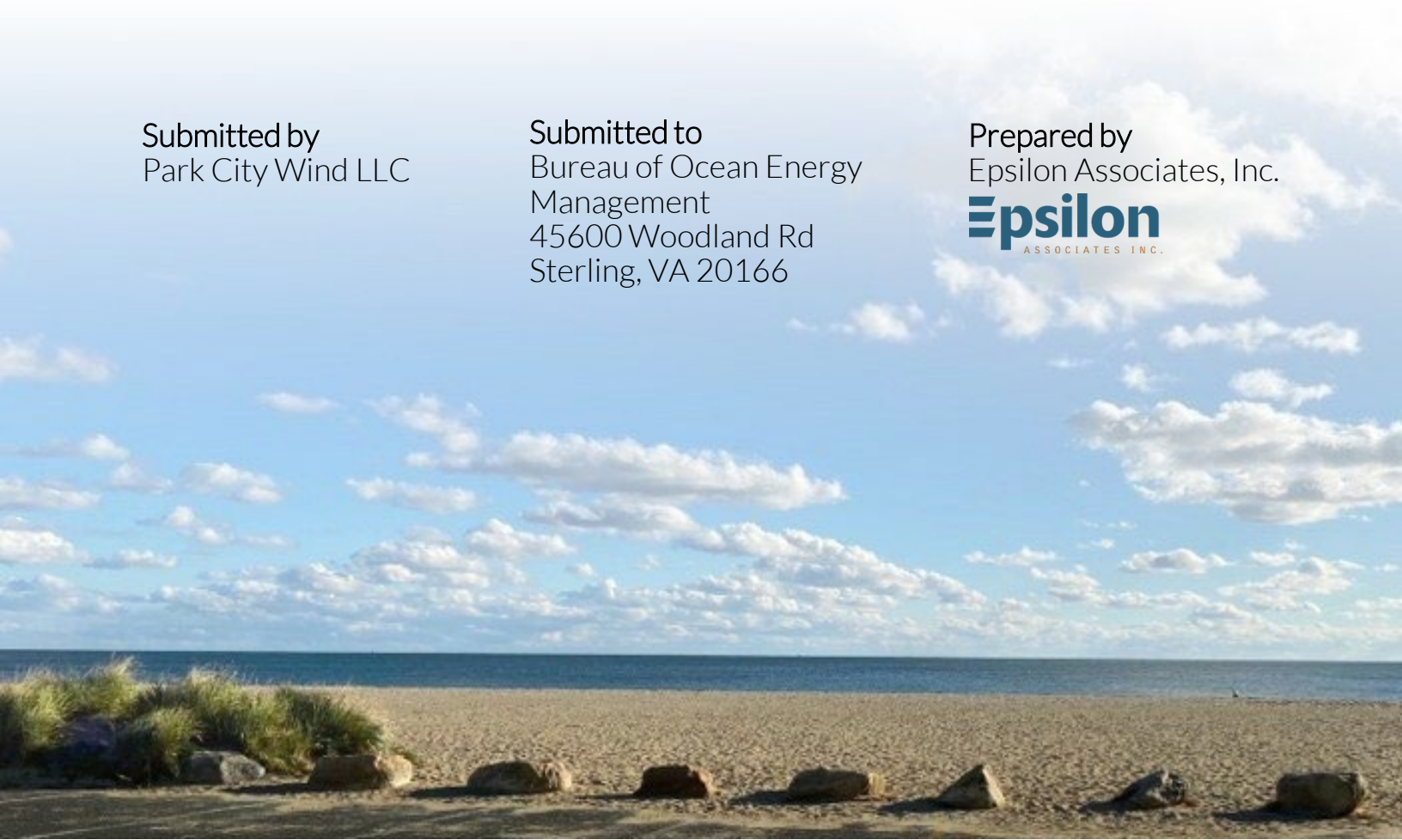
Volume III Appendices

February 2024

Submitted by
Park City Wind LLC

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

Prepared by
Epsilon Associates, Inc.



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Volume III Appendices

Submitted to:
BUREAU OF OCEAN ENERGY MANAGEMENT
45600 Woodland Rd
Sterling, VA 20166

Submitted by:
Park City Wind LLC

Prepared by:
Epsilon ASSOCIATES INC.

In Association with:

Baird & Associates
Biodiversity Research Institute
Capitol Air Space Group
Geo SubSea LLC
Geraldine Edens, P.A.
Gray & Pape
JASCO Applied Sciences
Public Archaeology Laboratory, Inc.
RPS
Saratoga Associates
SEARCH, Inc.
Wood Thilsted Partners Ltd

February 2024

On April 29, 2022, modifications were made to the project design Envelope that involved changing the maximum wind turbine generator (WTG) and electrical service platform (ESP) topside parameters for Phase 1 (Park City Wind) to match those of Phase 2 (Commonwealth Wind) (see Table 1). As a result of this change, the potential minimum footprint of Phase 1 decreased, and correspondingly the potential maximum footprint of Phase 2 increased (see Table 2). Additionally, the maximum capacity in megawatts for both phases was eliminated to accommodate the rapid advancement in commercially available wind turbine generator size and technology.

Table 1 Modifications to the Phase 1 WTG and ESP Parameters[1]

Maximum WTG Parameters	Previous Dimension	New Dimension[2]
Tip Height	319 m (1,047 ft)	357 (1,171 ft)
Top of the Nacelle Height	199 m (653 ft)	221 m (725 ft)
Hub Height	192 m (630 ft)	214 m (702 ft)
Rotor Diameter	255 m (837 ft)	285 m (935 ft)
Minimum Tip Clearance[3]	27 m (89 ft)	27 m (89 ft)
Blade Chord	8 m (26 ft)	9 m (30 ft)
Tower Diameter	9 m (30 ft)	10 m (33 ft)[4]
Maximum ESP Parameters	**Previous Dimension**	**New Dimension[2]**
Width	45 m (148 ft)	60 m (197 ft)
Length	70 m (230 ft)	100 m (328 ft)
Height	38 m (125 ft)	No change
Height of Topside (above MLLW[5])	70 m (230 ft)	No change

1. Maximum WTG dimensions are included in Table 3.2-1 and maximum ESP dimensions are included in Table 3.2-3 of COP Volume I
2. The new Phase 1 WTG and ESP maximum parameters were revised to match those of Phase 2
3. All parameters are maximum values except tip clearance, where the minimum tip clearance represents the maximum potential impact
4. To accommodate the slight increase in tower diameter, the maximum transition piece diameter/width for Phase 1 monopile foundations was also increased from 9 m (30 ft) to 10 m (33 ft) (see Table 3.2-2 of COP Volume I)
5. MLLW: Mean Lower Low Water

To accommodate the larger Phase 1 WTG dimensions and greater capacity range, the minimum footprint of Phase 1 decreased and the maximum footprint of Phase 2 increased, thus also adjusting the potential number of WTG/ESP positions within each Phase (see Table 2).

Table 2 Modifications to the Phase 1 and Phase 2 Layout and Size

		Previous Layout and Size	New Layout and Size
Phase 1	Number of WTGs	50-62	41-62
	Area	182-231 km^2 (44,973-57,081 acres)	150-231 km^2 (37,066-57,081 acres)
Phase 2	Number of WTGs	64-79	64-88
	Area	222-271 km^2 (54,857-66,966 acres)	222–303 km^2 (54,857–74,873 acres)

These revisions remain within the maximum design scenario considered for this report and the maximum potential impacts are still representative considering these modifications. Therefore, this report was not updated to reflect these minor modifications, as the findings are not affected.

New England Wind

Epsilon Associates, Inc.

Offshore near Martha's Vineyard and Nantucket, Massachusetts

Obstruction Evaluation & Airspace Analysis

August 2, 2021

Capitol Airspace Group

capitolairspace.com

(703) 256 - 2485

5400 Shawnee Road, Suite 304
Alexandria, VA 22312

703-256-2485
capitolairspace.com

Summary

Capitol Airspace conducted an obstruction evaluation and airspace analysis for the proposed New England Wind energy development (New England Wind), which is located in Lease Area OCS-A 0534 and the southwest portion of Lease Area OCS-A 0501 (referred to as the Southern Wind Development Area [SWDA]). New England Wind is located off the coast of Martha's Vineyard and Nantucket, Massachusetts. New England Wind will be developed in two Phases. The Phase 1 turbines will have a maximum height of 1,047 feet and the Phase 2 turbines will have a maximum height of 1,171 feet.

The purpose for this analysis was to identify obstacle clearance surfaces established by the Federal Aviation Administration (FAA) that could limit the placement of 1,047 and 1,171-feet (ft) above ground level (AGL) WTGs. At the time of this analysis, 130 wind turbine locations (black points, ***Figure 1***) and one vacant position located in the separate aliquot north of Lease Area OCS-A 0501 had been identified. This analysis assessed height constraints overlying each location as well as an approximately 175-square-mile study area (black outlines, ***Figure 1***) to aid in identifying optimal WTG locations.

The Bureau of Ocean Energy Management (BOEM) is responsible for regulating renewable energy activities on the outer continental shelf in accordance with 30 CFR Part 585. The New England Wind project lies both within and outside of the 12 nautical mile (NM) United States (US) territorial waters, and therefore lies in both FAA and BOEM jurisdiction. As part of the application process for leases, grants, and easements, BOEM may require the inclusion of an aeronautical study to determine the proposal's impact on airspace use and safety. If a project is determined to have an unacceptable impact on civil aviation or military activities, it could result in denial of the application.

14 CFR Part 77 applies to all structures within US territorial airspace. 14 CFR Part 77.9 requires that all structures exceeding 200 ft AGL be submitted to the FAA so that an aeronautical study can be conducted. The FAA's objective in conducting aeronautical studies is to ensure that proposed structures do not have an effect on the safety of air navigation and the efficient utilization of navigable airspace by aircraft. The end result of an aeronautical study is the issuance of a determination of 'hazard' or 'no hazard' that can be used by the proponent to obtain necessary local construction permits. It should be noted that the FAA has no control over land use in the US and cannot enforce the findings of its studies. In instances where the project lies outside of US territorial airspace and lies in BOEM jurisdiction, BOEM will consult with the FAA for any airspace that the FAA may need to adjust.

The lowest height constraints overlying the SWDA range from 549 to 4,549 ft above mean sea level (AMSL) and are associated with minimum vectoring altitude and minimum instrument flight rules (IFR) altitude sectors. Proposed structures that exceed these surfaces would require an increase to minimum vectoring/IFR altitudes. If the FAA determines that these impacts would affect as few as one radar vectoring operation per week, it could result in determinations of hazard. Additionally, warning area W-105A overlies the SWDA and could result in military objections to the proposed offshore wind development. This study did not consider electromagnetic interference on FAA communication or surveillance radar systems.

Capitol Airspace applies FAA defined rules and regulations applicable to obstacle evaluation, instrument procedures assessment and visual flight rules (VFR) operations to the best of its ability and with the intent to provide the most accurate representation of limiting airspace surfaces as possible. Capitol Airspace maintains datasets obtained from the FAA which are updated on a 28-day cycle. The results of this analysis are based on the most recent data available as of the date of this report. Limiting airspace surfaces depicted in this report are subject to change due to FAA rule changes and regular procedure amendments. Therefore, it is of the utmost importance to obtain FAA determinations of no hazard prior to making substantial financial investments in this project.

Methodology

Capitol Airspace studied New England Wind based upon location information provided by Epsilon Associates, Inc. Using this information, Capitol Airspace generated graphical overlays to determine proximity to airports (***Figure 1***), published instrument procedures, enroute airways, FAA minimum vectoring altitude and minimum IFR altitude charts, as well as military airspace and training routes.

Capitol Airspace evaluated all 14 CFR Part 77 imaginary surfaces, published instrument approach and departure procedures, visual flight rules operations, FAA minimum vectoring altitudes, minimum IFR altitudes, and enroute operations. All formulas, headings, altitudes, bearings and coordinates used during this study were derived from the following documents and data sources:

- 14 CFR Part 77 Safe, Efficient Use, and Preservation of the Navigable Airspace
- FAA Order 7400.2N Procedures for Handling Airspace Matters
- FAA Order 8260.3E United States Standard for Terminal Instrument Procedures
- FAA Order 8260.58B United States Standard for Performance Based Navigational (PBN) Instrument Procedure Design
- Technical Operations Evaluation Desk Guide for Obstruction Evaluation/Airport Airspace Analysis (1.5.1)
- US Government Flight Information Publication, US Terminal Procedures
- National Airspace System Resource Aeronautical Data
- National Oceanic and Atmospheric Administration (NOAA) Maritime Boundaries Data

