VINEYARD MID-ATLANTIC

CONSTRUCTION AND OPERATIONS PLAN

VOLUME II APPENDIX

JANUARY 2025

PREPARED BY:

Epsilon ASSOCIATES INC.

SUBMITTED BY:

VINEYARD MID-ATLANTIC LLC

VINEYARD MID-ATLANTIC

VINEYARD OFFSHORE

PUBLIC VERSION

Vineyard Mid-Atlantic COP

Appendix II-H Aviation Impact Assessment

Prepared by:
Capitol Airspace Group and Westslope Consulting

Prepared for:
Vineyard Mid-Atlantic LLC

January 2025

Vineyard Mid-Atlantic COP

Appendix II-H1 Obstruction Evaluation & Airspace Analysis

Prepared by:
Capitol Airspace Group

Prepared for:
Vineyard Mid-Atlantic LLC

January 2025

Revision	Date	Description
0	January 2024	Initial submission.
1	September 2024	Updated to incorporate revisions to the Project Design Envelope. (Note date listed on report remains 2023 to reflect date of airspace information used in the analysis.)
1	January 2025	Resubmitted without revisions.

Vineyard Mid-Atlantic Offshore Wind Development

Epsilon Associates, Inc.

Offshore Nassau & Suffolk Counties, New York

Obstruction Evaluation & Airspace Analysis

August 10, 2023

Capitol Airspace Group

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Introduction

14 CFR Part 77 applies to all structures within US territorial airspace. 14 CFR Part 77.9 requires that that all structures exceeding 200 feet (61 meters) above ground level (AGL) be submitted to the Federal Aviation Administration (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 affect the safety of air navigation or the efficient utilization of navigable airspace by aircraft. The 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 United States and cannot enforce the findings of its studies. For the portions of the project that lie outside of U.S. territorial airspace and in BOEM jurisdiction, BOEM will consult with the FAA for airspace impacts.

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. 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.

Vineyard Mid-Atlantic LLC (the "Proponent") proposes to develop, construct, and operate offshore renewable wind energy facilities in Bureau of Ocean Energy Management (BOEM) Lease Area OCS-A 0544 (the "Lease Area") along with associated offshore and onshore transmission systems. This proposed development is referred to as "Vineyard Mid-Atlantic." Vineyard Mid-Atlantic includes wind turbine generator (WTG) and electrical service platform (ESP) positions within the Lease Area. One or two positions will be occupied by ESPs and the remaining positions will be occupied by WTGs. Offshore export cables installed within an Offshore Export Cable Corridor (OECC) will transmit power from the renewable wind energy facilities to onshore transmission systems on Long Island, New York.

Capitol Airspace conducted an obstruction evaluation and airspace analysis for Vineyard Mid-Atlantic offshore of Nassau and Suffolk Counties, New York. This analysis was based on location information provided by Epsilon Associates, Inc. The purpose for this analysis was to identify obstacle clearance surfaces established by the FAA that could limit the placement of 1,165-foot tall (355 meter) wind turbines. This analysis assessed height constraints overlying an approximately 67-square-mile study area (black outline, ***Figure 1***).

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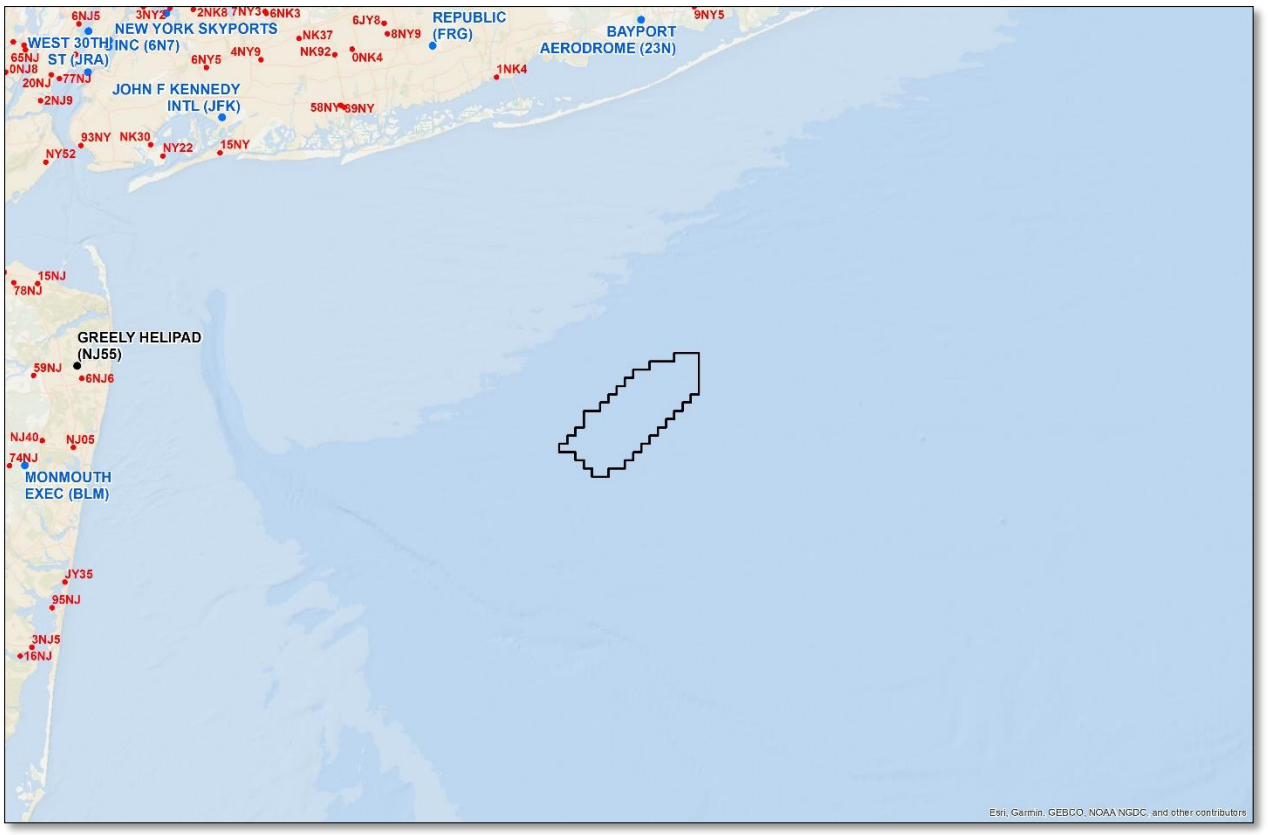


Figure 1: Public-use (blue), military (black), and private-use (red) airports in proximity to Vineyard Mid-Atlantic

Methodology

Capitol Airspace assessed the proposed project using a geographic information system (GIS) to determine proximity to airports, published instrument procedures, enroute airways, FAA minimum vectoring altitude and minimum instrument flight rules (IFR) altitude charts, and military airspace and training routes.

Capitol Airspace evaluated all 14 CFR Part 77 imaginary surfaces, published instrument approach and departure procedures, visual flight rules (VFR) operations, FAA minimum vectoring altitudes, minimum IFR altitudes, and enroute operations. 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 7400.2P Procedures for Handling Airspace Matters
- FAA Order 8260.3E United States Standard for Terminal Instrument Procedures (TERPS)
- FAA Order 8260.58C United States Standard for Performance Based Navigation (PBN) Instrument Procedure Design
- FAA Technical Operations Evaluation Desk Guide for Obstruction Evaluation (1.7)
- United States Terminal Procedures Publications
- FAA National Offload Program (NOP) Radar Track Data
- National Airspace System Resource (NASR) Aeronautical Data
- United States Geological Survey (USGS) National Elevation Dataset (NED)

This study did not consider electromagnetic interference on FAA communication or surveillance radar systems. Impact on these systems could be used as the basis for determinations of hazard regardless of the lack of impact on the physical airspace surfaces described in this report.

Level and sloping obstacle clearance surfaces (OCS) are provided in feet above mean sea level (AMSL). Planned structures that exceed an OCS will require changes to aircraft procedures. If the FAA determines that these changes would affect a significant volume of air traffic operations, it could result in determinations of hazard. The FAA generally defines a significant volume of operations as an average of one per day for VFR operations or one per week for IFR operations.

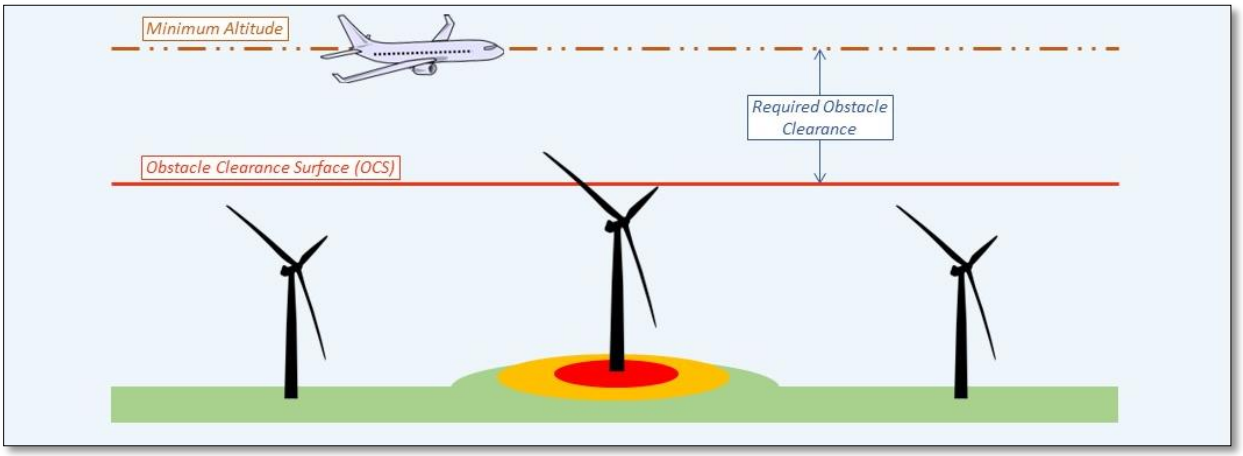


Figure 2: Example of level OCS

Study Findings

Territorial Airspace

The FAA conducts aeronautical studies for structures proposed within any state, territory, or possession of the United States, within the District of Columbia, or within territorial waters[1] surrounding the United States.[2] Although an offshore wind project may be located outside of territorial waters, BOEM may require an aeronautical study as part of the application process.

Vineyard Mid-Atlantic is not located within territorial waters (shaded purple, ***Figure 3***). Therefore, the FAA does not have a mandate to conduct aeronautical studies for wind turbines proposed within the defined study area. Regardless, BOEM may require consultation with the FAA as part of the application process. Providing an aeronautical study is useful to these consultations.

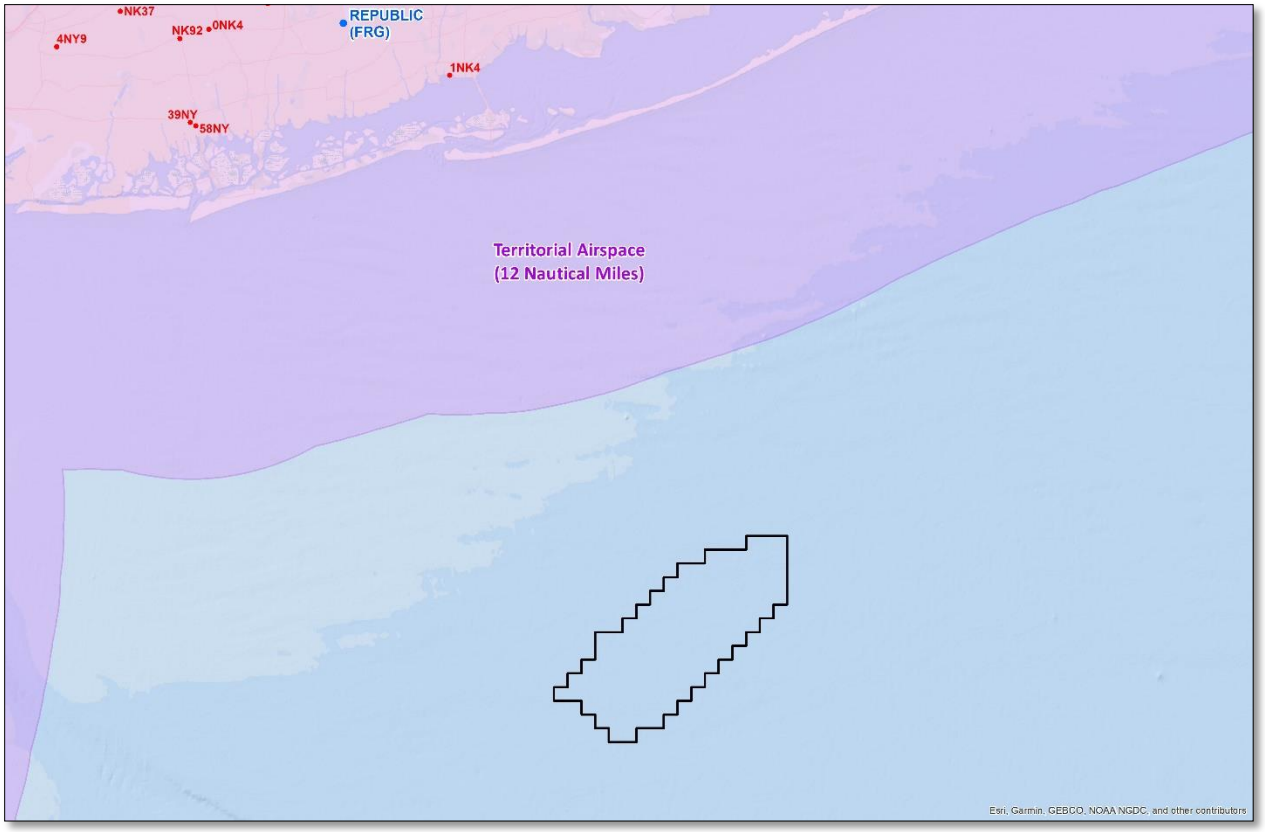


Figure 3: Territorial airspace in proximity to Vineyard Mid-Atlantic

[1] The National Oceanic and Atmospheric Administration (NOAA) defines territorial waters as 12 nautical miles (NM) (22 kilometers) measured from the official U.S. 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 7400.2P 5-1-4(a) "Scope."