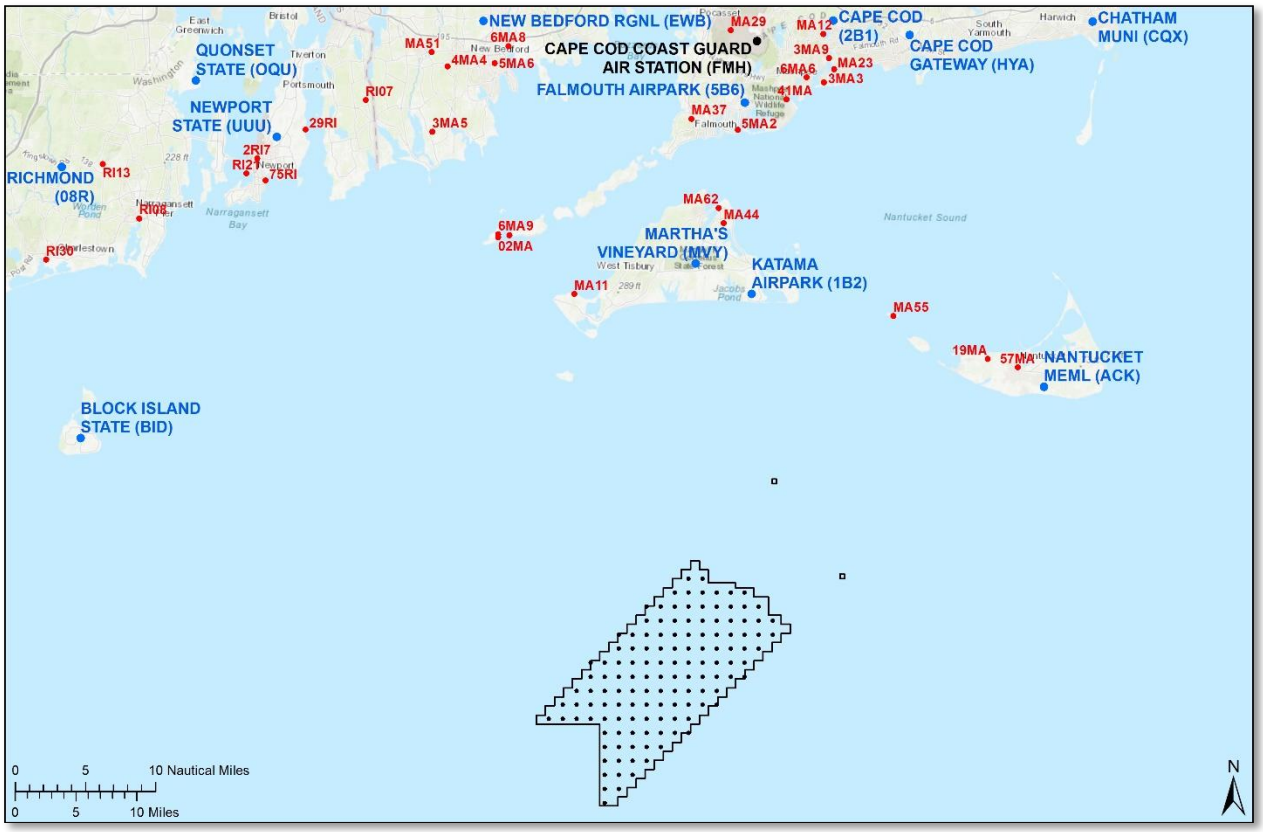


Figure 1: Public-use (blue), military (black), and private-use (red) airports in proximity to the SWDA

Study Findings

Territorial Airspace

The FAA conducts aeronautical studies for structures proposed within any state, territory, or possession of the US, within the District of Columbia, or within territorial waters[1] surrounding the US.[2]

The vacant position, located north of Lease Area OCS-A 0501, will be located within territorial waters (purple, ***Figure 2***). Structures in this aliquot that exceed 14 CFR Part 77 notification criteria must be submitted to the FAA.

No proposed WTG locations are located within territorial waters. Therefore, the FAA does not have a mandate to conduct aeronautical studies for the proposed WTGs. Regardless, BOEM may require consultation with the FAA as part of the application process and providing an aeronautical study is useful to these consultations.

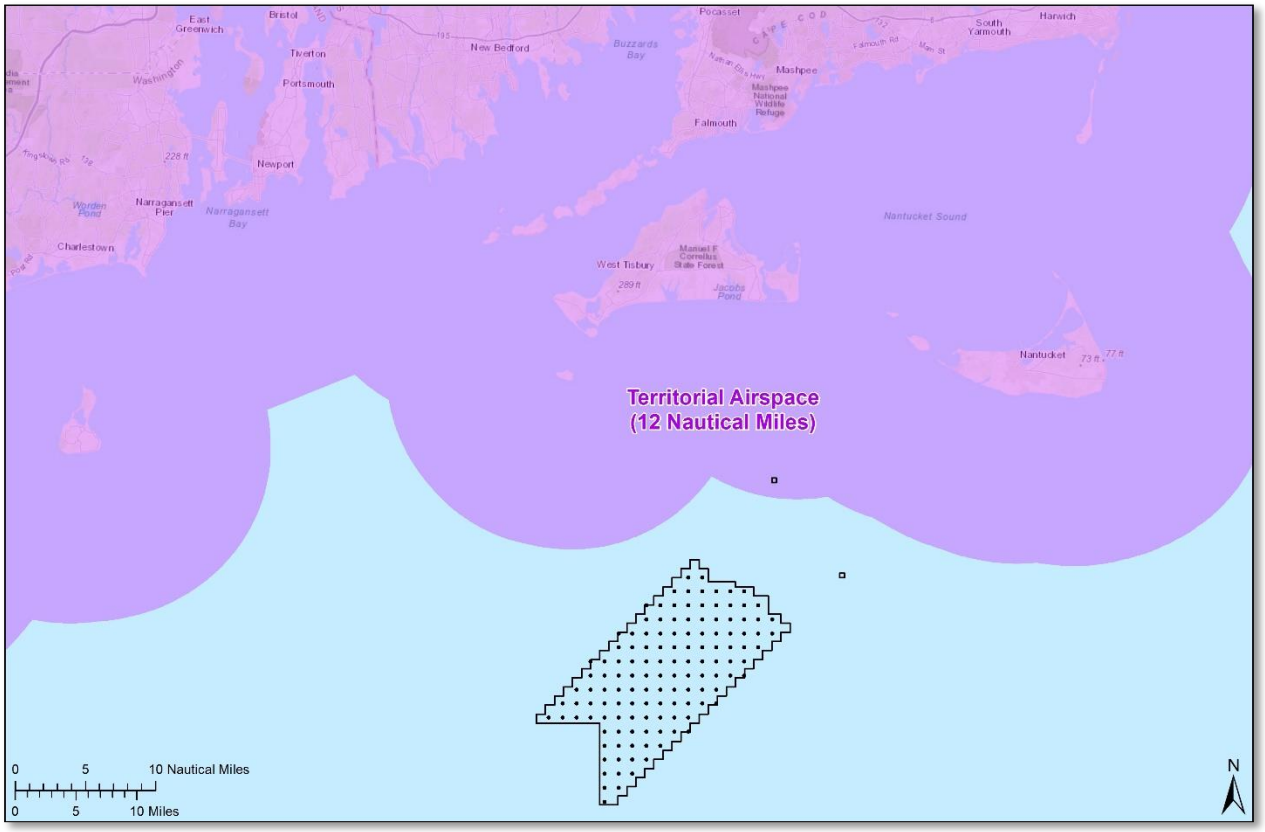


Figure 2: Territorial Airspace in proximity to the SWDA

[1] NOAA defines territorial waters as 12 nautical miles (NM) measured from the official US baseline – a recognized low water line along the coast. NOAA publishes this boundary in a publicly available ***Web Map Service***.

[2] As described in FAA Order 7400.2N 5-1-4(a) "Scope."

14 CFR Part 77.17(a)(2) Obstruction Standard and 77.19/21/23 Imaginary Surfaces

The FAA uses level and sloping imaginary surfaces to determine if a proposed structure is an obstruction to air navigation. Structures that are identified as obstructions are then subject to a full aeronautical study and increased scrutiny. However, exceeding a Part 77 imaginary surface does not automatically result in the issuance of a determination of hazard. Proposed structures must have airspace impacts that constitute a substantial adverse effect in order to warrant the issuance of determinations of hazard.

Public-use and military airport 14 CFR Part 77.17(a)(2) obstruction standard and 77.19/21/23 imaginary surfaces do not overlie the SWDA (e.g. ***Figure 3***). However, at 1,047 and 1,171 ft AGL, the proposed WTGs will exceed 77.17(a)(1) – a height of 499 ft AGL at the site of the object – and will be identified as obstructions regardless of location.

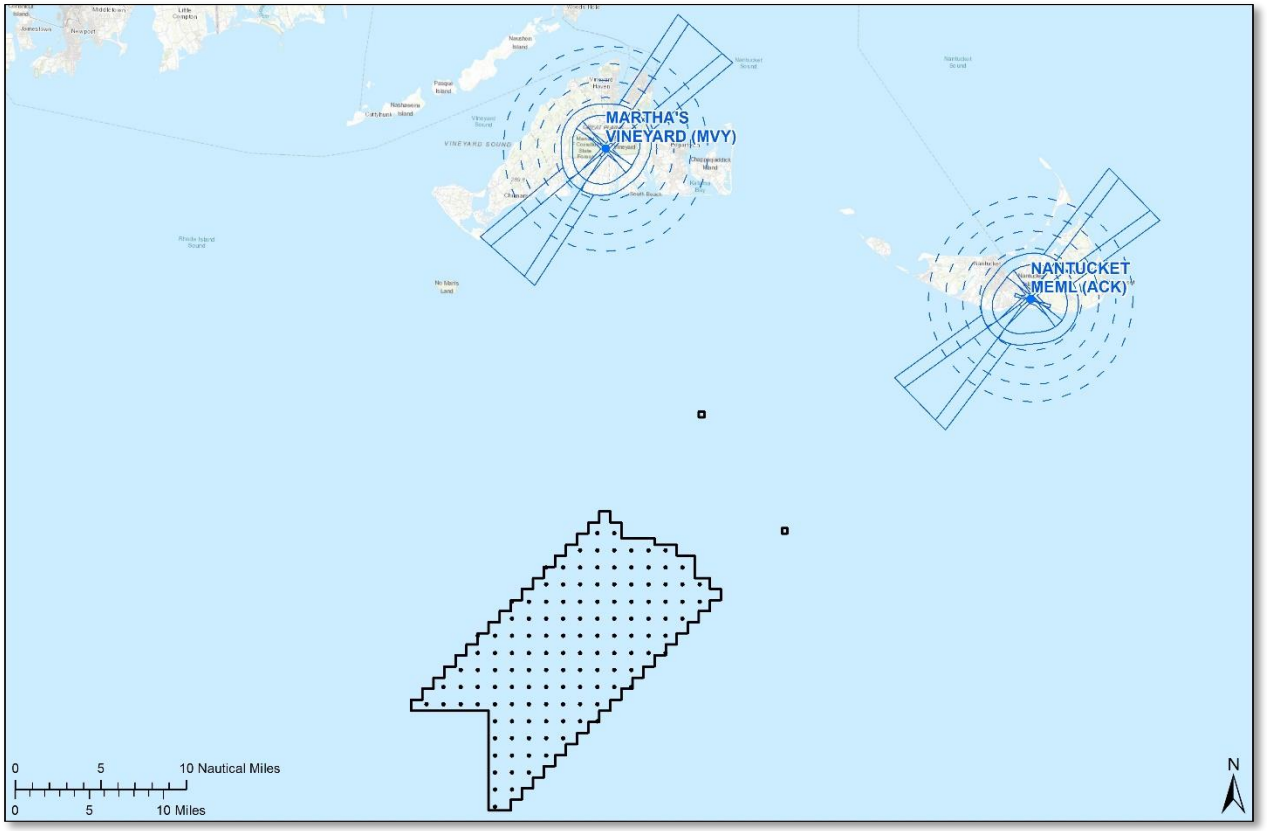


Figure 3: 77.17(a)(2) obstruction standard (dashed blue) and 77.19 imaginary surfaces (blue) in proximity to the SWDA

Visual Flight Rules (VFR) Traffic Pattern Airspace

Visual Flight Rules (VFR) traffic pattern airspace is used by pilots operating during visual meteorological conditions (VMC). The airspace dimensions are based upon the category of aircraft which, in turn, is based upon the approach speed of the aircraft. 14 CFR Part 77.17(a)(2) and 77.19 (as applied to a *visual* runway) imaginary surfaces establish the obstacle clearance surface heights within VFR traffic pattern airspace.

VFR traffic pattern airspace does not overlie the SWDA and should not limit 1,047 or 1,171-ft AGL WTGs within the defined study area (***Figure 4***).

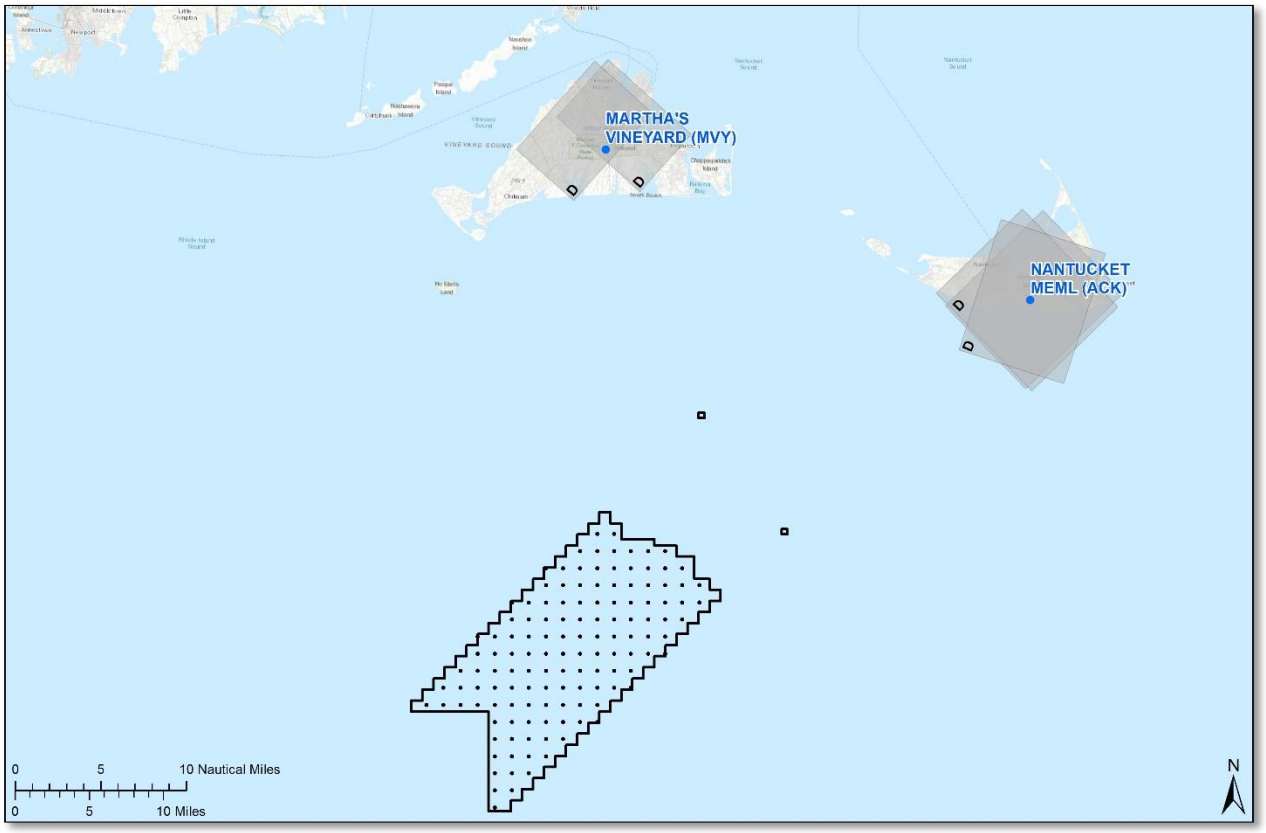


Figure 4: VFR traffic pattern airspace in proximity to the SWDA

Visual Flight Rules (VFR) Routes

During periods of marginal VMC – low cloud ceilings and one statute mile visibility – pilots often operate below the floor of controlled airspace. Operating under these weather conditions requires pilots to remain within one statute mile of recognizable landmarks such as roads, rivers, and railroad tracks. The FAA protects for known and regularly used VFR routes by limiting structure heights within two statute miles of these routes to no greater than 14 CFR Part 77.17(a)(1) – a height of 499 feet AGL at the site of the object.