14 CFR Part 77.17 Obstruction Standards

The FAA uses standards established in 14 CFR Part 77.17 to determine if a proposed structure is an obstruction to air navigation.[3] Structures that are identified as obstructions are then subject to a full aeronautical study and increased scrutiny. However, exceeding a Part 77.17 obstruction standard 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.

14 CFR Part 77.17(a)(2) and 77.17(a)(5) obstruction standards do not overlie Vineyard Mid-Atlantic (e.g., ***Figure 4***). However, at 1,165 feet tall (355 meters), proposed wind turbines will exceed 77.17(a)(1) – a height of 499 feet AGL (152 meters) at the site of the object – and could be identified as obstructions regardless of location.

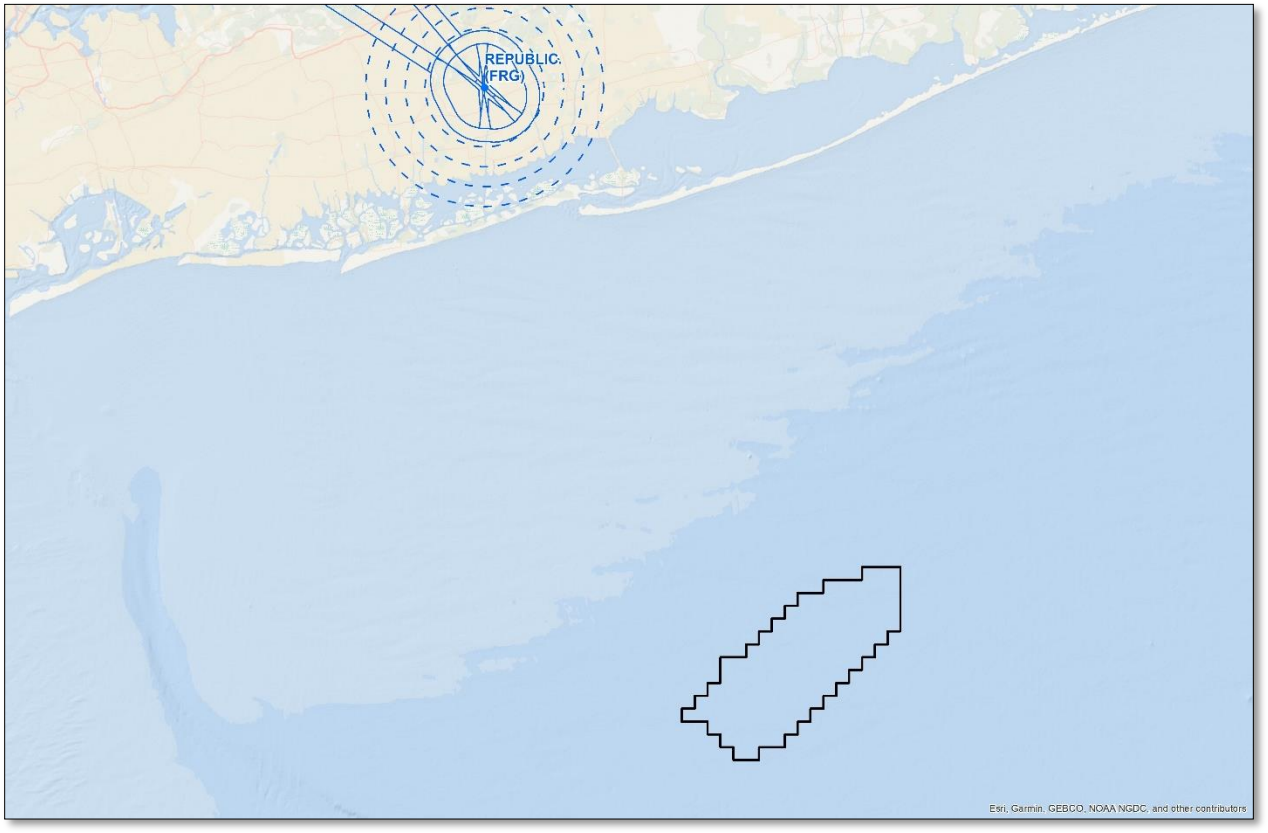


Figure 4: Republic (FRG) 14 CFR Part 77.17(a)(2) (dashed blue) and 77.17(a)(5) (solid blue) obstruction standards in proximity to Vineyard Mid-Atlantic

[3] 14 CFR Part 77.17 is made up of five obstruction standards. Part 77.17(a)(1) is based on a height of 499 feet AGL at the site of the object. Part 77.17(a)(2) is based on a sloping surface within six nautical miles of certain airports. Part 77.17(a)(3) and 77.17(a)(4) are based on the terminal and enroute obstacle clearance surfaces described in the rest of this report. Part 77.17(a)(5) is based on imaginary surfaces established in 14 CFR Parts 77.19, 77.21, and 77.23. Exceeding a Part 77.17 obstruction standard could result in circularization.

Visual Flight Rules (VFR) Traffic Pattern Airspace

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 Vineyard Mid-Atlantic and should not limit 1,165-foot tall (355 meter) wind turbines within the defined study area (e.g., ***Figure 5***).

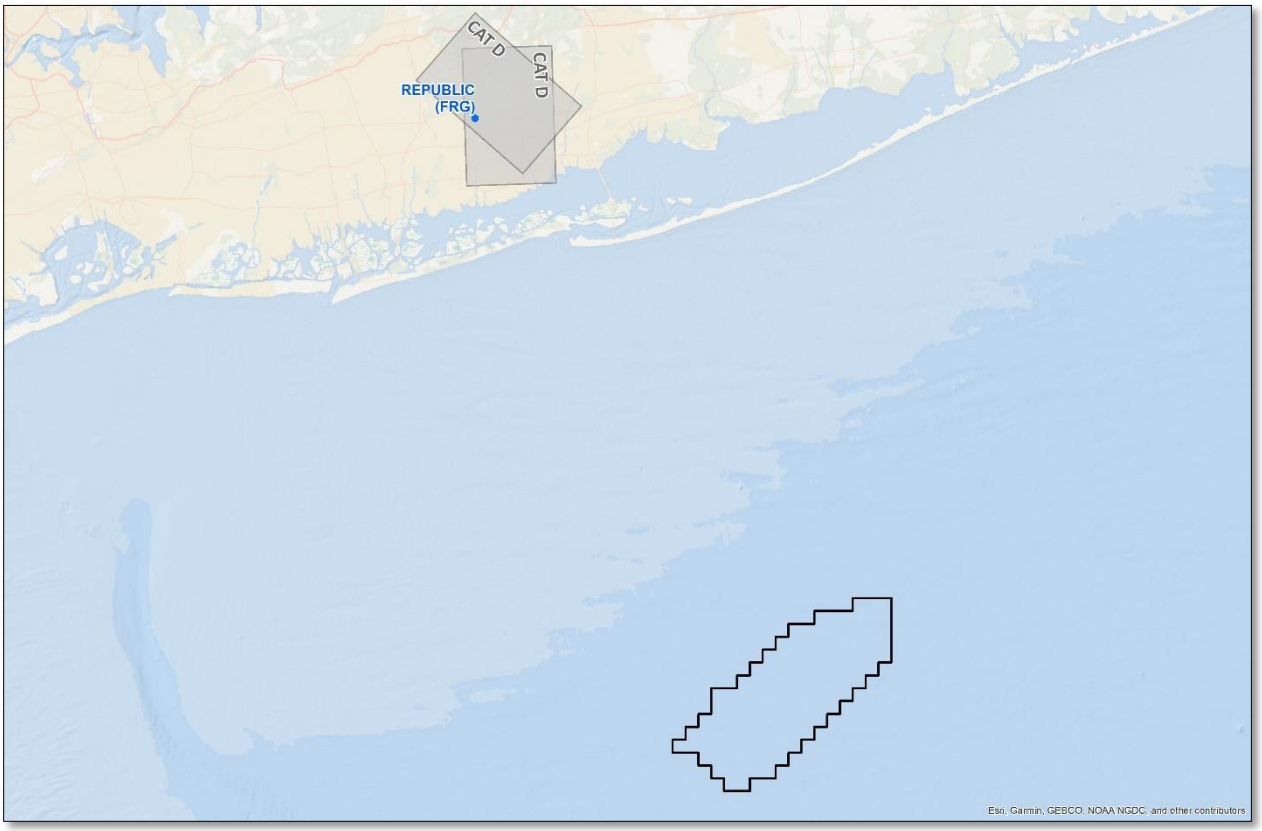


Figure 5: Republic (FRG) VFR traffic pattern airspace in proximity to Vineyard Mid-Atlantic

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[4] 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 (152 meters) at the site of the object.

Vineyard Mid-Atlantic is located in proximity to coastlines, railroads, highways, bridges, or low-altitude enroute airways[5] that could be used as VFR routes (hatched purple, ***Figure 6***). However, there is insufficient radar coverage to assess historical low-altitude flights in proximity to the study area. As a result, the FAA will solicit public comment to identify VFR routes that may be affected by proposed wind turbines. Wind turbines located within two statute-miles of regularly used VFR routes may be limited to no greater than 499 feet AGL (152 meters).

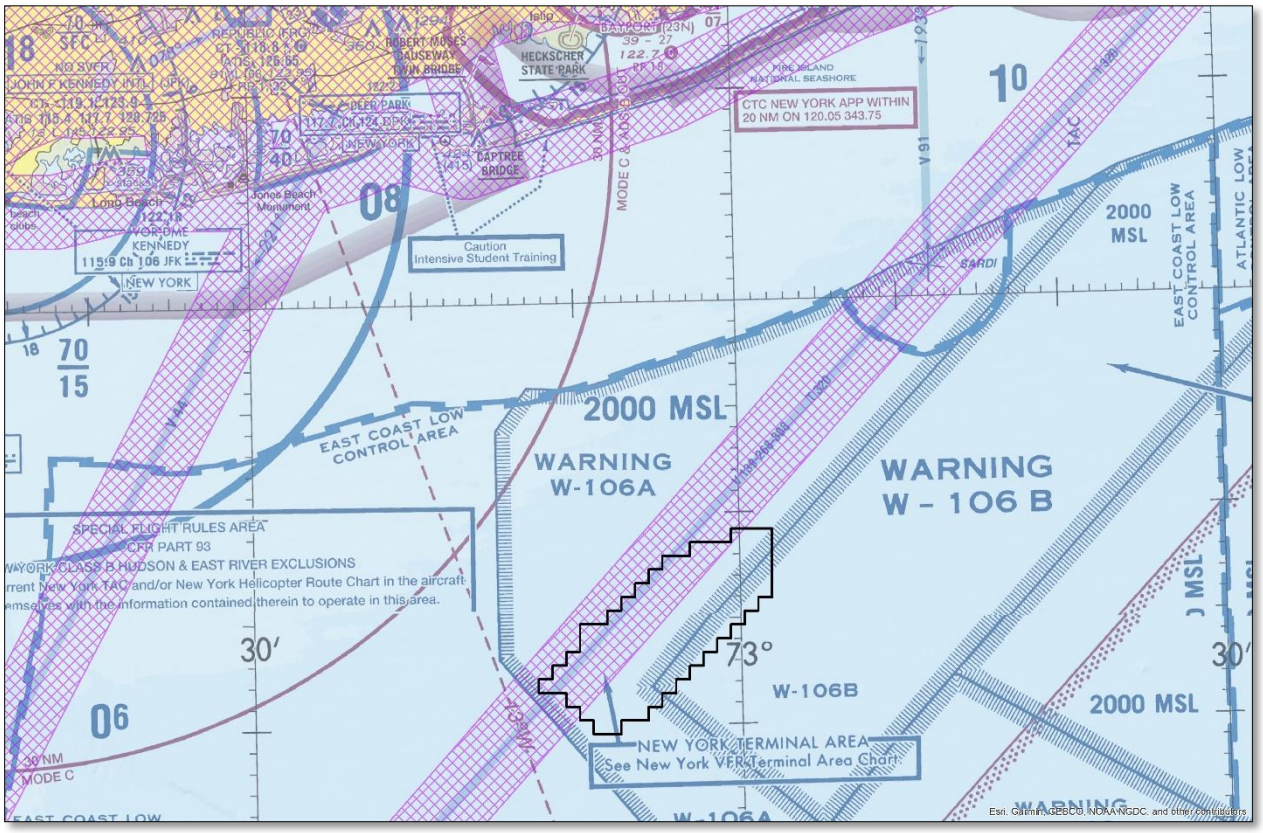


Figure 6: Potential VFR routes overlying Vineyard Mid-Atlantic

[4] As few as one flight per day.

[5] VFR traffic may use enroute airways at altitudes lower than the published minimum enroute altitude.

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 (e.g., ***Figure 7***) do not overlie the study area and should not limit 1,165-foot tall (355 meter) wind turbines within the defined study area.

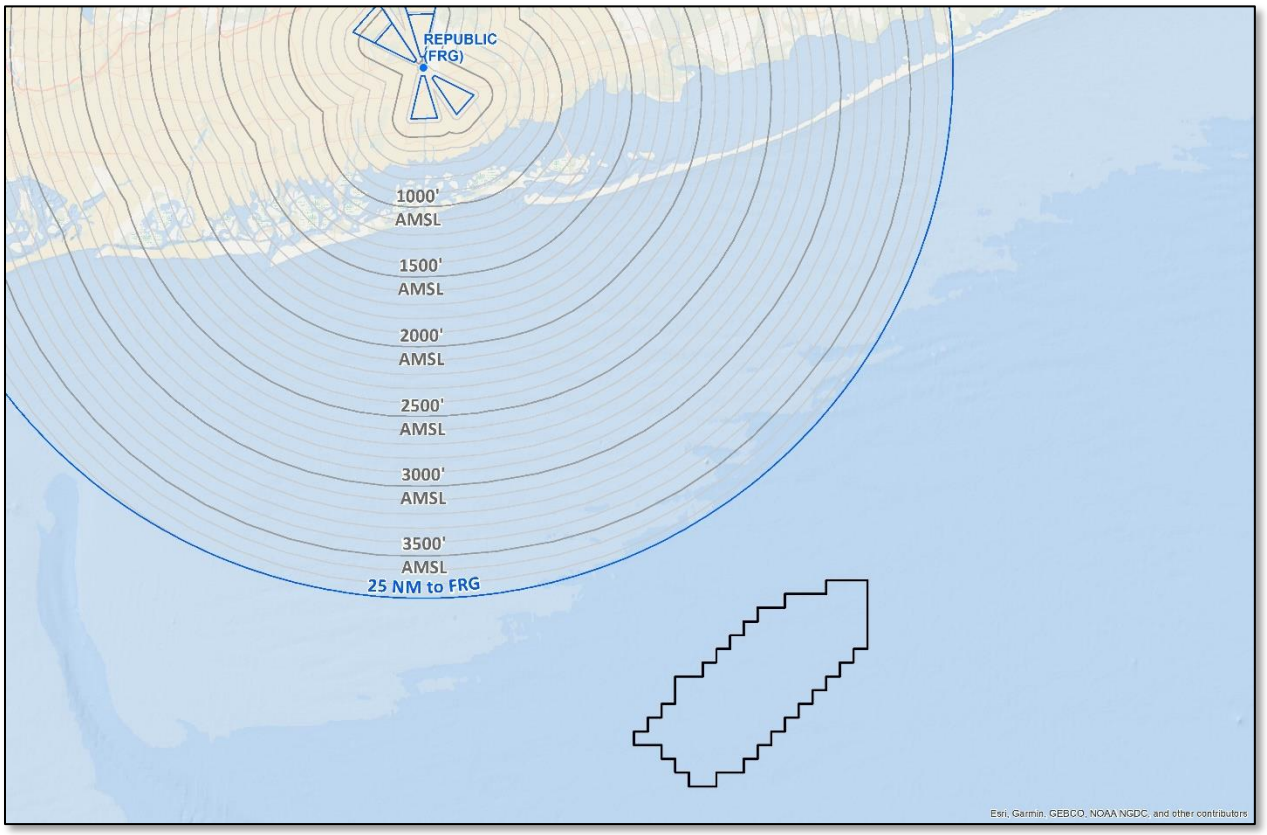


Figure 7: Republic (FRG) obstacle departure procedure

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 Vineyard Mid-Atlantic: [6]

Long Island Mac Arthur (ISP)
ILS or Localizer Approach to Runway 06
ILS or Localizer Approach to Runway 06 (SA CAT I-II)
ILS or Localizer Approach to Runway 24
RNAV (GPS) Approach to Runway 06
RNAV (GPS) Approach to Runway 24
RNAV (GPS) Approach to Runway 15R
RNAV (GPS) Approach to Runway 33L

Republic (FRG)
ILS or Localizer Approach to Runway 14
RNAV (RNP) Z Approach to Runway 14
RNAV (GPS) Y Approach to Runway 14
RNAV (GPS) Approach to Runway 01
RNAV (GPS) Approach to Runway 19
RNAV (GPS) Approach to Runway 32

Proposed structures that exceed instrument approach procedure obstacle clearance surfaces would require an increase to their minimum altitudes. Increases to these altitudes, especially critical *decision altitudes (DA)* and *minimum descent altitudes (MDA)*, 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.

[6] Capitol Airspace assessed instrument approach procedures within 30 nautical miles (NM) (56 kilometers [KM]) of the study area. Although approach surfaces – including terminal arrival areas (TAA), feeder segments, and initial segments – from airports further than 30 NM may overlie the 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 (56 KM) were not considered and are not included in the ***Composite Map***.

Long Island Mac Arthur (ISP)

Minimum Safe Altitude (MSA)

The RNAV (GPS) Approach to Runway 06 MSA is 1,900 feet AMSL (579 meters). The obstacle clearance surface (hatched purple, ***Figure 8***) is 900 feet AMSL (274 meters) and is in excess of other, lower surfaces. 1,165-foot tall (355 meter) wind turbines in a small northern section of the study area (red area, ***Figure 8***) will exceed this surface.

The RNAV (GPS) Approach to Runway 33 MSA is 1,900 feet AMSL (579 meters). The obstacle clearance surface is 900 feet AMSL (274 meters) and is in excess of other, lower surfaces. 1,165-foot tall (355 meter) wind turbines in a small northern section of the study area will exceed this surface.

However, in accordance with FAA Order 7400.2P Paragraph 6-3-9(e)(5), MSAs are for emergency use only and cannot be used as the basis for determinations of hazard. As a result, height constraints associated with MSAs are not included in the ***Composite Map***.

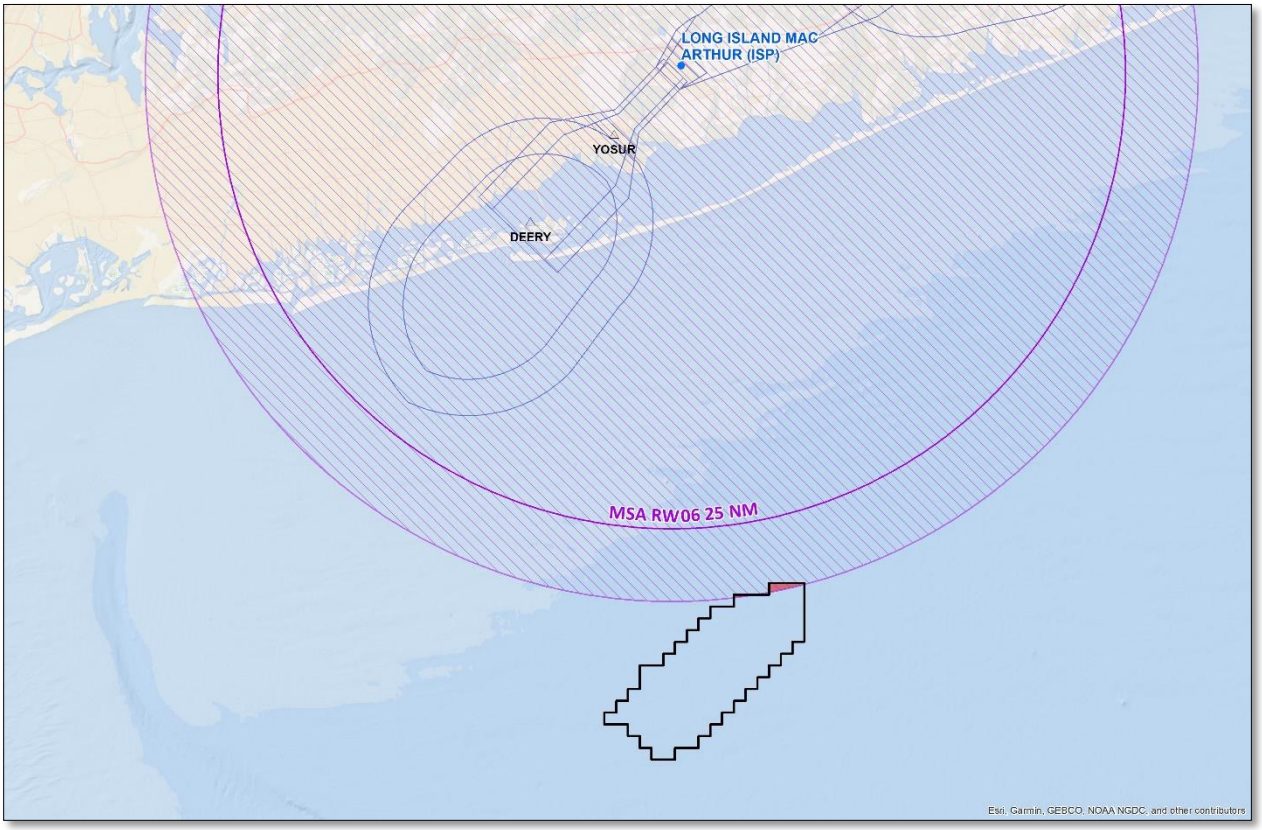


Figure 8: Long Island Mac Arthur (ISP) RNAV (GPS) Approach to Runway 06

Enroute Airways

Enroute airways provide pilots a means of navigation when flying from airport to airport and are defined by radials between VHF 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 feet (304 meters) in non-mountainous areas and normally 2,000 feet (609 meters) in mountainous areas.

Proposed structures that exceed enroute airway obstacle clearance surfaces would require an increase to their minimum obstruction clearance altitudes (MOCA) and/or minimum enroute altitudes (MEA). 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.

T320

MANTA to *BEADS*

The global navigation satellite system (GNSS) MOCA is 1,300 feet AMSL (396 meters). The obstacle clearance surfaces (purple outlines, ***Figure 9***) range from 300 to 1,300 feet AMSL (91 to 396 meters) and are the lowest height constraints overlying the entire study area. This surface could limit 1,165-foot tall (355 meter) wind turbines throughout the study area (red area, ***Figure 9***). However, the FAA may be willing to increase this altitude to accommodate wind development up to 1,165 feet tall (355 meters). This mitigation option is subject to FAA approval.

The GNSS MEA is 2,500 feet AMSL (762 meters). The primary area obstacle clearance surface (inner purple outline, ***Figure 9***) is 1,500 feet AMSL (457 meters) and is in excess of other, lower surfaces. Additionally, USGS elevation data indicates that this surface should not limit 1,165-foot tall (355 meter) wind turbines within the defined study area.

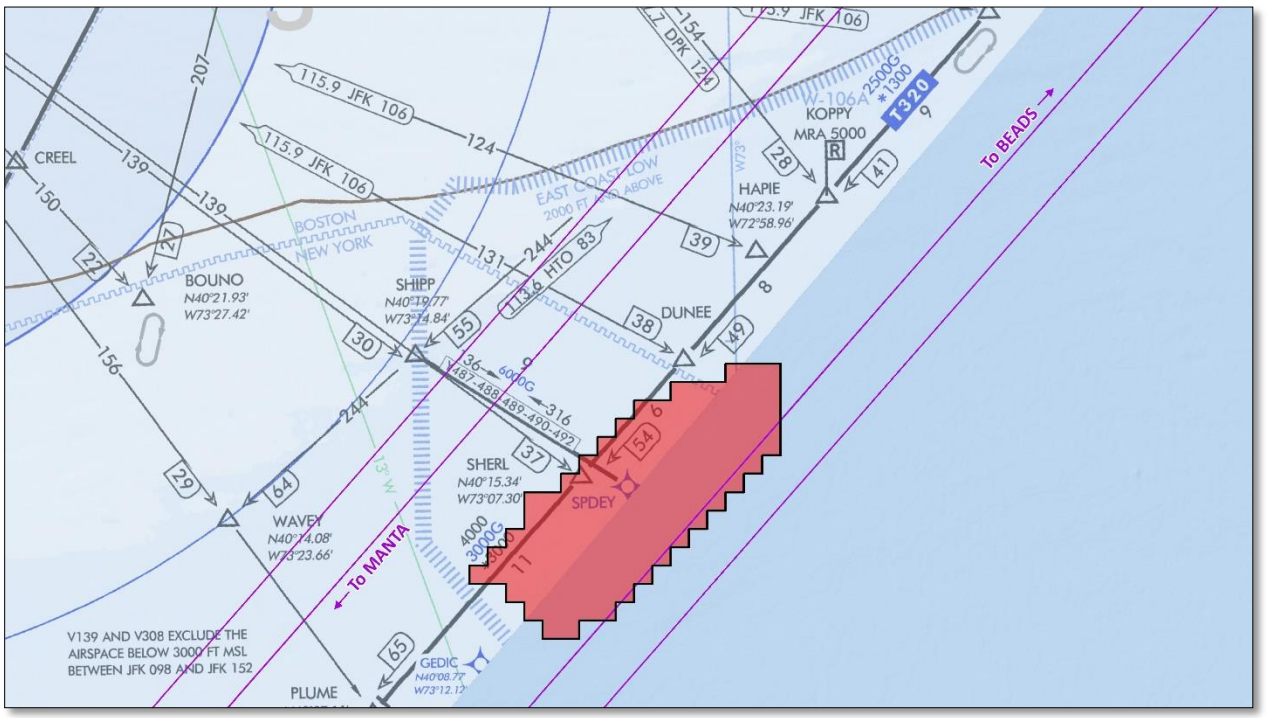


Figure 9: Low altitude enroute chart L-34 with T320 (purple) obstacle evaluation area

Minimum Vectoring/IFR Altitudes

The FAA publishes minimum vectoring altitude (MVA) and minimum instrument flight rules (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 feet (304 meters) in non-mountainous areas and normally 2,000 feet (609 meters) in mountainous areas.