Operational data describing the usage of potential VFR routes is not available. If the FAA determines VFR routes overlie the SWDA and determines that they are flown regularly (as few as one operation per day), they could limit offshore wind development in excess of 499 ft AGL and within two statute miles of these landmarks (e.g. hatched purple, ***Figure 5***). However, the SWDA is not in proximity to any landmarks that could be the basis for VFR Routes (***Figure 5***).

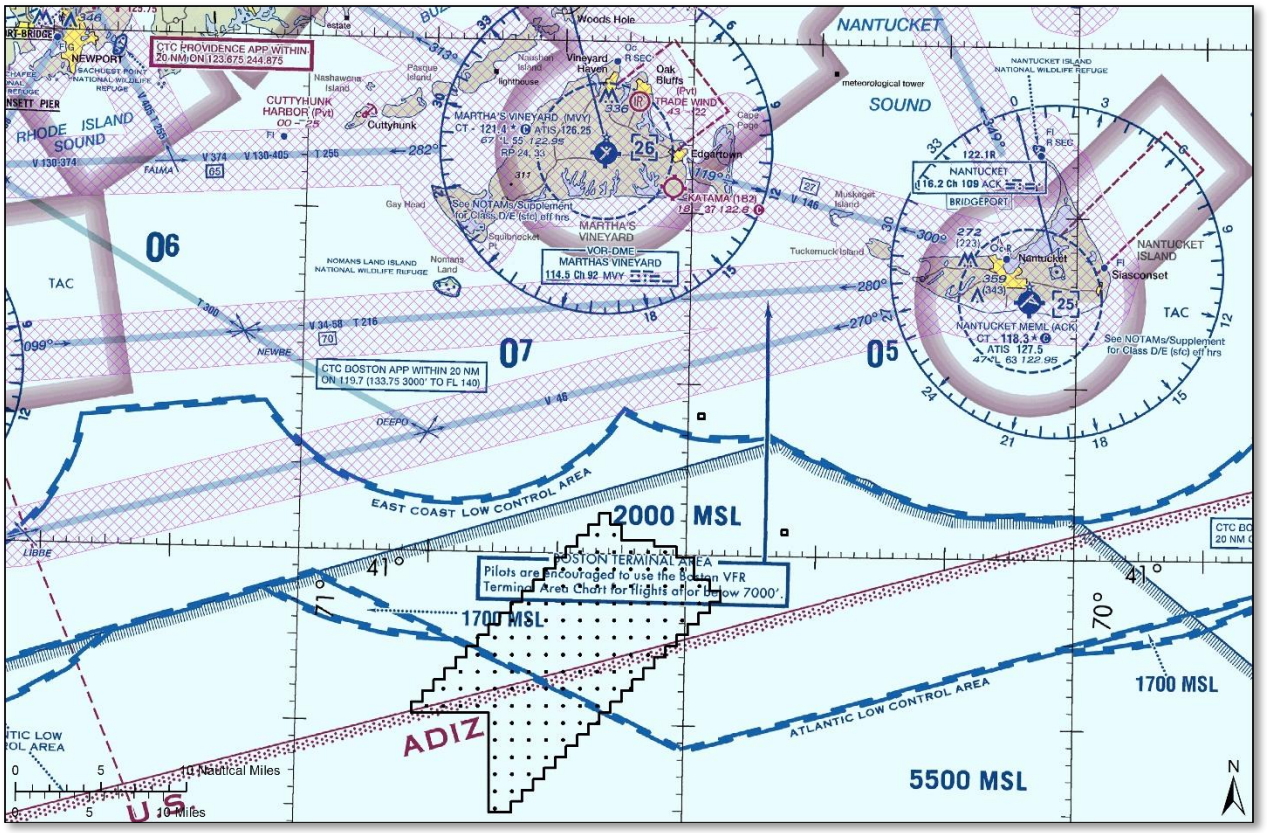


Figure 5: Potential VFR routes (hatched purple) in proximity to the SWDA

Instrument Departures

In order to ensure that aircraft departing during marginal weather conditions do not fly into terrain or obstacles, the FAA publishes instrument departure procedures that provide obstacle clearance to pilots as they transition between the terminal and enroute environments. These procedures contain specific routing and minimum climb gradients to ensure clearance from terrain and obstacles.

Proposed structures that exceed instrument departure procedure obstacle clearance surfaces would require an increase to instrument departure procedure minimum climb gradients. If the FAA determines that this impact would affect as few as one operation per week, it could be used as the basis for determinations of hazard.

Instrument departure procedure obstacle clearance surfaces (***Figure 6***) are in excess of other, lower surfaces and should not limit 1,047 or 1,171-ft AGL WTGs at any of the proposed locations.

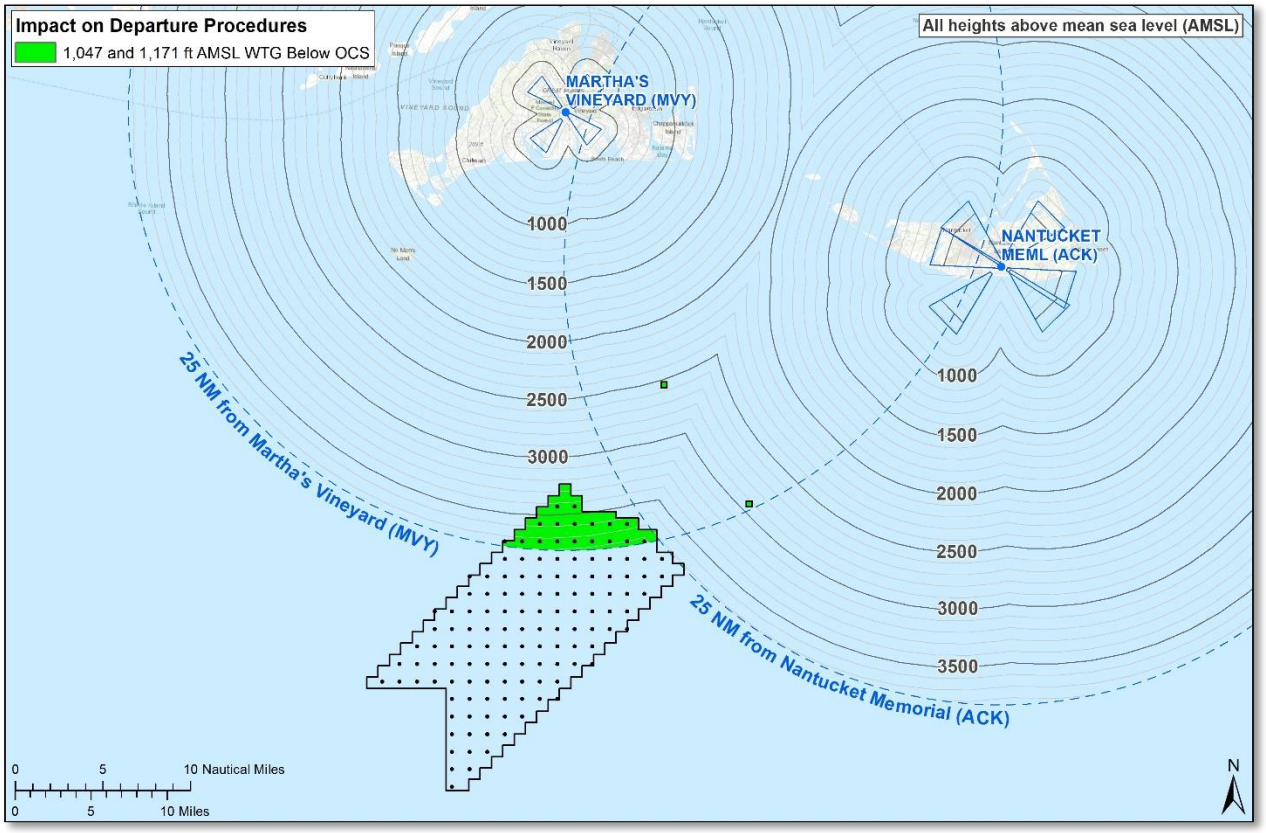


Figure 6: Martha's Vineyard (MVY) and Nantucket Memorial (ACK) obstacle departure procedure assessment (gray contours)

Instrument Approaches

Pilots operating during periods of reduced visibility and low cloud ceilings rely on terrestrial and satellite based navigational aids (NAVAIDS) in order to navigate from one point to another and to locate runways. The FAA publishes instrument approach procedures that provide course guidance to on-board avionics that aid the pilot in locating the runway. Capitol Airspace assessed 13 published instrument approach procedures at two public-use airports in proximity to the SWDA:[3]

Nantucket Memorial (ACK)
ILS or Localizer Approach to Runway 06
ILS or Localizer Approach to Runway 24
RNAV (GPS) Approach to Runway 06
RNAV (GPS) Approach to Runway 15
RNAV (GPS) Approach to Runway 24
RNAV (GPS) Approach to Runway 33
VOR Approach to Runway 24

Martha's Vineyard (MVY)
ILS or Localizer Approach to Runway 24
RNAV (GPS) Approach to Runway 06
RNAV (GPS) Approach to Runway 15
RNAV (GPS) Approach to Runway 24
RNAV (GPS) Approach to Runway 33
VOR Approach to Runway 06

Proposed WTGs that exceed instrument approach procedure obstacle clearance surfaces would require an increase to their minimum altitudes. Increases to these altitudes, especially critical *decision altitudes* and *minimum descent altitudes*, can directly impact the efficiency of instrument approach procedures. If the FAA determines this impact would affect as few as one operation per week, it could be used as the basis for determinations of hazard.[4]

Instrument approach procedure obstacle clearance surfaces (e.g. ***Figure 7***) are in excess of other, lower surfaces and should not limit 1,047 or 1,171-ft AGL WTGs at any of the proposed locations.

[3] Capitol Airspace assessed instrument approach procedures within 30 NM of the defined study area. Although approach surfaces – including terminal arrival areas, feeder segments, and initial segments – from airports further than 30 NM may overlie the defined study area, the obstacle clearance surfaces present a lower risk to projects than the surfaces identified in this report. Therefore, height constraints associated with instrument approach surfaces for airports beyond 30 NM were not considered and are not included in the ***Composite Map***.

[4] Multiple minimum safe altitudes (MSA) overlie the SWDA. However, in accordance with FAA Order 7400.2N Paragraph 6-3-9(e)(5), MSAs are for emergency use only and cannot be used as the basis for determinations of hazard. Therefore, height constraints associated with MSAs were not considered and are not included in the ***Composite Map***.

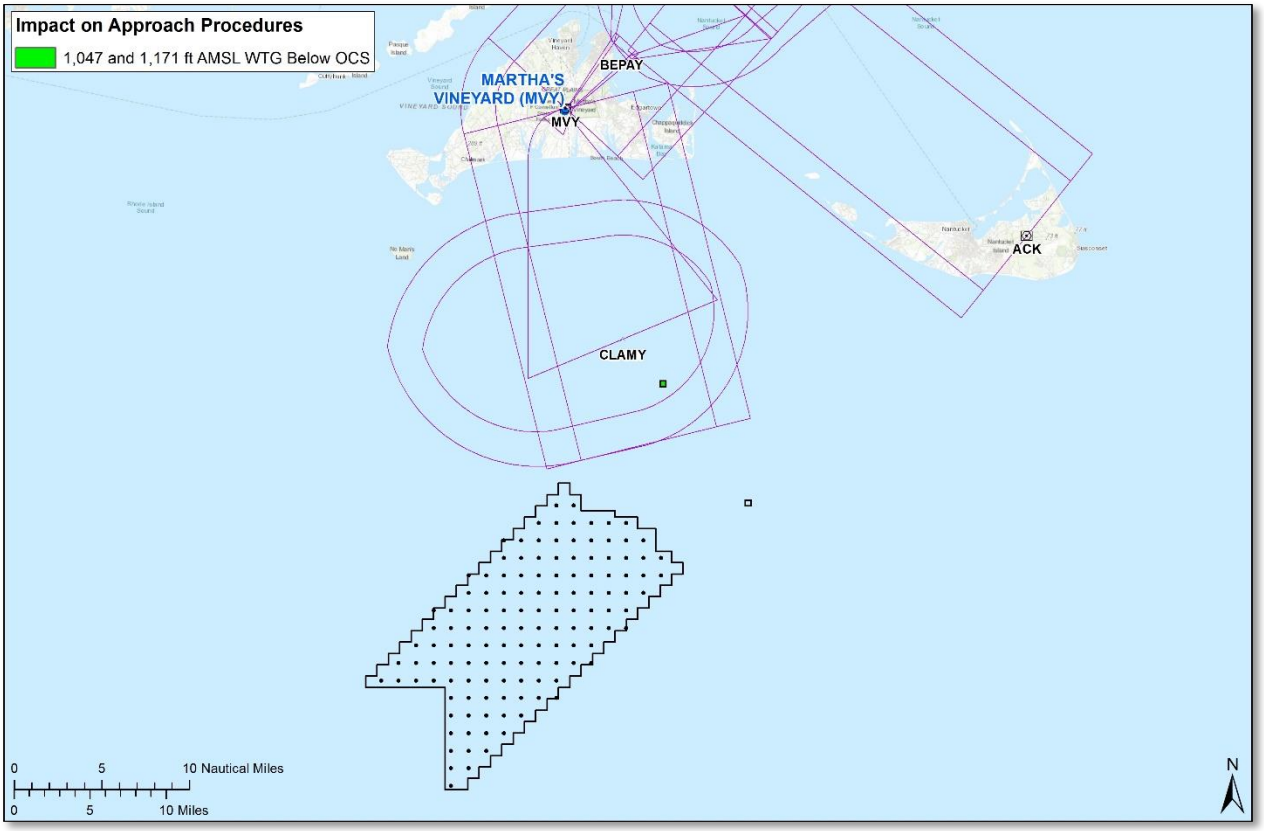


Figure 7: Martha's Vineyard (MVY) Localizer Approach to Runway 24 obstacle evaluation areas (purple outline)

Enroute Airways

Enroute airways provide pilots a means of navigation when flying from airport to airport and are defined by radials between very high frequency omni-directional ranges (VORs). The FAA publishes minimum altitudes for airways to ensure clearance from obstacles and terrain. The FAA requires that each airway have a minimum obstacle clearance of 1,000 ft in non-mountainous areas and normally 2,000 ft in mountainous areas.