Proposed structures that exceed MVA/MIA sector obstacle clearance surfaces 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 operation per week, it could result in determinations of hazard. [7]

New York (N90) Terminal Radar Approach Control (TRACON)

Sector L (N90_MVA_FUS3_2022)

The MVA is 2,000 feet AMSL (609 meters). The obstacle clearance surface is 1,049 feet AMSL (319 meters) and is in excess of other, lower surfaces. However, this surface could still limit 1,165-foot tall (355 meter) wind turbines throughout the study area (red area, ***Figure 10***).

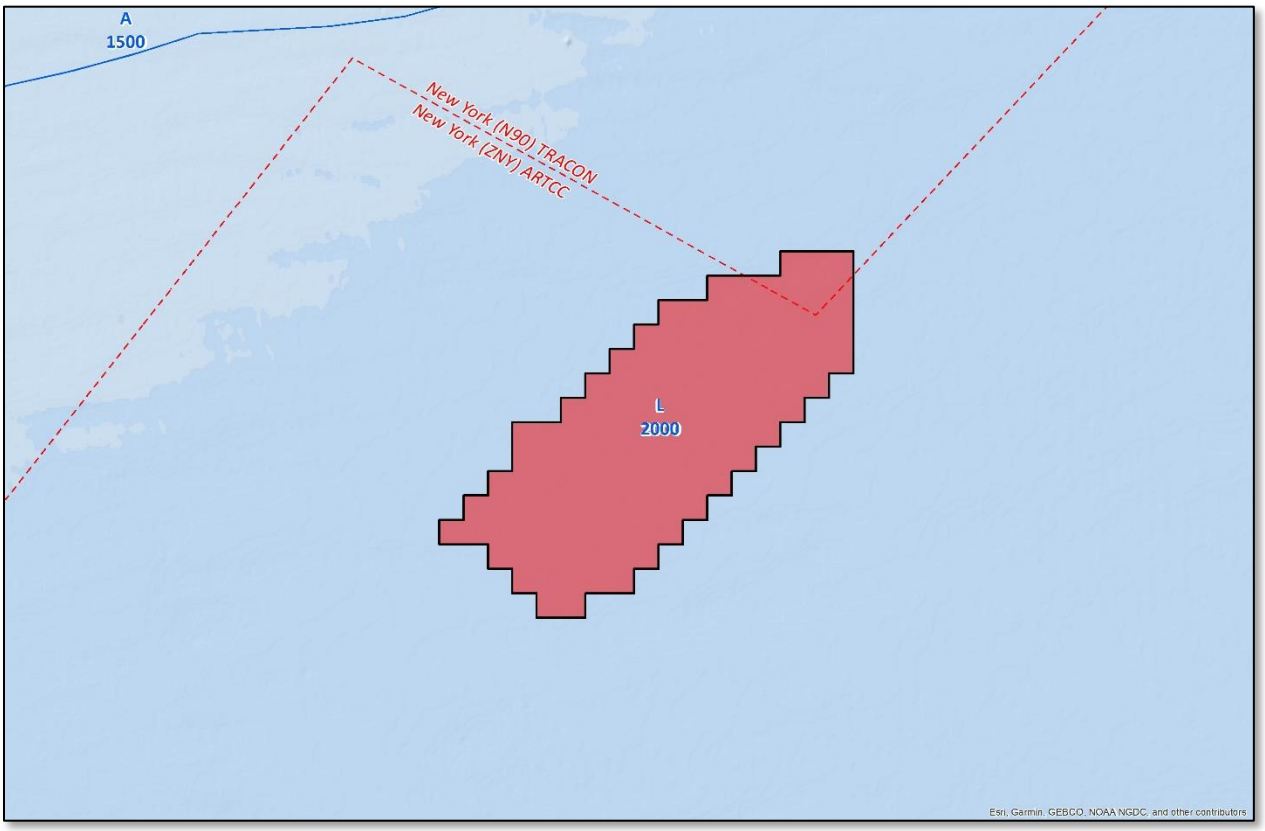


Figure 10: New York (N90) TRACON FUSION 3 MVA sector (blue)

[7] Department of Defense (DoD) radar vectoring charts, including those for Navy and Air Force Radar Approach Control (RAPCON) facilities, Navy Radar Air Traffic Control Facilities (RATCF), and Army Radar Approach Control Facilities (ARAC) are not publicly released. McGuire (WRI) RAPCON sectors overlie Vineyard Mid-Atlantic. Therefore, Capitol Airspace requested their chart and assessed for impacts to their MVA sectors. However, unreleased or updated charts could result in lower height constraints than those depicted in this report.

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 Vineyard Mid-Atlantic (***Figure 11***). As a result, it is unlikely that proposed wind turbines would have a physical or electromagnetic effect on terminal or enroute NAVAIDs.

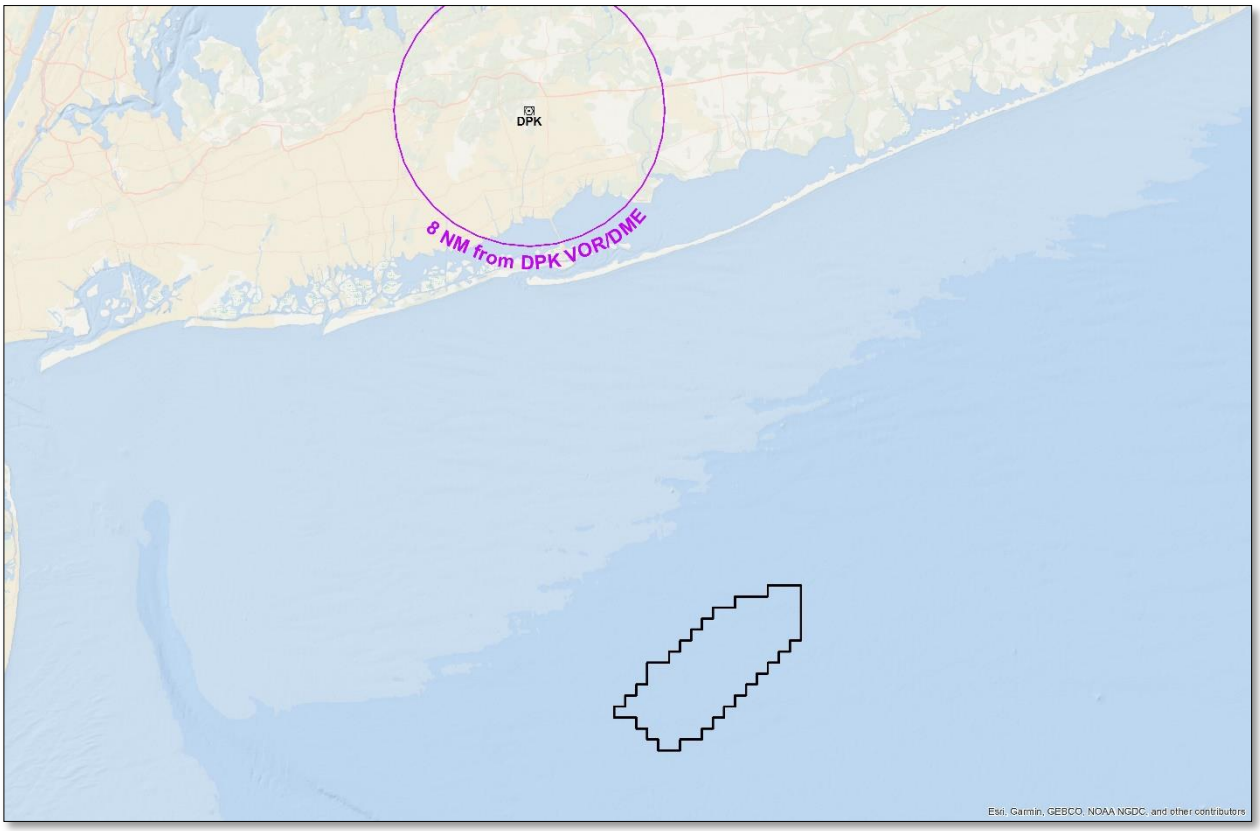


Figure 11: Deer Park (DPK) NAVAID protection area in proximity to Vineyard Mid-Atlantic

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. If the planned development area is located on federal land, impact on military airspace or training routes may result in the denial of permits by BOEM.

Warning areas (W) and low-altitude tactical navigation (LATN) route areas overlying Vineyard Mid-Atlantic (***Figure 12***):

U.S. Navy Fleet Area Control and Surveillance Facility, Virginia Capes (FACSFAC VACAPES)

Route/Airspace	*Minimum Altitude*
W-106A	Surface
W-106B	Surface

Gabreski Air Force National Guard Base (ANGB), Westhampton Beach

Route/Airspace	*Minimum Altitude*
Gabreski LATN	300 feet AGL (91 meters)

Due to the low altitudes associated with these segments of airspace, wind development could have an impact on its operations. If FACSFAC VACAPES, Gabreski ANGB, or other nearby units use these segments of airspace regularly, they may object to proposed wind development within their boundaries.

Under the provisions of the 2018 National Defense Authorization Act (NDAA), the Military Aviation and Installation Assurance Siting Clearinghouse (Clearinghouse) may issue a Notice of Presumed Risk to National Security (NPR) letter to initiate mitigation discussions. These discussions are facilitated through the Clearinghouse and with the affected bases or organizations with operational interests. Per the legislative directive, NPR letters are provided to the Governor of the State(s). The Clearinghouse typically attempts to notify developers shortly before the issuance of an NPR letter.

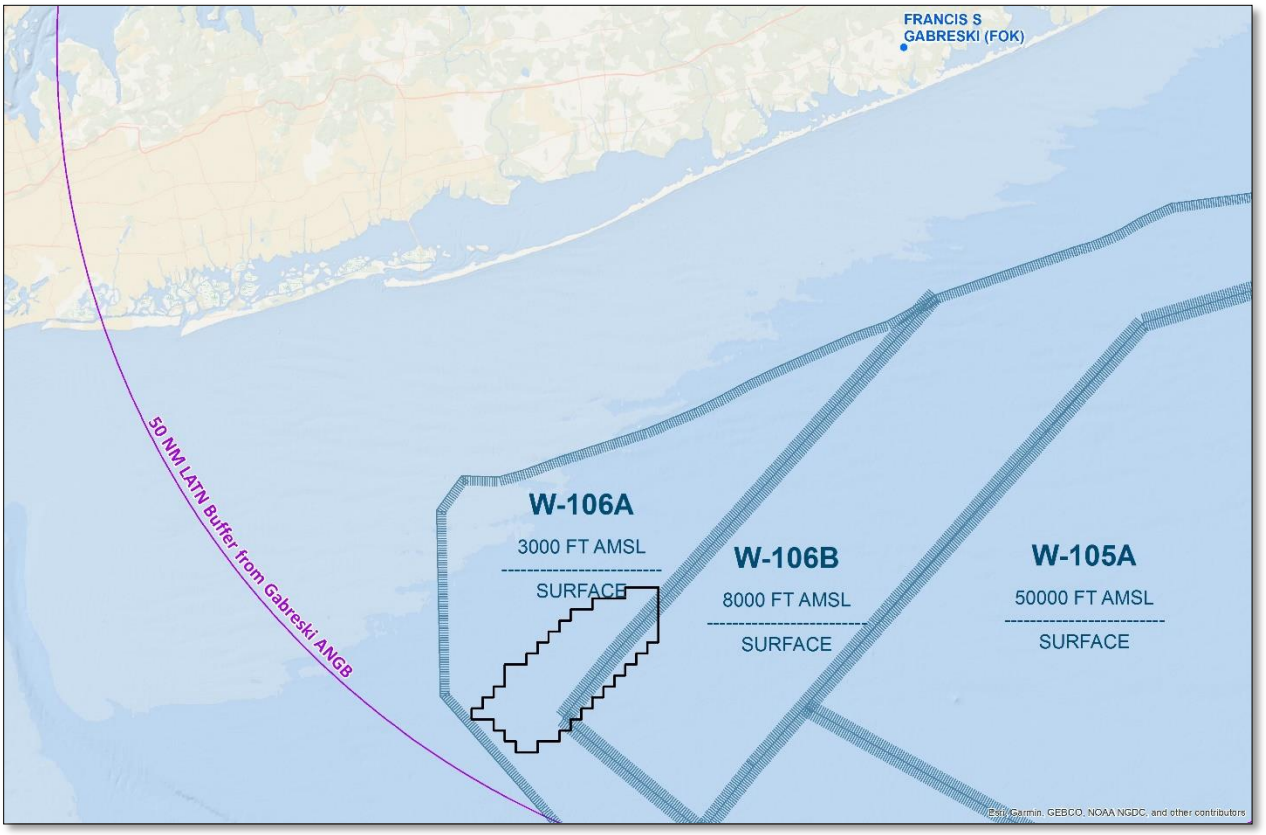


Figure 12: Special use airspace and LATN screening surface (purple) overlying Vineyard Mid-Atlantic

Conclusion

At 1,165 feet tall (355 meters), wind turbines throughout the proposed study area will exceed 14 CFR Part 77.17(a)(1) – a height of 499 feet AGL (152 meters) at the site of the object – and will be identified as obstructions regardless of their location. However, heights in excess of 499 feet AGL (152 meters) are feasible provided proposed wind turbines do not exceed FAA obstacle clearance surfaces.

The lowest obstacle clearance surfaces overlying Vineyard Mid-Atlantic range from 300 to 1,002 feet AMSL (92 to 305 meters) (***Figure 13***) and are associated with an enroute airway. These surfaces could limit 1,165-foot tall (355 meter) wind turbines throughout the study area (red area, ***Figure 14***).

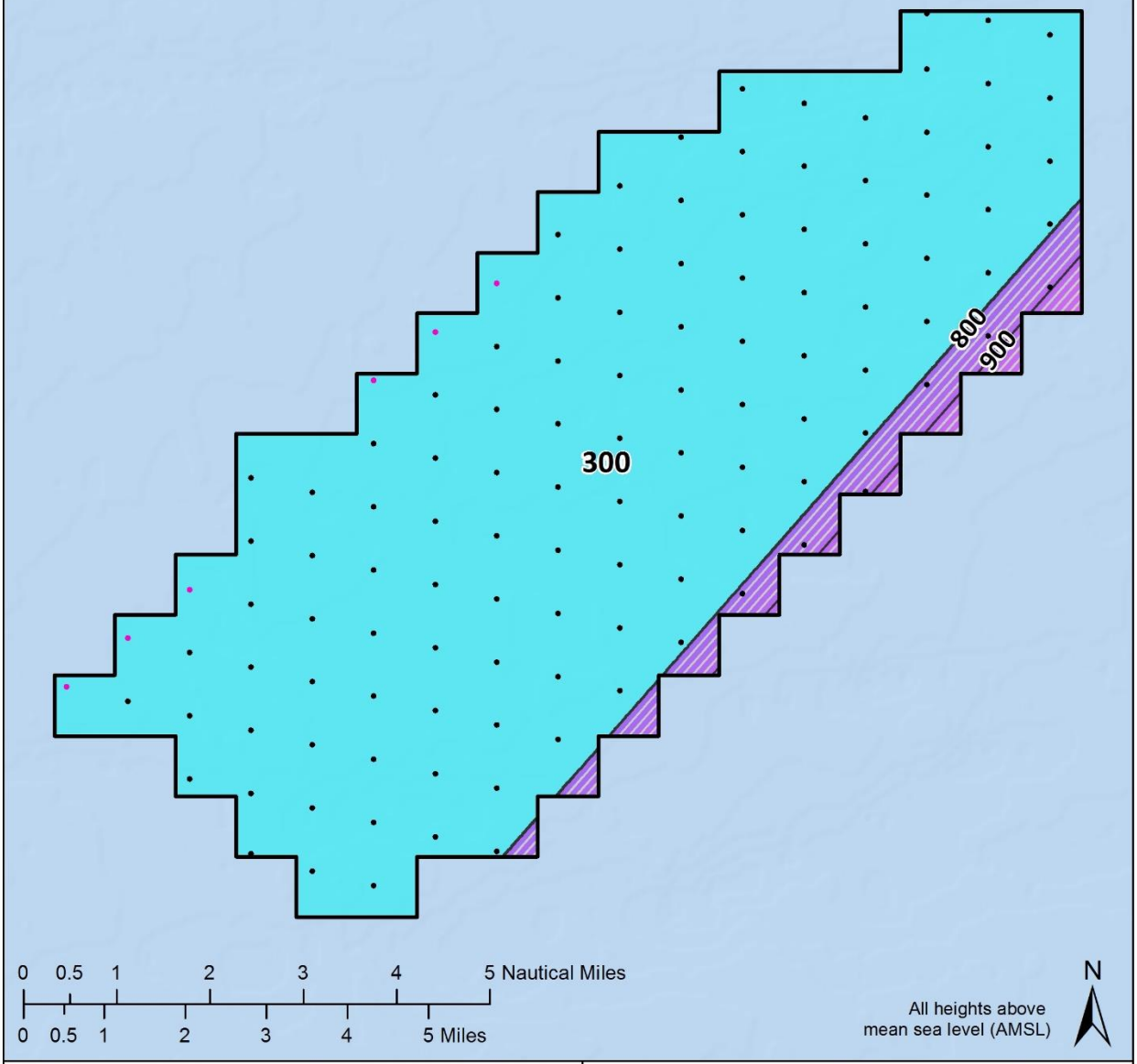
At 1,165 feet tall (355 meters), wind turbines throughout the study area (red area, ***Figure 9***) will require an increase to enroute airway T320 MOCA. However, the FAA may be willing to increase this altitude to accommodate wind development up to 1,165 feet tall (355 meters). This mitigation option is subject to FAA approval.

At 1,165 feet tall (355 meters), wind turbines throughout the study area (red area, ***Figure 10***) will require an increase to the New York (N90) TRACON Sector L MVA. If the FAA determines that this impact would affect as few as one radar vectoring operation per week, it could be used as the basis for determinations of hazard.

Multiple warning areas and a LATN overlie Vineyard Mid-Atlantic (***Figure 12***) and could result in military objections to proposed wind development. Further analysis may be required to determine if regularly used LATN routes overlie the study area.

If you have any questions regarding the findings of this study, please contact ***David Beranek*** or ***Alison Kennedy*** 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
High : 1002
Low : 300

Wind Turbine Generator (WTG)/Electrical Service Platform (ESP) Positions
Contingent WTG/ESP Positions
20-Foot Contour
100-Foot Contour
Lease Area OCS-A 0544

Vineyard Mid-Atlantic will not develop these contingent WTG/ESP positions if the final Empire Wind 2 layout includes WTGs at immediately adjacent positions within Lease Area OCS-A 0512.

Vineyard Mid-Atlantic
Composite Height Constraint Map

Plot Date:
10 August 2023

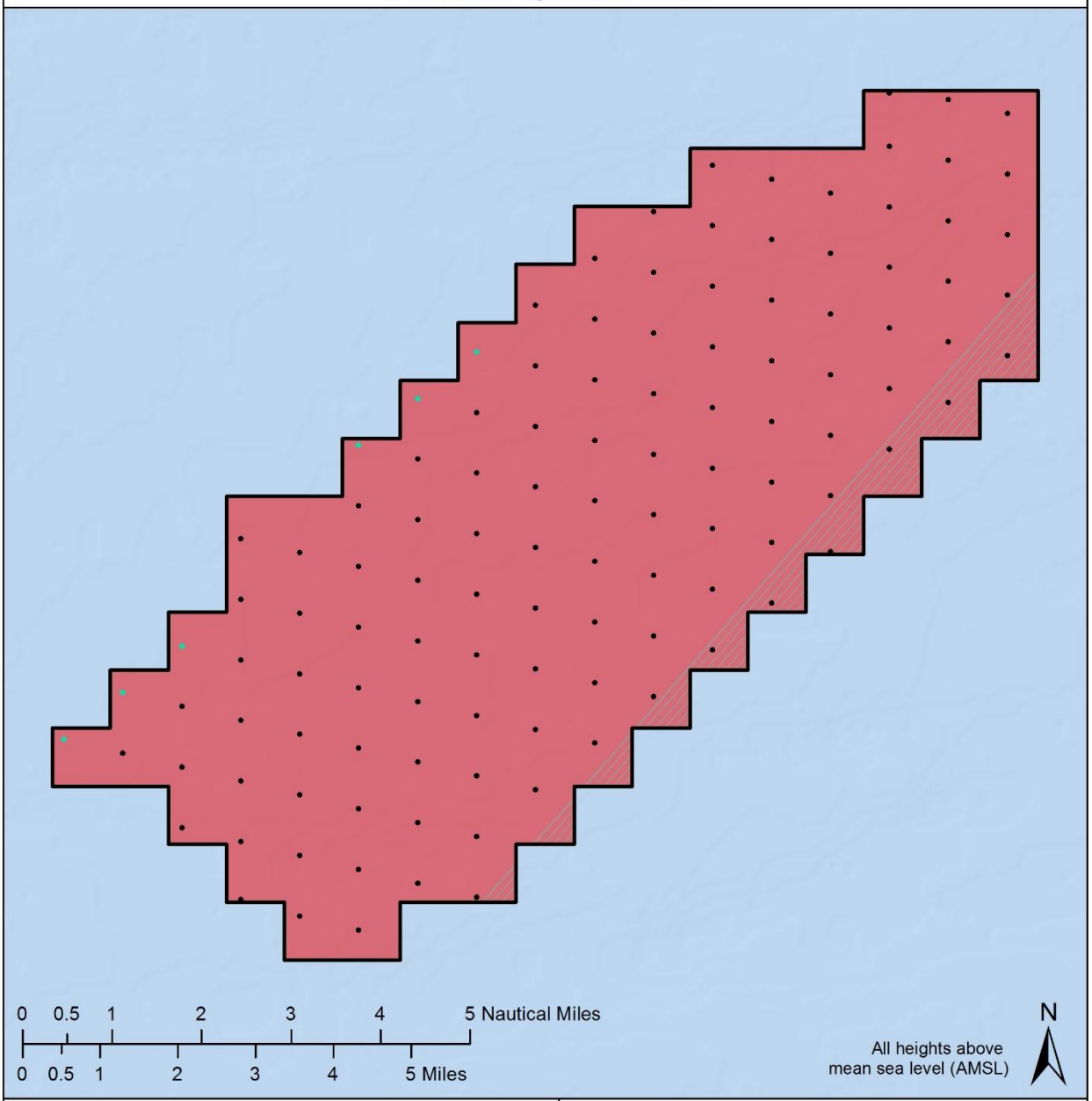
Coordinate System:
NAD 1983 UTM Zone 18N

Alison Kennedy

Figure 13

Capitol Airspace Group

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.



Clearance
Height - AMSL Feet
< 1,165
≥ 1,165
Lease Area OCS-A 0544

Wind Turbine Generator (WTG)/Electrical Service Platform (ESP) Positions
Contingent WTG/ESP Positions

Vineyard Mid-Atlantic will not develop these contingent WTG/ESP positions if the final Empire Wind 2 layout includes WTGs at immediately adjacent positions within Lease Area OCS-A 0512.

Vineyard Mid-Atlantic
Above Mean Sea Level (AMSL) Clearance Map

Plot Date:
10 August 2023

Coordinate System:
NAD 1983 UTM Zone 18N

Alison Kennedy

Figure 14

Capitol Airspace Group

Vineyard Mid-Atlantic COP

Appendix II-H2 Air Traffic Flow Analysis

Prepared by:
Capitol Airspace Group

Prepared for:
Vineyard Northeast LLC

January 2025

Revision	Date	Description
0	January 2024	Initial submission.
1	September 2024	Updated to incorporate revisions to the Project Design Envelope.
1	January 2025	Resubmitted without revisions.

Vineyard Mid-Atlantic Offshore Wind Development

Epsilon Associates, Inc.

Offshore Nassau & Suffolk Counties, New York

Air Traffic Flow Analysis

April 23, 2024

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Introduction

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 visual flight rules (VFR) operations the threshold is one flight per day. For instrument flight rules (IFR) operations the threshold is one flight per week.

Vineyard Mid-Atlantic LLC (the "Proponent") proposes to develop, construct, and operate offshore renewable wind energy facilities in Bureau of Ocean Energy Management (BOEM) Lease Area OCS-A 0544 (the "Lease Area") along with associated offshore and onshore transmission systems. This proposed development is referred to as "Vineyard Mid-Atlantic." Vineyard Mid-Atlantic includes wind turbine generator (WTG) and electrical service platform (ESP) positions within the Lease Area. One or two positions will be occupied by ESPs and the remaining positions will be occupied by WTGs. Offshore export cables installed within an Offshore Export Cable Corridor (OECC) will transmit power from the renewable wind energy facilities to onshore transmission systems on Long Island, New York.

Capitol Airspace previously conducted an obstruction evaluation and airspace analysis for the Vineyard Mid-Atlantic (black outline, ***Figure 1***). This analysis determined that 1,165-foot-tall (355 meter) wind turbines would require an increase to a low-altitude enroute airway minimum altitude and a New York (N90) Terminal Radar Approach Control (TRACON) minimum vectoring altitude (MVA). If either of these IFR impacts would affect as few as one operation per week, it could be used as the basis for determinations of hazard.

In order to determine the number of IFR operations potentially affected by proposed wind turbines, Capitol Airspace conducted an air traffic flow analysis for the Vineyard Mid-Atlantic. This analysis is an assessment of historical flight tracks that can be used to determine the likelihood of airspace impacts affecting a significant volume of future operations.