Proposed structures that exceed enroute airway obstacle clearance surfaces would require an increase to their minimum obstruction clearance altitudes and/or minimum enroute altitudes. If the FAA determines that this impact would affect as few as one operation per week, it could be used as the basis for determinations of hazard.

Low altitude enroute airway obstacle clearance surfaces (e.g. ***Figure 8***) are in excess of other, lower surfaces and should not limit 1,047 or 1,171-ft AGL WTGs at any of the proposed locations.

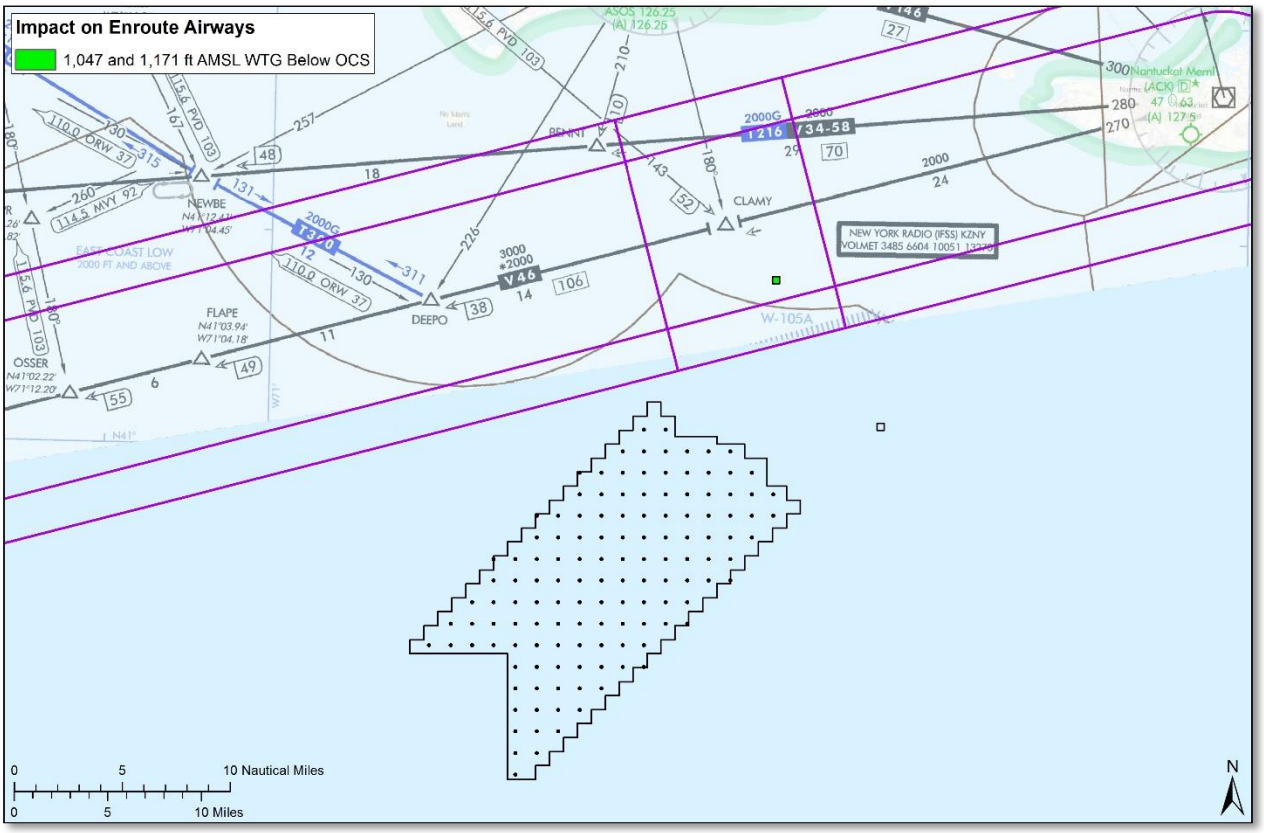


Figure 8: Low altitude enroute chart with V46 obstacle evaluation areas (purple outline)

Minimum Vectoring/IFR Altitudes

The FAA publishes minimum vectoring altitude (MVA) and minimum IFR altitude (MIA) charts that define sectors with the lowest altitudes at which air traffic controllers can issue radar vectors to aircraft based on obstacle clearance. The FAA requires that sectors have a minimum obstacle clearance of 1,000 ft in non-mountainous areas and normally 2,000 ft in mountainous areas.

Proposed structures that exceed MVA/MIA sector obstacle clearance surfaces (OCS) would require an increase to the altitudes usable by air traffic control for vectoring aircraft. If the FAA determines that this impact would affect as few as one radar vectoring operation per week, it could result in determinations of hazard.

Boston Consolidated (A90) Terminal Radar Approach Control (TRACON) MVA sectors, Providence (PVD) TRACON MVA sectors, and Boston (ZBW) Air Route Traffic Control Center (ARTCC) MIA sectors overlie the SWDA (***Table 1***, ***Figure 9***, ***Figure 10***, ***Figure 11***, ***Figure 12***, & ***Figure 13***). The obstacle clearance surfaces range from 549 to 4,849 ft AMSL and are the lowest height constraints overlying the study area. At 1,047 and 1,171 ft AGL, proposed WTGs in the northern section of the defined study area (red area, ***Figure 10***) will exceed these surfaces and require an increase to a Boston Consolidated (A90) TRACON MVA. Additionally, at 1,171 ft AGL, the proposed WTGS throughout the majority of the study area (red and orange areas, ***Figure 9***, ***Figure 10***, & ***Figure 12***) will exceed these surfaces and require an increase to Boston Consolidated (A90) TRACON and Providence (PVD) TRACON MVAs.

Table 1: MVA/MIA sector analysis summary

Facility	Chart	Sector	MVA/MIA (AMSL Feet)	OCS (AMSL Feet)	Limits 1,047' AGL WTG?	Limits 1,171' AGL WTG?
A90 TRACON	*A90_MVA_FUS3_2020 (Figure 9)*	*II*	1,500	549	0	0
		U	2,000	1,049	0	113
		T	5,500	4,549	0	0
	A90_MVA_FUS5_2021 (Figure 10)	*FF*	1,500	549	1	1
		HH	2,300	1,349	0	0
		EE	5,800	4,849	0	0
PVD TRACON	*PVD_MVA_FUS3_2019 (Figure 11)*	*B*	1,900	949	0	0
		N	2,000	1,049	0	0
		G	2,300	1,349	0	0
		H	5,800	4,849	0	0
	PVD_MVA_FUS5_2019 (Figure 12)	*N*	2,000	1,049	0	2
		G	2,300	1,349	0	0
		H	5,800	4,849	0	0
ZBW ARTCC	*ZBW_TAV_2020 (Figure 13)*	*bBOS04*	2,300	1,349	0	0
		bBOS06	5,800	4,849	0	0

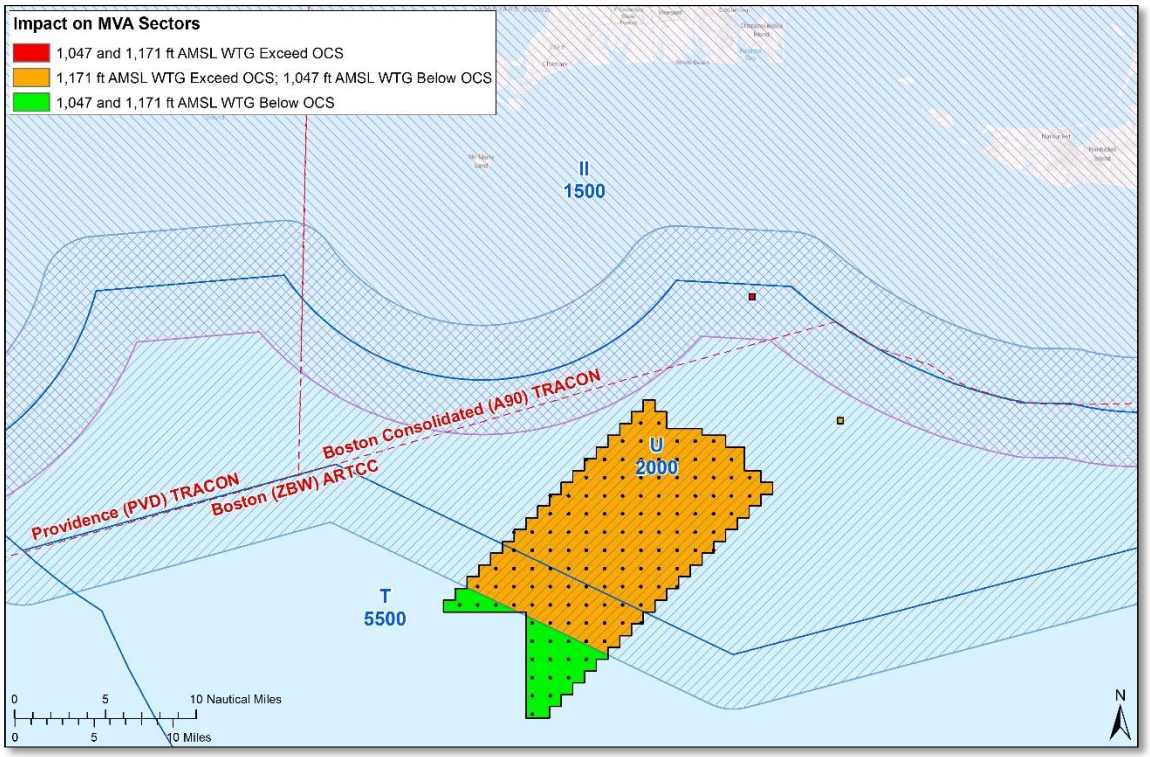


Figure 9: Boston Consolidated (A90) TRACON FUSION 3 MVA Sectors (blue outline) with Sector II (hatched purple) and Sector U (hatched blue) obstacle evaluation areas

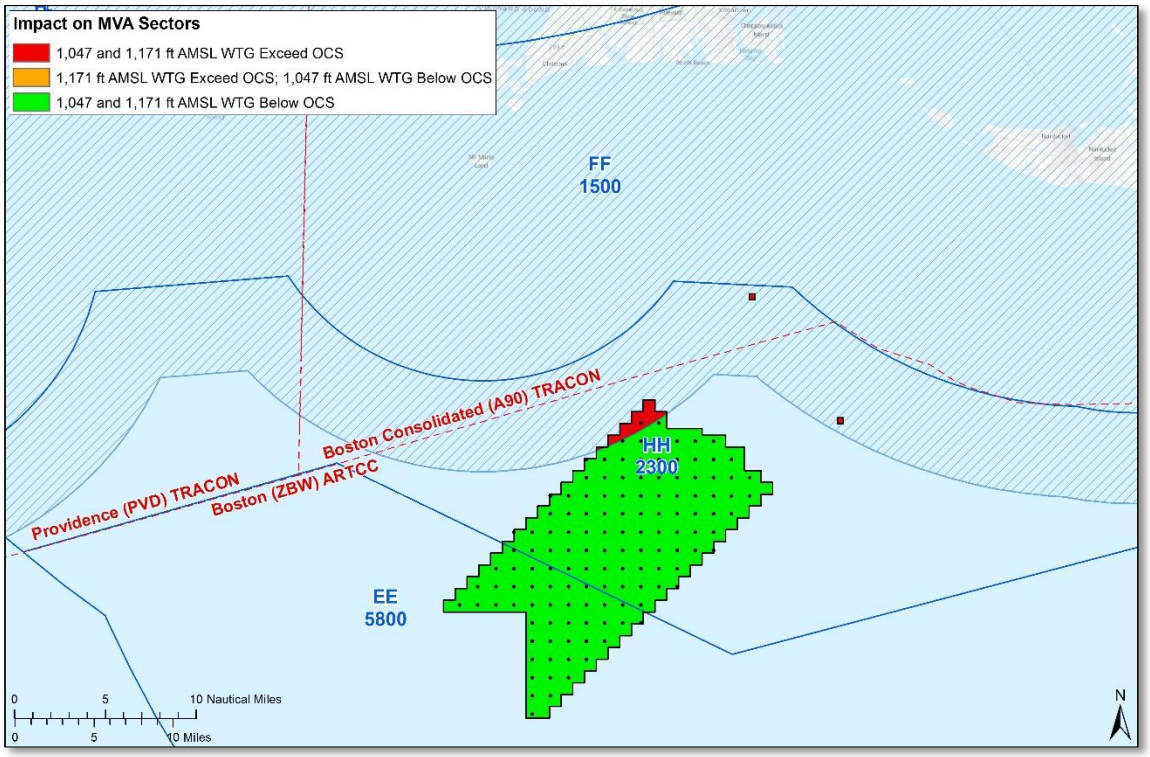


Figure 10: Boston Consolidated (A90) TRACON FUSION 5 MVA sectors (blue outline) with Sector FF obstacle evaluation area (hatched blue)

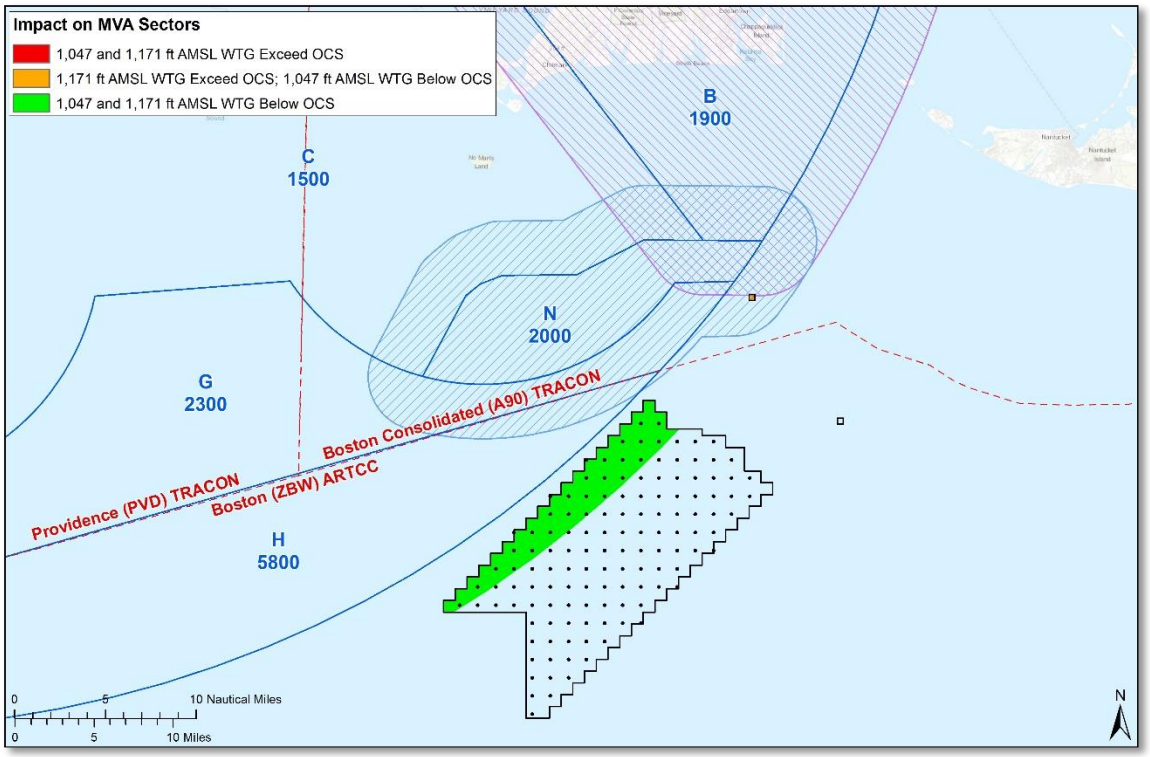


Figure 11: Providence (PVD) TRACON FUSION 3 MVA Sectors (blue outline) with Sector B (hatched purple) and Sector N (hatched blue) obstacle evaluation area

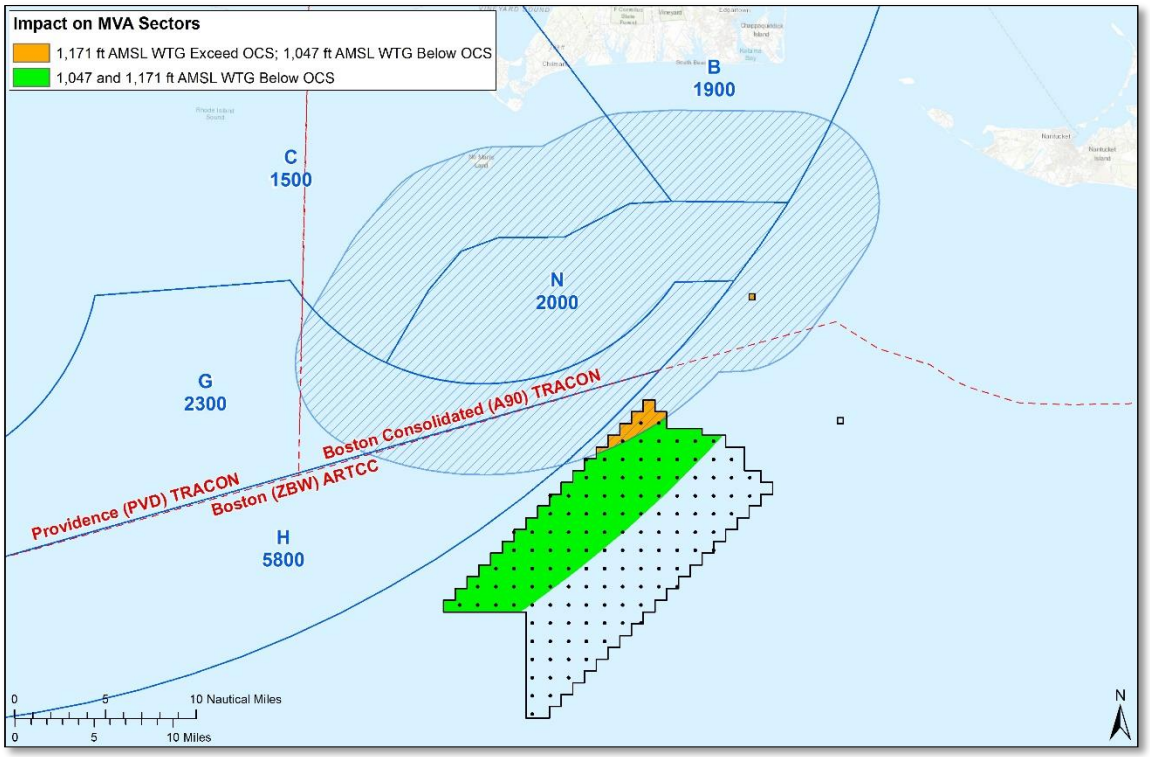


Figure 12: Providence (PVD) TRACON FUSION 5 MVA Sectors (blue outline) with Sector N obstacle evaluation area (hatched blue)

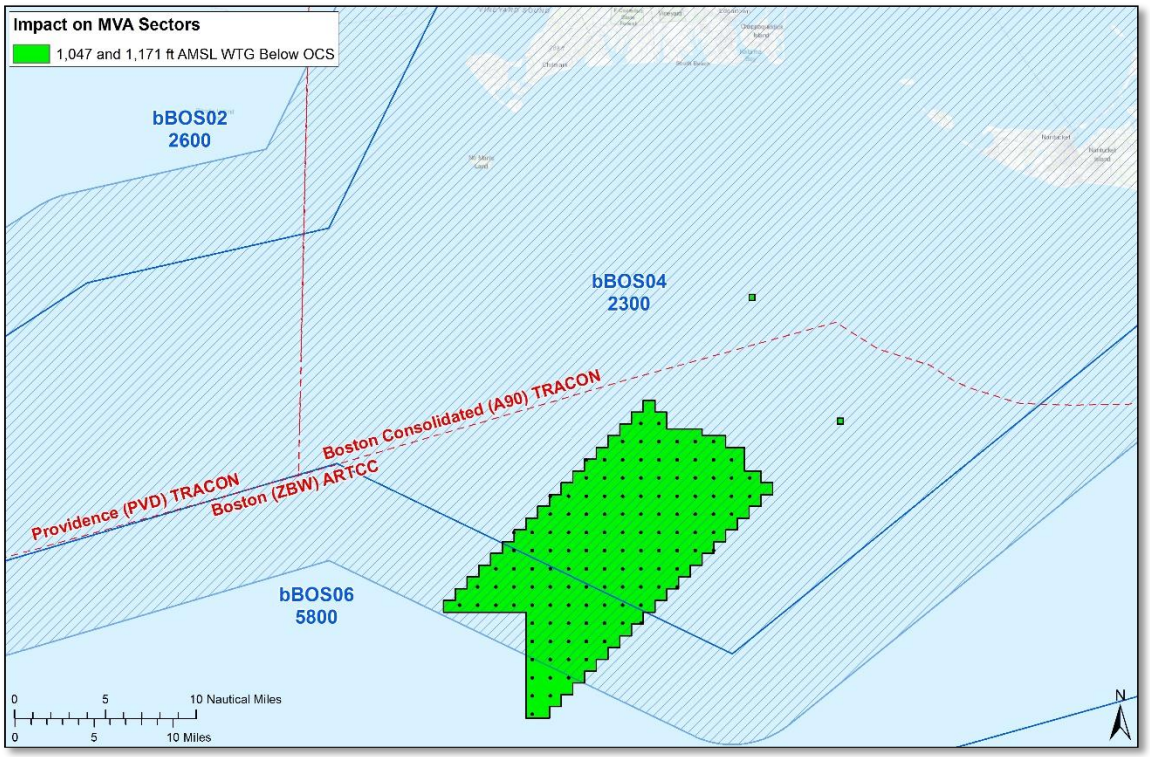


Figure 13: Boston (ZBW) ARTCC MIA Sectors (blue outline) with Sector bBOS04 obstacle evaluation area (hatched blue)

Terminal and Enroute Navigational Aids

The FAA has established protection areas in order to identify proposed structures that may have a physical and/or electromagnetic effect on navigational aids (NAVAIDs). The protection area dimensions vary based on the proposed structure type as well as the NAVAID type. Proposed structures located within these areas may interfere with NAVAID services and will require further review by FAA Technical Operations. If further review determines that proposed structures would have a significant physical and/or electromagnetic effect on NAVAIDs, it could result in determinations of hazard.

NAVAID protection areas do not overlie the SWDA (***Figure 14***). As a result, it is unlikely that the proposed WTGs would have a physical or electromagnetic effect on terminal or enroute NAVAIDs.

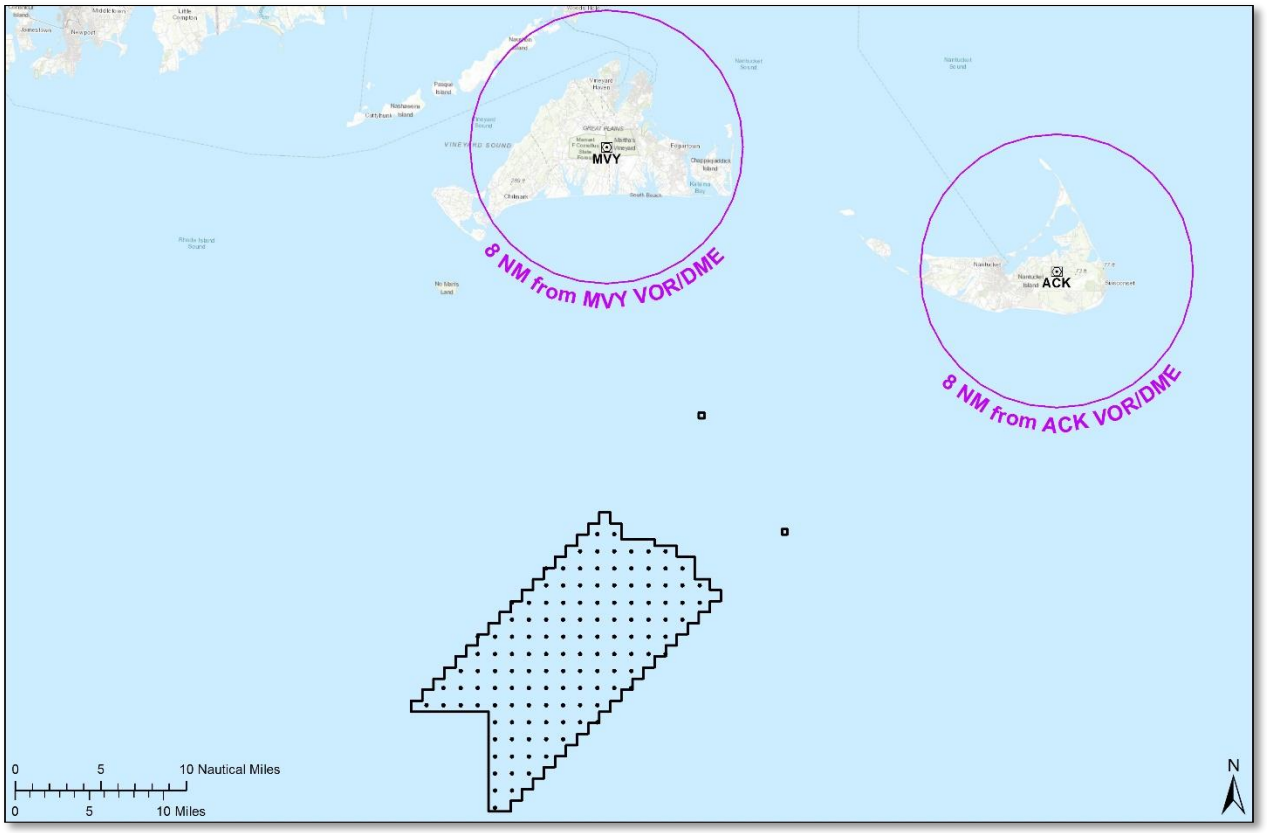


Figure 14: Martha's Vineyard (MVY) VOR/DME and Nantucket (ACK) VOR/DME protection areas (purple outline)

Military Airspace and Training Routes

Although the FAA does not consider impact on military airspace or training routes, they will notify the military of proposed structures located within these segments of airspace. Impact on these segments of airspace can result in military objections to the proposed development. Military airspace, training areas, and training routes may exist outside of US territorial waters and may require consultation with the Military Aviation and Installation Assurance Siting Clearinghouse (Clearinghouse).