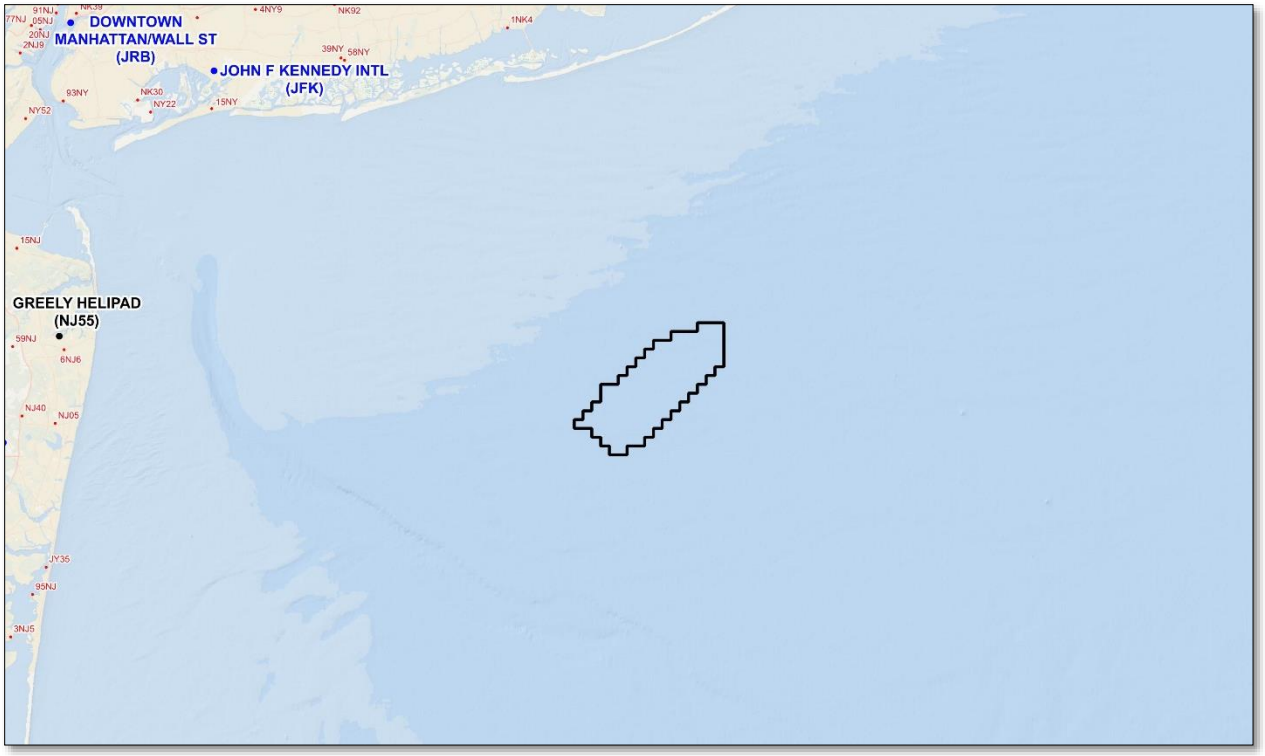

Figure 1: Public-use (blue), private-use (red), and military (black) airports in proximity to the Vineyard Mid-Atlantic (black outline)

Methodology

Capitol Airspace evaluated FAA National Offload Program (NOP) flight tracks in proximity to the Vineyard Mid-Atlantic for the 2021 calendar year. Flight tracks from the 2021 dataset were assessed since it contained a greater number of flights in the affected airspace than the 2019 and 2020 datasets. The FAA NOP data contained radar returns associated with 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 to determine its likely operation.

Enroute Airways

The FAA publishes minimum altitudes for airways to ensure clearance from obstacles and terrain. Proposed structures that exceed enroute airway obstacle clearance surfaces would require an increase to their minimum obstruction clearance altitudes (MOCA) and/or minimum enroute altitudes (MEA). Capitol Airspace analyzed each flight for altitude and direction trends to determine if it potentially utilized the affected enroute airway. The historical presence of these flights is an indicator that the required procedure modifications could affect future enroute airway operations.

Minimum Vectoring Altitudes

In order to accommodate proposed wind turbines, the FAA must modify MVA sector boundaries or establish isolation areas with an increased MVA. Depending on the type of chart, the modifications would implement either a three or five nautical mile (NM) buffer around wind turbines exceeding the MVA sector's obstacle clearance surface. Flights that maintained one or more specific headings within the affected volume of 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 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.

Findings

Enroute Airways

T320 – MANTA to BEADS

At 1,165 feet tall (355 meters), proposed wind turbines throughout the study area (red area, ***Figure 2***) would exceed the obstacle clearance surfaces (blue outlines, ***Figure 2***) and require an increase to the global navigation satellite system (GNSS) MOCA from 1,300 to 2,200 feet AMSL.

Flight track data indicates that as many as 858 flights (purple tracks, ***Figure 2***), an average of *16.50 flights per week*, potentially operated along the *MANTA to BEADS* segment. As many as 75 of these flights, an average of *1.44 flights per week,* operated at the altitudes affected by 1,165-foot-tall (355 meter) wind turbines.

This frequency of operations is above the threshold for a significant volume of IFR operations (one per week). As a result of these findings, it is possible that the FAA would object to increasing the T320 *MANTA to BEADS* segment GNSS MOCA in order to accommodate 1,165-foot-tall (355 meter) wind turbines.

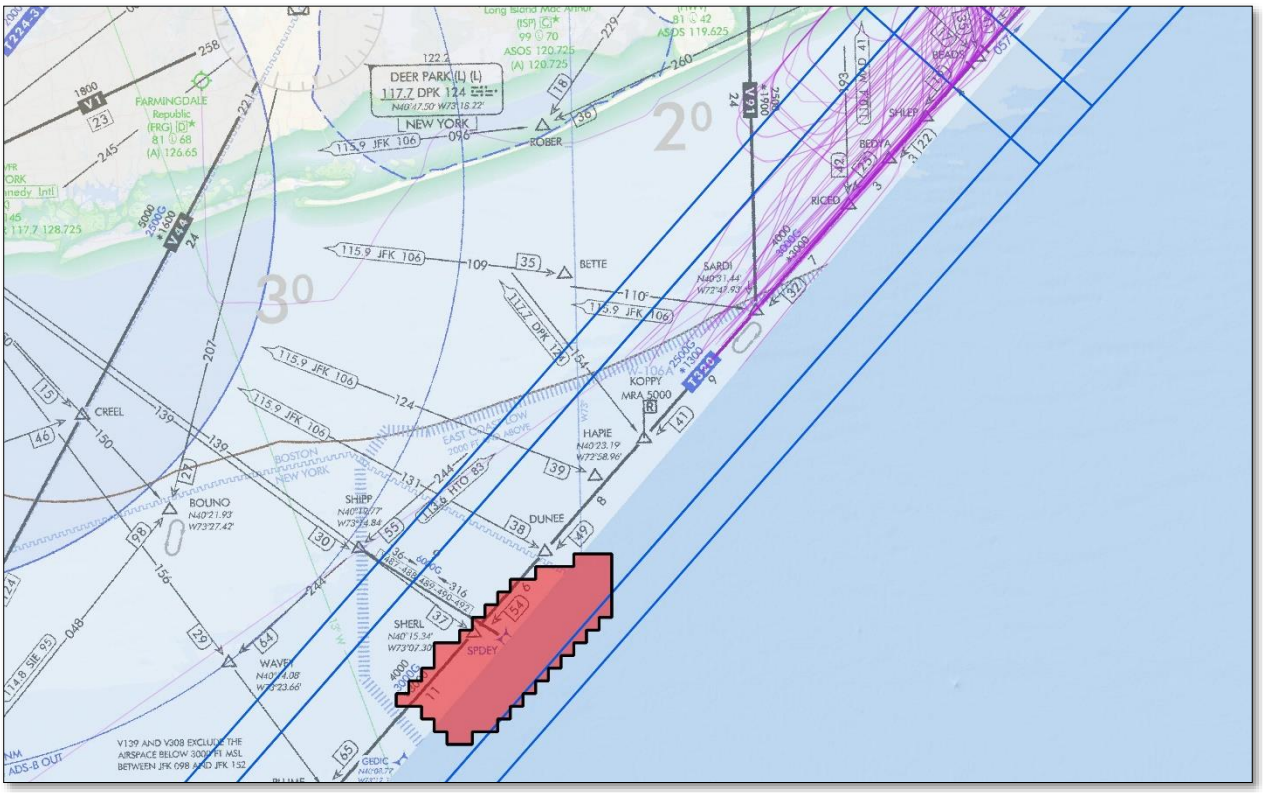

Figure 2: Historical flight tracks (purple) that operated along the T320 MANTA to BEADS segment at the altitudes affected by 1,165-foot-tall (355-meter) wind turbines

New York (N90) TRACON

N90_MVA_FUS3_2022

At 1,165 feet tall (355 meters), proposed wind turbines throughout the study area (red area, ***Figure 3***) would require an increased MVA that would affect portions of Sector L. Historical flight track data indicates that an increase to this MVA as a result of 1,165-foot-tall (355 meter) wind turbines would not affect a significant volume of radar vectoring operations (***Table 1***). As a result of these findings, it is possible that New York (N90) TRACON would not object to modifying sector L to accommodate 1,165-foot-tall (355 meter) wind turbines.

Table 1: N90_MVA_FUS3_2022 chart impact summary and flight track analysis results

MVA			Flights Within Affected Airspace
Sector	Current Altitude (AMSL Feet)	Required Altitude (AMSL Feet)	
L	2000	2200	1 (*0.02 flights per week*)

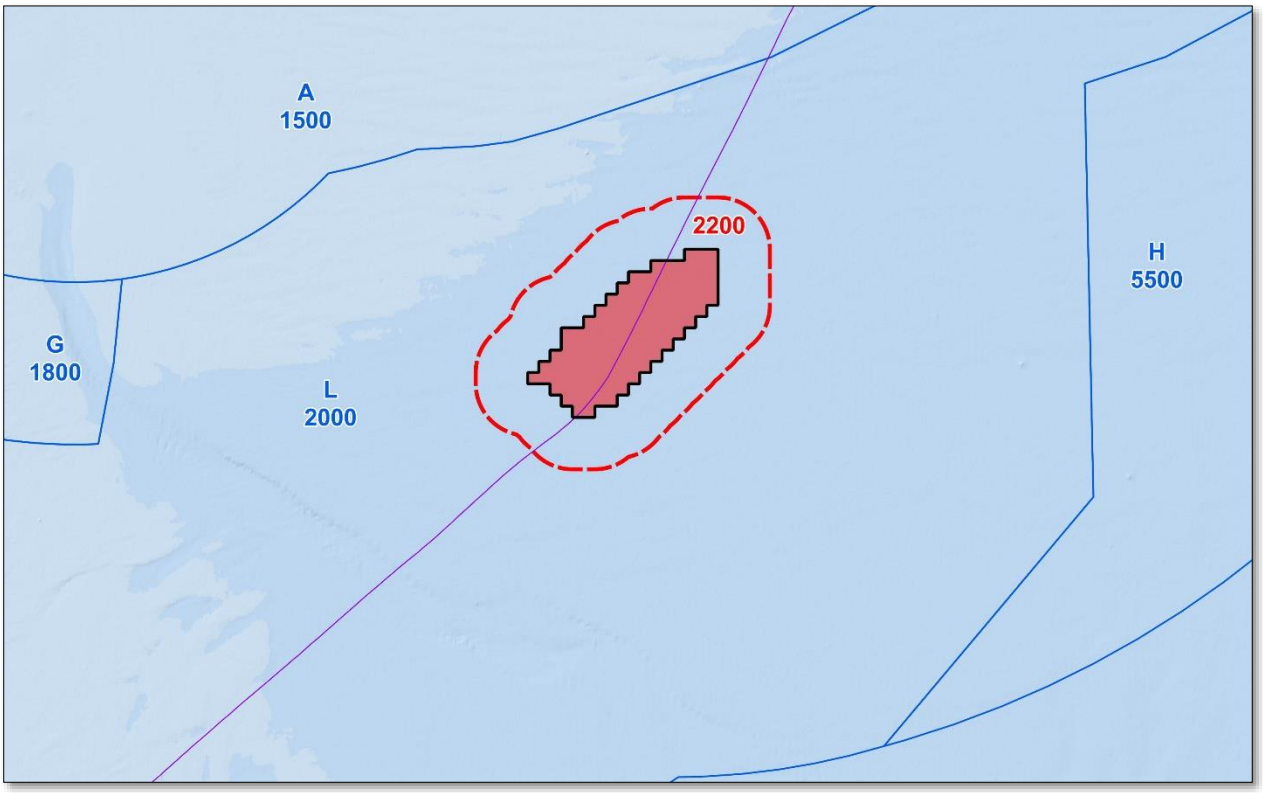

Figure 3: Historical flight track (purple) that operated within the isolation area required by 1,165-foot-tall (355 meter) wind turbines (dashed red outline)

Conclusion

Capitol Airspace assessed historical FAA radar track data covering the period of one year to determine the number of radar vectoring operations that could be affected by 1,165-foot-tall (355 meter) wind turbines.

Enroute Airways

T320 – MANTA to BEADS

At 1,165 feet tall (355 meters), proposed wind turbines throughout the study area would require an increase to the GNSS MOCA from 1,300 to 2,200 feet AMSL. As many as 75 flights (*1.44 per week*) operated along the affected segment of this enroute airway at the altitudes affected by 1,165-foot-tall (355 meter) wind turbines. This frequency of operations is above the threshold for a significant volume of IFR operations (one per week).

New York (N90) TRACON

N90_MVA_FUS3_2022

At 1,165 feet tall (355 meters), wind turbines throughout the study area would require an increase to the Sector L MVA from 2,000 to 2,200 feet AMSL. Only one flight (*0.02 per week*) operated within the isolation area required by 1,165-foot-tall (355 meter) wind turbines. This frequency of operations is below the threshold for a significant volume of IFR operations (*one per week*).

Based on these findings, the impact on the *MANTA to BEADS* segment GNSS MOCA of T320 could affect a significant volume of operations. As a result, the FAA could use this impact as the basis for determinations of hazard for 1,165-foot-tall (355 meter) wind turbines throughout the study area.

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

Vineyard Mid-Atlantic COP

Appendix II-H3 Radar and Navigational Aid Screening Study

Prepared by:
Westslope Consulting

Prepared for:
Vineyard Mid-Atlantic LLC

January 2025

Revision	Date	Description
0	January 2024	Initial submission.
1	September 2024	Updated to incorporate revisions to the Project Design Envelope.
1	January 2025	Resubmitted without revisions.

VINEYARD MID-ATLANTIC OFFSHORE WIND DEVELOPMENT

RADAR AND NAVIGATIONAL AID SCREENING STUDY

AUGUST 7, 2023

AMENDED: MARCH 20, 2024

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3940 West Tecumseh Road, Suite 200
Norman, Oklahoma 73072
(405) 310-6058

INTRODUCTION

Vineyard Mid-Atlantic LLC (the "Proponent") proposes to develop, construct, and operate offshore renewable wind energy facilities in Bureau of Ocean Energy Management (BOEM) Lease Area OCS-A 0544 (the "Lease Area") along with associated offshore and onshore transmission systems. This proposed development is referred to as "Vineyard Mid-Atlantic." Vineyard Mid-Atlantic includes 118 total wind turbine generator (WTG) and electrical service platform (ESP) positions within the Lease Area.[1] One or two of those positions will be occupied by ESPs and the remaining positions will be occupied by WTGs. Further, six of the WTG/ESP positions are contingent, that is, will not be developed if the final Empire Wind 2 layout includes WTGs at immediately adjacent positions within Lease Area OCS-A 0512. Offshore export cables installed within an Offshore Export Cable Corridor (OECC) will transmit power from the renewable wind energy facilities to onshore transmission systems on Long Island, New York.

This report provides the results of a radar and navigational aid screening study conducted by Westslope Consulting, LLC (Westslope) for the WTG and ESP positions (proposed locations) using a wind turbine blade-tip height of 355 meters (m) (1,165 feet (ft)) above mean sea level (AMSL).

This study includes the following:

- Research into radar sites and navigational aid (NAVAID) sites near Vineyard Mid-Atlantic.
- An Air Route Surveillance Radar (ARSR) and Airport Surveillance Radar (ASR) line-of-sight analysis.
- A Terminal Doppler Weather Radar (TDWR) screening analysis.
- A Next Generation Radar (NEXRAD) screening analysis for Weather Surveillance Radar-1988 Doppler (WSR-88D) sites.
- A coastal High Frequency (HF) radar line-of-sight analysis.

[1] vo544_wtg_layout_cop_20230602.shp and lease_area_OCS-A0544.shp.

RESEARCH

ARSR and ASR Sites

Westslope's research identified the following 10 ARSR and ASR sites near Vineyard Mid-Atlantic:

- Atlantic City Airport Surveillance Radar-9 (ASR-9)
- Gibbsboro Air Route Surveillance Radar-4 (ARSR-4)
- Islip ASR-9
- McGuire Air Force Base (AFB) Digital Airport Surveillance Radar (DASR)
- Naval Air Station (NAS) Willow Grove Airport Surveillance Radar-11 (ASR-11)
- New York ASR-9
- Newark ASR-9
- Philadelphia ASR-9
- Riverhead ARSR-4
- White Plains ASR-9

The Department of Defense (DoD) uses these radar sites for air defense at the North American Aerospace Defense Command, and the Department of Homeland Security (DHS) uses these radar sites for homeland security at the Air and Marine Operations Center. In addition, the DoD uses the McGuire AFB DASR for air traffic control at the McGuire AFB Radar Approach Control facility. The Federal Aviation Administration (FAA) uses the Atlantic City ASR-9, the Gibbsboro ARSR-4, the Islip ASR-9, the NAS Willow Grove ASR-11, the New York ASR-9, the Newark ASR-9, the Philadelphia ASR-9, the Riverhead ARSR-4, and the White Plains ASR-9 for air traffic control at multiple facilities, including the Atlantic City Terminal Radar Approach Control (TRACON), the New York Air Route Traffic Control Center, the New York TRACON, and the Philadelphia TRACON.

Co-Located Secondary Surveillance Radar

Westslope's research identified the following secondary surveillance radar systems co-located with the ARSR and ASR systems:

- An Air Traffic Control Beacon Interrogator-5 is co-located with the Atlantic City ASR-9.
- An Air Traffic Control Beacon Interrogator-6 is co-located with the Gibbsboro ARSR-4 and the Riverhead ARSR-4.
- A Mode S is co-located with the Islip ASR-9, the New York ASR-9, the Newark ASR-9, the Philadelphia ASR-9, and the White Plains ASR-9.
- A Monopulse Secondary Surveillance Radar is co-located with the McGuire AFB DASR and the NAS Willow Grove ASR-11.

In general, secondary surveillance radar systems are less susceptible to interference from WTGs than primary surveillance radar systems, such as the ARSR and ASR systems.

TDWR Sites

Westslope's research identified the following two TDWR sites near Vineyard Mid-Atlantic:

- Floyd Bennett Field TDWR
- Woodbridge TDWR

The FAA uses these radar sites for air traffic control at the New York TRACON. In addition, the National Weather Service (NWS), part of the National Oceanic and Atmospheric Administration (NOAA), uses these radar sites for weather operations at the New York Weather Forecast Office (WFO).

NAVAID Sites

Westslope's research shows there are no Very High Frequency Omnidirectional Range, Distance Measuring Equipment, or Tactical Air Navigation systems near Vineyard Mid-Atlantic.

WSR-88D Sites

Westslope's research identified the following two WSR-88D sites near Vineyard Mid-Atlantic:

- Brookhaven WSR-88D
- Philadelphia WSR-88D

The NWS uses these radar sites for weather operations at multiple facilities, including the New York WFO and the Philadelphia/Mount Holly WFO. In addition, the DoD may use these radar sites for weather operations.

The NWS, and possibly the DoD, use data from the lowest three elevation angles scanned by these radar sites to monitor hazardous weather conditions. These radar sites scan at the NWS's standard three lowest elevation angles of 0.5 degrees, 0.9 degrees, and 1.3 degrees.

HF Radar Sites

Westslope's research identified the following 10 HF radar sites near Vineyard Mid-Atlantic:

- Amagansett HF radar
- Block Island Long Range HF radar
- Bradley Beach HF radar
- Brigantine Long Range HF radar
- Hempstead HF radar
- Loveladies HF radar
- Moriches HF radar
- Sandy Hook HF radar
- Sea Bright HF radar
- Seaside Park HF radar

These HF radar sites are operated by Rutgers University.

In partnership with the NOAA Integrated Ocean Observing System (IOOS), various federal agencies use the ocean surface current and wave data provided by these HF radar sites in support of multiple missions.

ANALYSIS

ARSR and ASR Line-of-Sight Analysis

Westslope conducted an ARSR and ASR line-of-sight analysis using the 4/3rd Effective Earth's Radius Model and United States Geological Survey (USGS) 1/3rd arc-second 3-Dimensional Elevation Program (3DEP) bare-earth data.[2] The 4/3rd Effective Earth's Radius Model accounts for the refraction of radio waves as these waves propagate through the lowest layer of the atmosphere under standard atmospheric conditions. Westslope's analysis shows whether the proposed locations at a blade-tip height of 355 m (1,165 ft) AMSL will be within line-of-sight of and will interfere with ARSR or ASR sites.

Westslope conducted the line-of-sight analysis for the following 10 ARSR and ASR sites:

- Atlantic City ASR-9
- Gibbsboro ARSR-4
- Islip ASR-9
- McGuire AFB DASR
- NAS Willow Grove ASR-11
- New York ASR-9
- Newark ASR-9
- Philadelphia ASR-9
- Riverhead ARSR-4
- White Plains ASR-9

Vineyard Mid-Atlantic is beyond the instrumented range of the Atlantic City ASR-9, the McGuire AFB DASR, the NAS Willow Grove ASR-11, and the Philadelphia ASR-9. As such, Westslope did not consider any additional analysis necessary for these radar sites.

Gibbsboro ARSR-4

The line-of-sight analysis results show that the 118 proposed locations will not be within line-of-sight of and will not interfere with the Gibbsboro ARSR-4 at a blade-tip height of 355 m (1,165 ft) AMSL. As a result, Westslope does not expect any radar effects at or below this blade-tip height.

[2] The USGS 1/3rd arc-second 3DEP bare-earth data has a vertical accuracy of approximately 2.7 feet root mean square error. [1]

Islip ASR-9

The line-of-sight analysis results show that all 118 proposed locations will be within line-of-sight of and will interfere with the Islip ASR-9 at a blade-tip height of 355 m (1,165 ft) AMSL. See Figure 1. The radar effects will include unwanted radar returns (clutter) resulting in a partial loss of primary target detection and false primary targets over and in the immediate vicinity of the proposed locations. Other radar effects will include a partial loss of weather detection and false weather indications over and in the immediate vicinity of the proposed locations.

New York ASR-9

The line-of-sight analysis results show that all 118 proposed locations will be within line-of-sight of and will interfere with the New York ASR-9 at a blade-tip height of 355 m (1,165 ft) AMSL. See Figure 2. The radar effects will include clutter resulting in a partial loss of primary target detection and false primary targets over and in the immediate vicinity of the proposed locations. Other radar effects will include a partial loss of weather detection and false weather indications over and in the immediate vicinity of the proposed locations.

Newark ASR-9

The line-of-sight analysis results show that the 118 proposed locations will not be within line-of-sight of and will not interfere with the Newark ASR-9 at a blade-tip height of 355 m (1,165 ft) AMSL. As a result, Westslope does not expect any radar effects at or below this blade-tip height.

Riverhead ARSR-4

The line-of-sight analysis results show that all 118 proposed locations will be within line-of-sight of and will interfere with the Riverhead ARSR-4 at a blade-tip height of 355 m (1,165 ft) AMSL. See Figure 3. The radar effects will include clutter resulting in a partial loss of primary target detection and false primary targets over and in the immediate vicinity of the proposed locations.

White Plains ASR-9

The line-of-sight analysis results show that eight of the 118 proposed locations will be within line-of-sight of and will interfere with the White Plains ASR-9 at a blade-tip height of 355 m (1,165 ft) AMSL. See Figure 4. The radar effects may include clutter resulting in a partial loss of primary target detection and false primary targets over and in the immediate vicinity of the proposed locations within line-of-sight. Other possible radar effects may include a partial loss of weather detection and false weather indications over and in the immediate vicinity of the proposed locations within line-of-sight.