Military airspace overlying the SWDA (***Figure 15***):

US Navy, Fleet Area Control and Surveillance Facility, Virginia Capes (FACSFAC VACAPES)

Route/Airspace	*Minimum Altitude*
W-105A	Surface

Due to the low altitude associated with W-105A, wind development could have an impact on its operations. If the US Navy and other nearby units use this segment of airspace regularly, they may object to the proposed offshore wind development within the boundaries of W-105A.

Under the provisions of the 2018 National Defense Authorization Act (NDAA), the Clearinghouse may issue a Notice of Presumed Risk to National Security letter to initiate mitigation discussions. These discussions are facilitated through the Clearinghouse and with the affected bases or organizations with operational interests. The Clearinghouse typically attempts to notify developers shortly before the issuance of a Notice of Presumed Risk to National Security letter.

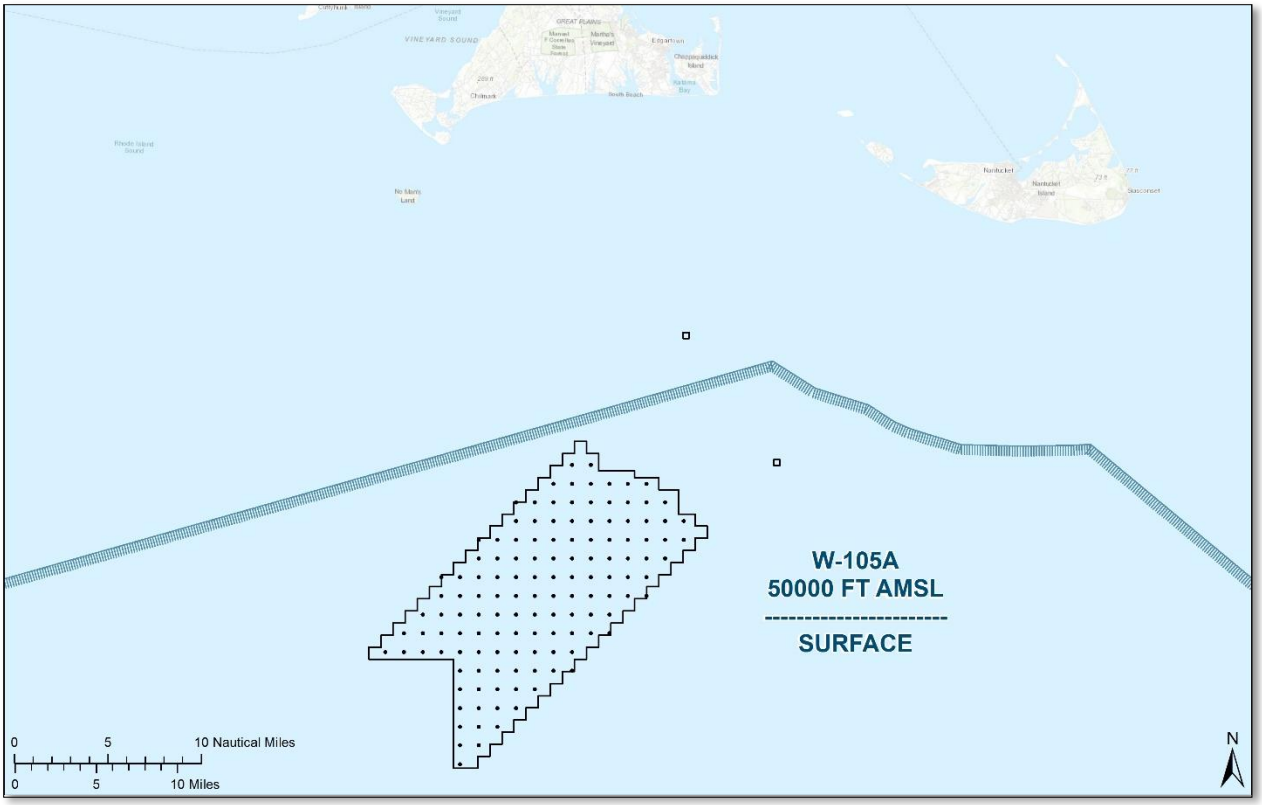


Figure 15: Military airspace (hatched outline) overlying the New England Wind project

Conclusion

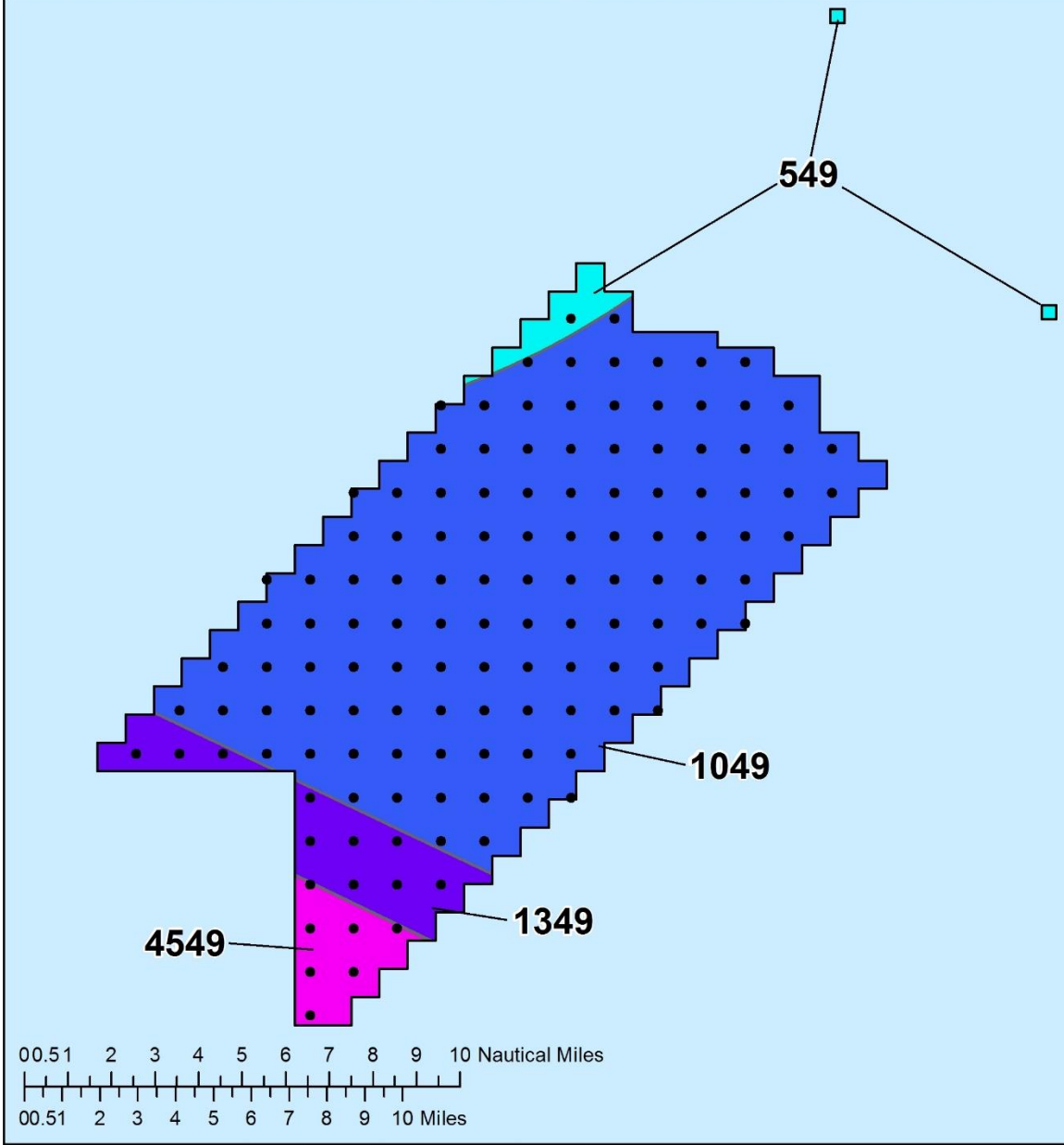
At 1,047 and 1,171 ft AGL, the proposed WTGs will exceed 77.17(a)(1) – a height of 499 ft AGL at the site of the object – and will be identified as obstructions. However, heights in excess of 499 ft AGL are feasible provided the proposed WTGs do not exceed FAA obstacle clearance surfaces.

The lowest obstacle clearance surfaces overlying the SWDA range from 549 to 4,549 ft AMSL (***Figure 16***) and are associated with MVA and MIA sectors. At 1,047 and 1,171 ft AGL, one proposed WTG in the northern section of the defined study area (red area, ***Figure 10*** & ***Figure 16***) will require an increase to the Boston Consolidated (A90) TRACON FUSION 5 Sector FF MVA. Additionally, at 1,171 ft AGL, 113 proposed WTGs throughout most of the defined study area (orange areas, ***Figure 9***, ***Figure 12***, & ***Figure 17***) would require an increase to the Boston Consolidated (A90) TRACON FUSION 3 Sector U and the Providence (PVD) TRACON FUSION 5 Sector N MVAs.

Warning area W-105A overlies the SWDA (***Figure 15***). Due to the low floor associated with this segment of airspace, offshore wind development could have an impact on its operations. If the US Navy uses this warning area regularly, it could result in military objections to the proposed offshore wind development.

If you have any questions regarding the findings of this study, please contact ***Dan Underwood*** or ***Wesley Williamson*** at (703) 256-2485.

Proposed structures that exceed 14 CFR Part 77.17(a)(1) - a height of 499 feet AGL at the site of the object - will be identified as obstructions regardless of location.



Obstacle Clearance Surface

Height - AMSL Feet

- 549
- 1,049
- 1,349
- 4,549

All heights above mean sea level (AMSL)

- Study Area
- Wind Turbine Generator

New England Wind Project
Composite Height Constraint Map

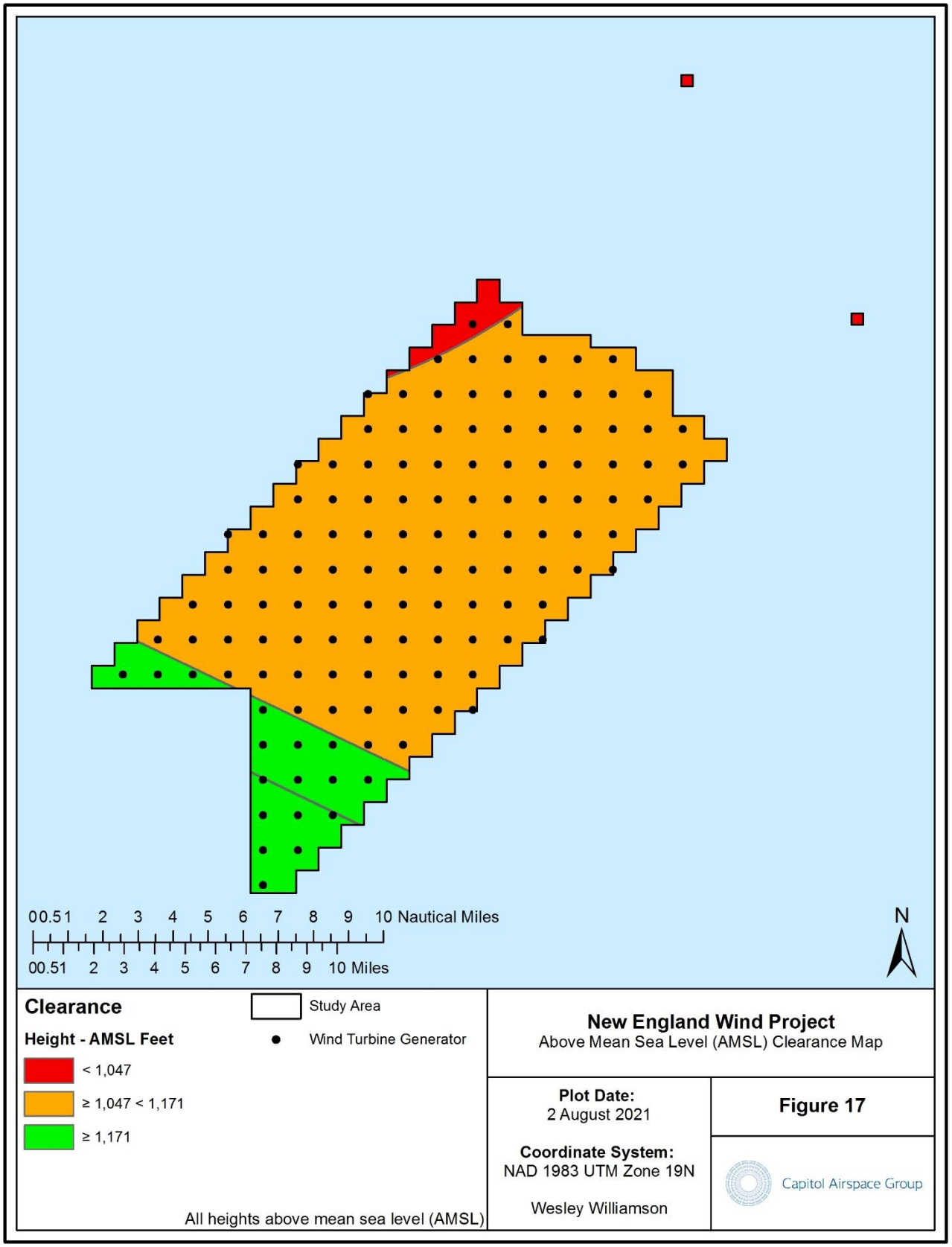
Plot Date:
2 August 2021

Coordinate System:
NAD 1983 UTM Zone 19N

Wesley Williamson

Figure 16

Capitol Airspace Group


0 0.5 1 2 3 4 5 6 7 8 9 10 Nautical Miles
0 0.5 1 2 3 4 5 6 7 8 9 10 Miles
N
Clearance
Height - AMSL Feet
< 1,047
≥ 1,047 < 1,171
≥ 1,171
Study Area
Wind Turbine Generator
All heights above mean sea level (AMSL)
New England Wind Project
Above Mean Sea Level (AMSL) Clearance Map
Plot Date:
2 August 2021
Coordinate System:
NAD 1983 UTM Zone 19N
Wesley Williamson
Figure 17
Capitol Airspace Group

New England Wind

Epsilon Associates, Inc.

Offshore near Martha's Vineyard and Nantucket, Massachusetts

Air Traffic Flow Analysis

August 5, 2021

Capitol Airspace Group

capitolairspace.com

(703) 256 - 2485

5400 Shawnee Road, Suite 304
Alexandria, VA 22312
703-256-2485
capitolairspace.com

Summary

Capitol Airspace conducted an air traffic flow analysis for the proposed New England Wind energy development (New England Wind), which is located in Lease Area OCS-A 0534 and the southwest portion of Lease Area OCS-A 0501 (referred to as the Southern Wind Development Area [SWDA]) (black outline, ***Figure 1***). New England Wind is located off the coast of Martha's Vineyard and Nantucket, Massachusetts. New England Wind will be developed in two Phases. The Phase 1 wind turbine generators (WTGs) will have a maximum height of 1,047 feet (ft) and the Phase 2 WTGs will have a maximum height of 1,171 ft.

At the time of this analysis, 130 WTG locations (black points, ***Figure 1***) had been identified. At 1,047 and 1,171 ft above mean sea level (AMSL), the proposed WTGs throughout the majority of the study area would require an increase to Boston Consolidated (A90) Terminal Radar Approach Control (TRACON) and Providence (PVD) TRACON minimum vectoring altitudes (MVA). The purpose for this analysis was to determine the number of operations potentially affected by the airspace changes required to accommodate offshore wind development of up to 1,171 ft AMSL.

The Federal Aviation Administration (FAA) conducts aeronautical studies to ensure that proposed structures do not affect the safety of air navigation and the efficient utilization of navigable airspace by aircraft. Proposed structures undergoing aeronautical study that exceed obstacle clearance surfaces will be identified as having an adverse effect. If the FAA determines that the adverse effect would impact a significant volume of operations, it could be used as the basis for determinations of hazard. For instrument flight rules (IFR) operations the significant volume threshold is one per week; for visual flight rules (VFR) operations the threshold is one per day. In instances where the project lies outside of FAA jurisdiction and lies in BOEM jurisdiction, BOEM will consult with the FAA for any airspace that the FAA may need to adjust. Capitol Airspace is applying the same methodology for airspace analysis not in FAA jurisdiction to highlight the minimal effect of the flights over the New England Wind project.

Historical air traffic data indicate that the required changes to Boston Consolidated (A90) TRACON MVA sectors and a Providence (PVD) TRACON MVA sector should not affect a significant volume of radar vectoring operations. As a result, it is possible that Boston Consolidated (A90) TRACON and Providence (PVD) TRACON would be willing to increase the affected MVAs in order to accommodate offshore wind development up to 1,171 ft AMSL. This mitigation option is subject to FAA approval.

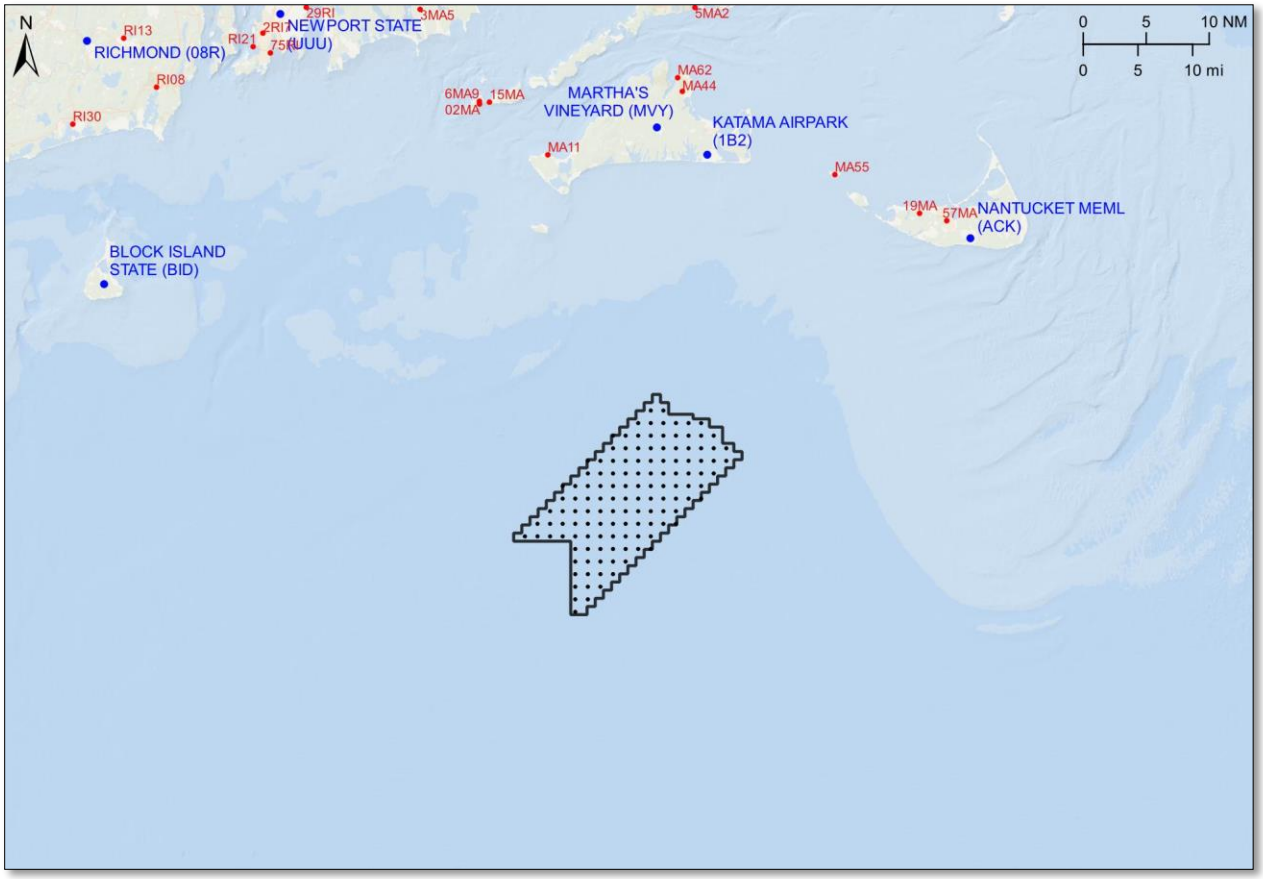


Figure 1: Public-use (blue) and private-use (red) airports in proximity to the SWDA (black outline)

Methodology

At 1,047 and 1,171 ft AMSL, the proposed WTGs in the northern section of the SWDA (red area, ***Figure 2***) will exceed MVA sector obstacle clearance surfaces (e.g. hatched blue, ***Figure 2***). Additionally, at 1,171 ft AMSL, the proposed WTGs throughout the majority of the study area (red area, ***Figure 3***) will exceed MVA sector obstacle clearance surfaces (hatched blue, ***Figure 3***). As a result, the FAA must modify sector boundaries or establish isolation areas with increased MVAs. These sector modifications result in a three-dimensional volume of affected airspace where radar vectoring would be unavailable.

In order to quantify the number of radar vectoring operations potentially affected by MVA sector modifications, Capitol Airspace evaluated FAA National Offload Program (NOP) radar returns covering the period between September 1, 2018 and August 31, 2019. The FAA NOP data contained 105,556,938 radar returns associated with 540,735 flights receiving air traffic control services.[1] Each flight that had at least one radar return within the affected airspace was analyzed for altitude and direction trends.

Flights that maintained one or more specific headings within the affected airspace operated in a manner consistent with receiving radar vectoring services. These flights also maintained or climbed/descended to maintain an altitude within the affected airspace. The historical presence of these flights within the affected airspace is an indicator that the required MVA sector modifications could affect future air traffic control operations.

[1] NOP data excludes certain military flights due to the sensitive nature of some operations.

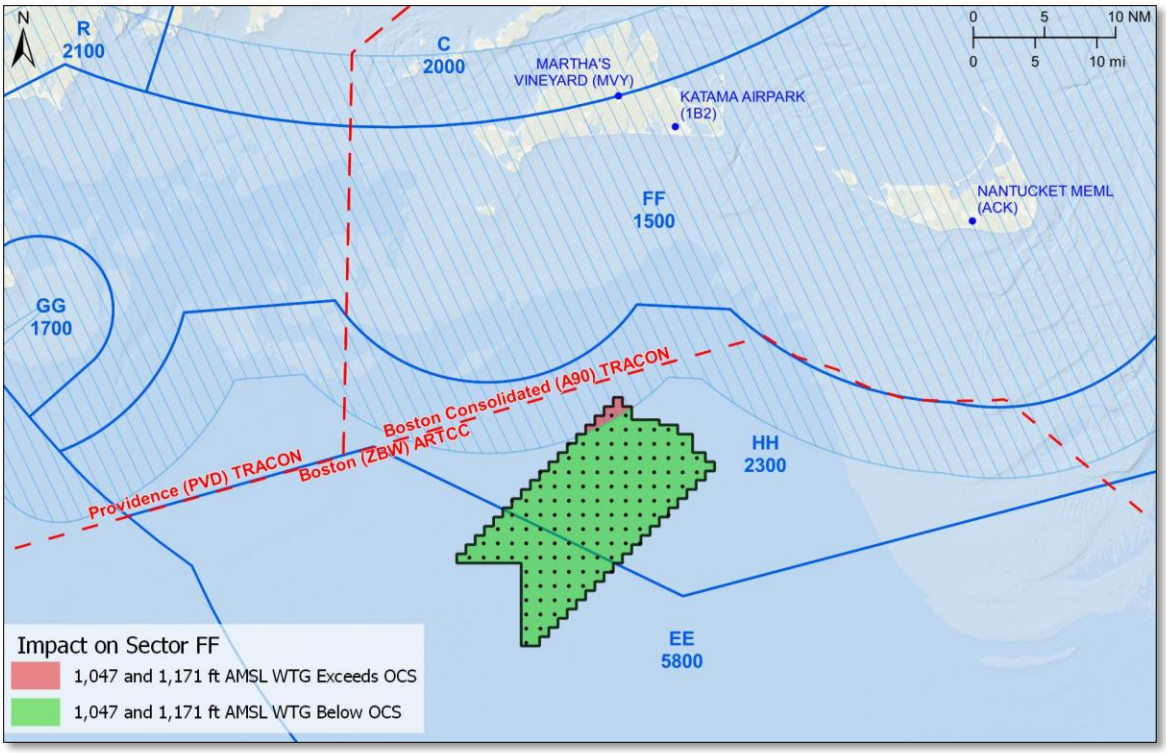


Figure 2: Boston Consolidated (A90) TRACON FUSION 5 MVA sectors (blue) with Sector FF obstacle evaluation area (hatched blue)

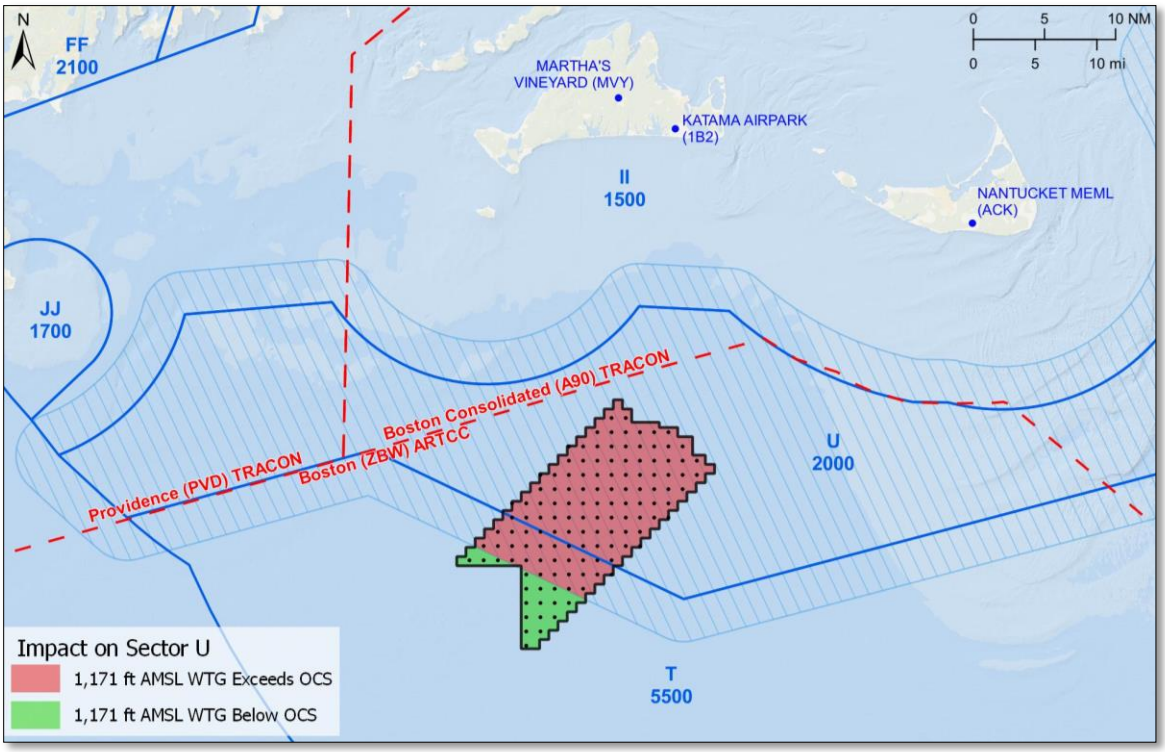


Figure 3: Boston Consolidated (A90) TRACON FUSION 3 MVA sectors (blue) with Sector U obstacle evaluation area (hatched blue)

Findings

Boston Consolidated (A90) TRACON

In order to accommodate offshore wind development up to 1,171 ft AMSL, the FAA must increase existing MVAs from as low as 1,500 to as high as 2,200 ft AMSL. This increase would affect both the FUSION 3 and FUSION 5 MVA charts.

FUSION 3 (A90_MVA_FUS3_2020)

Sector U

The current MVA is 2,000 ft AMSL; the obstacle clearance surface is 1,049 ft AMSL. At 1,171 ft AMSL, the proposed WTGs throughout the majority of the study area (red area, ***Figure 3***) would exceed this surface and require an increase to the MVA from 2,000 to 2,200 ft AMSL.

Flight track data indicate that zero flights operated within the affected airspace (dashed green outline, ***Figure 4***). This flight total represents an average of *0.00 flights per week* which is below the FAA's threshold for a significant volume of operations.

FUSION 5 (A90_MVA_FUS5_2021)

Sector FF

The current MVA is 1,500 ft AMSL; the obstacle clearance surface is 549 ft AMSL. At 1,049 and 1,171 ft AMSL, the proposed WTGs in the northern section of the study area (red area, ***Figure 2***) would exceed this surface and require an increase to the MVA from 1,500 to as high as 2,200 ft AMSL.

Flight track data indicate that only two flights (yellow tracks, ***Figure 5***) operated within the affected airspace (dashed blue outline, ***Figure 5***). This flight total represents an average of *0.04 flights per week* which is below the FAA's threshold for a significant volume of operations. Additionally, it is not likely that all of these flights were receiving radar vectoring services.

As a result of these findings, it is possible that Boston Consolidated (A90) TRACON would not object to modifying Sectors U and FF in order to accommodate offshore wind development up to 1,171 ft AMSL.

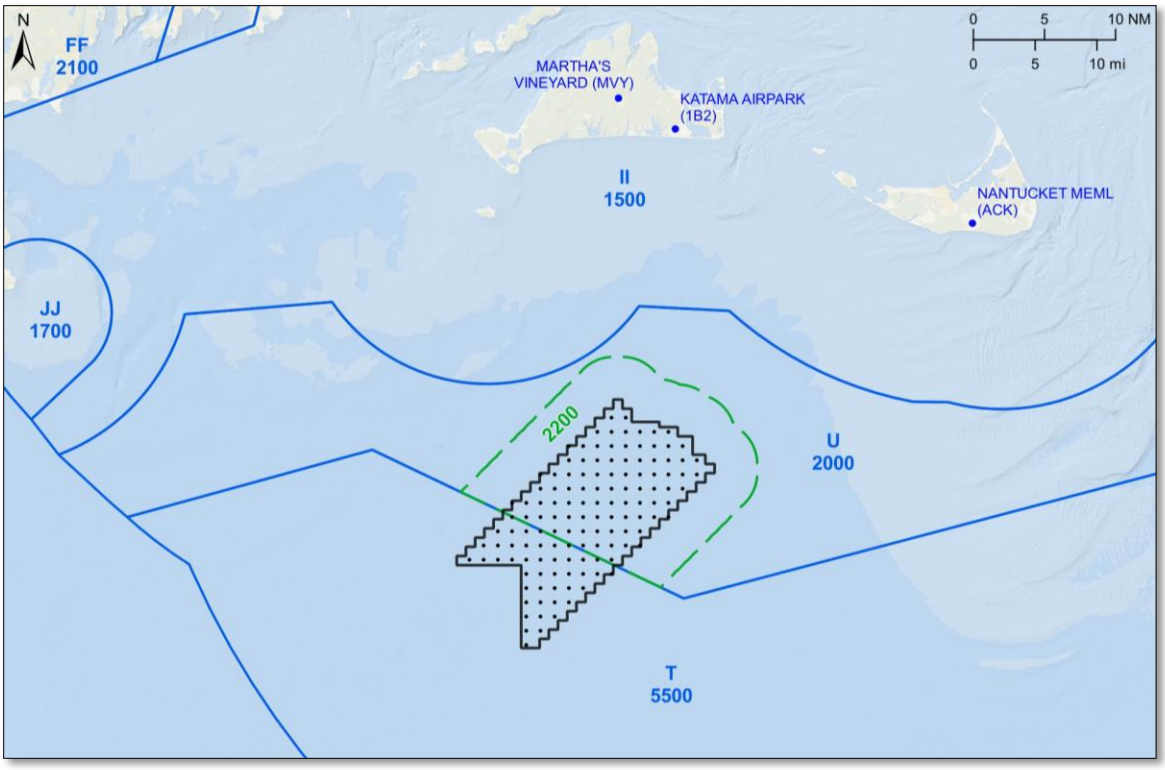


Figure 4: Historical flight track (purple) that operated within the FUSION 3 affected airspace (dashed green outline)

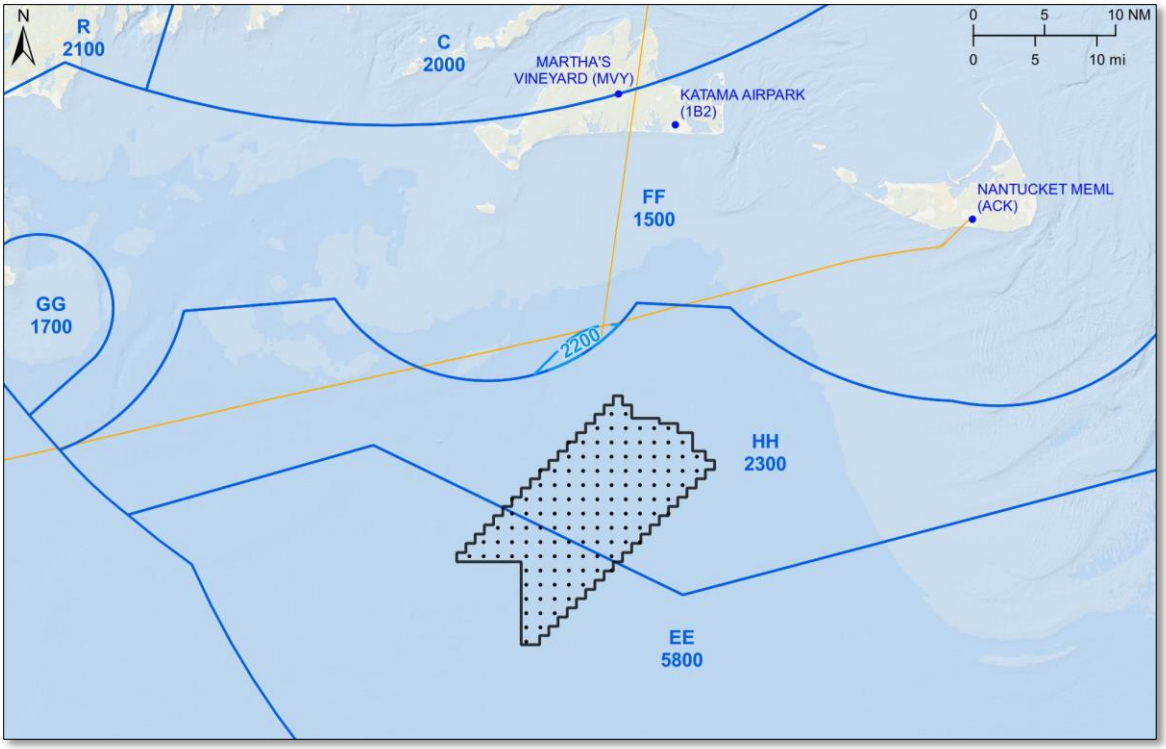


Figure 5: Historical flight tracks (yellow) that operated within the FUSION 5 affected airspace (dashed blue outline)

Providence (PVD) TRACON

In order to accommodate offshore wind development up to 1,171 ft AMSL, the FAA must increase the existing MVA from 2,000 ft AMSL up to 2,200 ft AMSL. This increase would affect only the FUSION 5 MVA chart.

FUSION 5 (PVD_MVA_FUS5_2019)

Sector N

The current MVA is 2,000 ft AMSL; the obstacle clearance surface is 1,049 ft AMSL. At 1,171 ft AMSL, the proposed WTGs in the northern section of the study area would exceed this surface and require an increase to the MVA from 2,000 to 2,200 ft AMSL.

Flight track data indicate that only two flights (purple tracks, ***Figure 6***) operated within the affected airspace (dashed green outline, ***Figure 6***). This flight total represents an average of *0.04 flights per week* which is below the FAA's threshold for a significant volume of operations. Additionally, it is not likely that all of these flights were receiving radar vectoring services.

As a result of these findings, it is possible that PVD TRACON would not object to modifying Sector N in order to accommodate offshore wind development up to 1,171 ft AMSL.

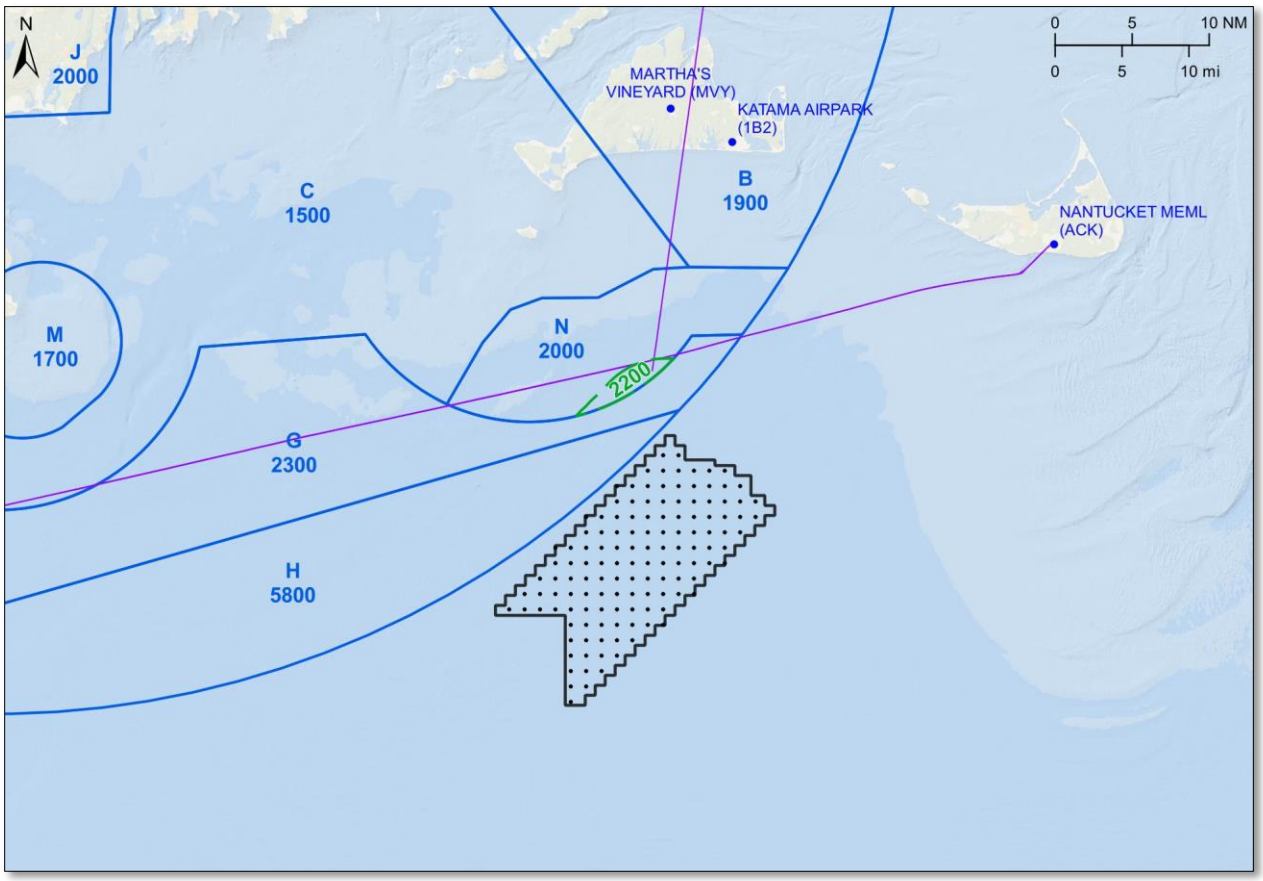


Figure 6: Historical flight tracks (purple) that operated within the FUSION 5 affected airspace (dashed green outline)

5400 Shawnee Road, Suite 304
Alexandria, VA 22312
703-256-2485
capitolairspace.com

Conclusion

Capitol Airspace assessed historical FAA radar track data covering the period of one year to determine the number of operations that could be affected by increasing Boston Consolidated (A90) TRACON and Providence (PVD) TRACON MVAs. In order to accommodate offshore wind development up to 1,171 ft AMSL, the MVAs must be increased from as low as 1,500 to as high as 2,200 ft AMSL.

Historical radar track data indicate that the proposed WTGs should not affect a significant volume of Boston Consolidated (A90) TRACON radar vectoring operations (*0.00 flights per week* for FUSION 3 Chart, *0.04 flights per week* for FUSION 5 Chart) or Providence (PVD) TRACON radar vectoring operations (*0.04 flights per week* for FUSION 5 Chart). These numbers are below the FAA threshold for a significant volume of operations. As a result of these findings, it is possible that Boston Consolidated (A90) TRACON and Providence (PVD) TRACON would not object to modifying the affected MVA sectors in order to accommodate offshore wind development up to 1,171 ft AMSL.

Please contact ***Dan Underwood*** or ***Candace Childress*** at (703) 256-2485 with any questions regarding the findings of this analysis.