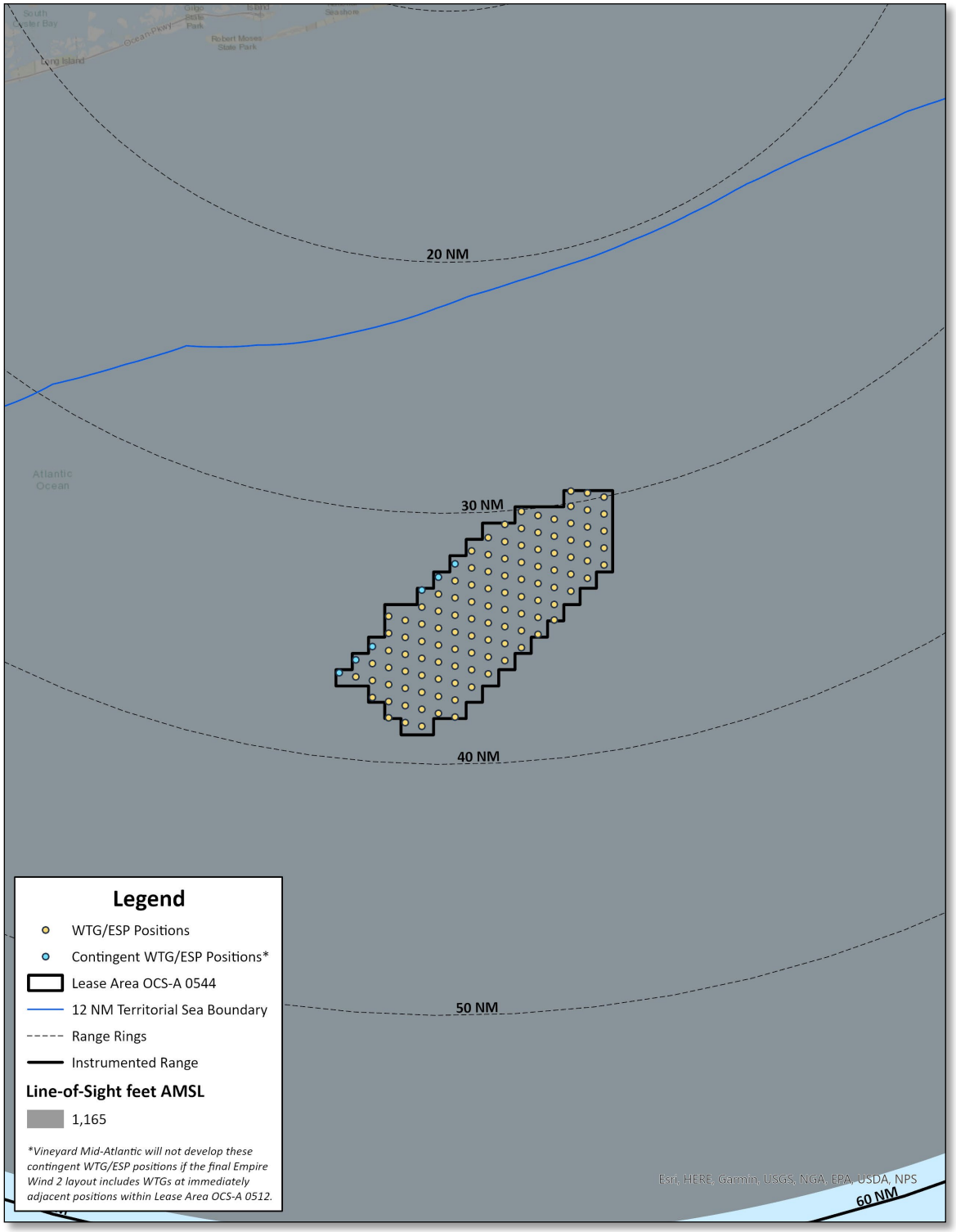

Figure 1 Line-of-Sight Analysis Results for the Islip ASR-9 using 3DEP Data

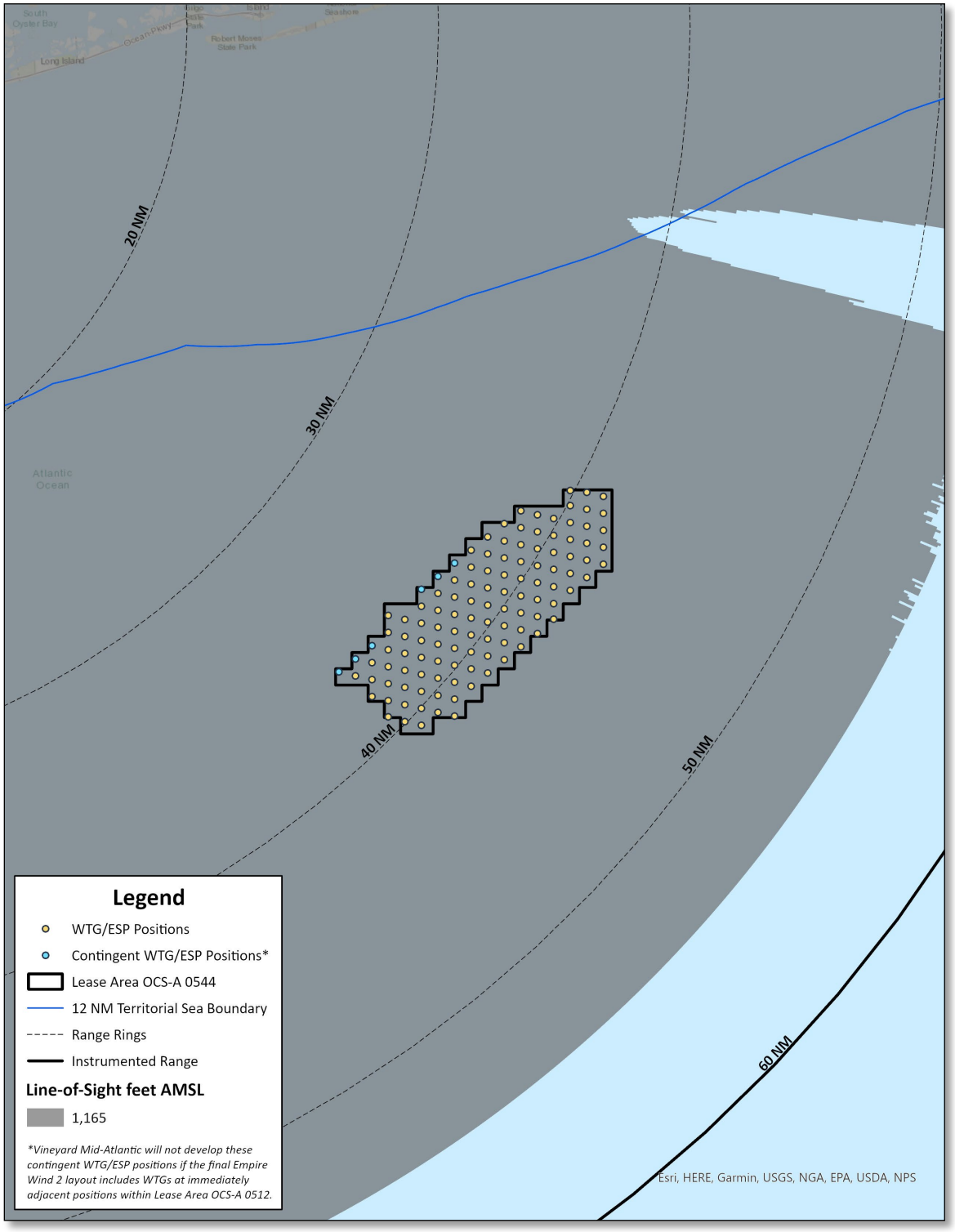

Figure 2 Line-of-Sight Analysis Results for the New York ASR-9 using 3DEP Data

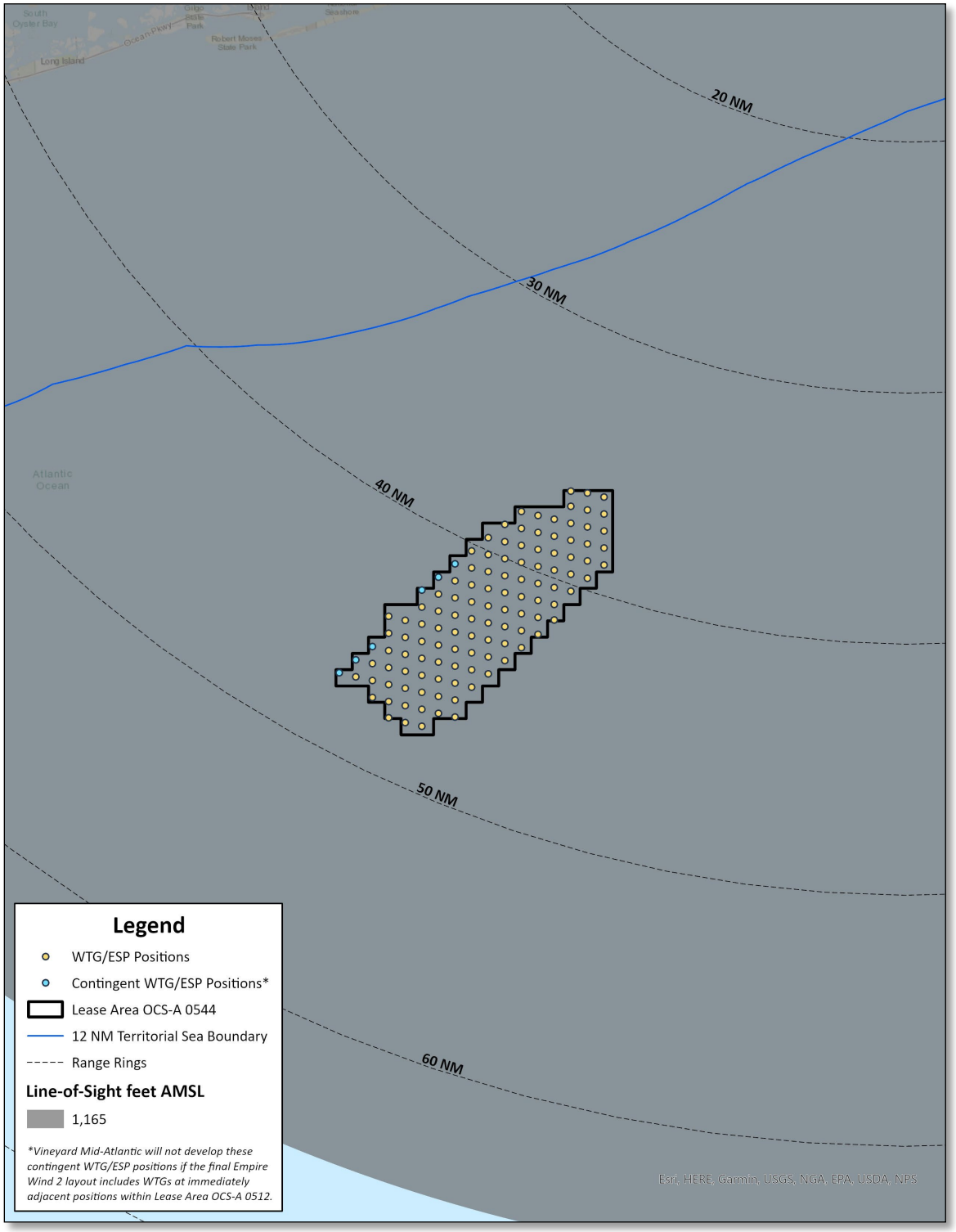

Figure 3 Line-of-Sight Analysis Results for the Riverhead ARSR-4 using 3DEP Data

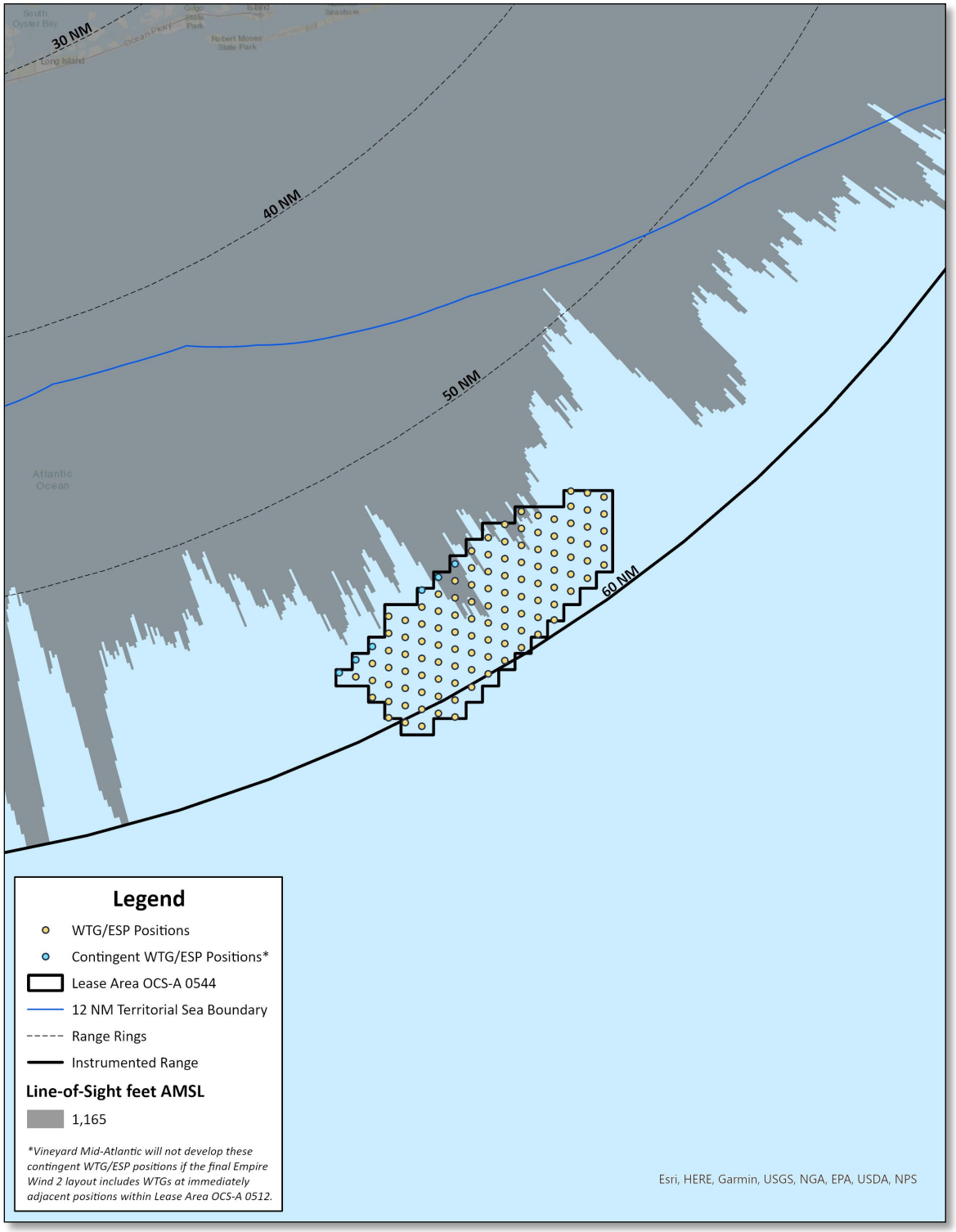

Figure 4 Line-of-Sight Analysis Results for the White Plains ASR-9 using 3DEP Data

TDWR Screening Analysis

Westslope conducted a TDWR screening analysis using the 4/3rd Effective Earth's Radius Model and USGS 1/3rd arc-second 3DEP bare-earth data. Westslope's analysis shows whether the proposed locations at a blade-tip height of 355 m (1,165 ft) AMSL will be within line-of-sight of a TDWR site and penetrate one or more of the elevation angles scanned by the radar site.

Westslope conducted the TDWR screening analysis for the following two radar sites:

- Floyd Bennett Field TDWR
- Woodbridge TDWR

Vineyard Mid-Atlantic is beyond the instrumented range of the Woodbridge TDWR. As such, Westslope did not consider any additional analysis necessary for this radar site.

Floyd Bennett Field TDWR

Westslope's TDWR screening analysis results show that the 118 proposed locations at a blade-tip height of 355 m (1,165 ft) AMSL will not penetrate any of the elevation angles scanned by the Floyd Bennett Field TDWR. As a result, Westslope does not expect any impacts to Floyd Bennett Field TDWR operations at or below this blade-tip height.

NEXRAD Screening Analysis

Westslope conducted a NEXRAD screening analysis using the 4/3rd Effective Earth's Radius Model and USGS 1/3rd arc-second 3DEP bare-earth data. Westslope's analysis shows whether the proposed locations at a blade-tip height of 355 m (1,165 ft) AMSL will be within line-of-sight of a WSR-88D site and penetrate the lowest three elevation angles scanned by the radar site. This analysis uses Westslope's implementation of the impact zone scheme employed by NOAA's NWS Radar Operations Center.

Westslope conducted the NEXRAD screening analysis for the following two WSR-88D sites:

- Brookhaven WSR-88D
- Philadelphia WSR-88D

These radar sites scan at the NWS's standard three lowest elevation angles of 0.5 degrees, 0.9 degrees, and 1.3 degrees.

Brookhaven WSR-88D

Westslope's NEXRAD screening analysis results show that 27 of the 118 proposed locations will fall within a notification zone and the remaining 91 proposed locations will fall within a no-impact zone for the Brookhaven WSR-88D at a blade-tip height of 355 m (1,165 ft) AMSL. See Figure 5. A notification zone represents areas between 36 kilometers (km) and 60 km of a WSR-88D site where WTGs will penetrate only the lowest elevation angle scanned by the radar site. A no-impact zone represents areas where WTGs will not penetrate the lowest three elevation angles scanned by a WSR-88D site.

At a blade-tip height of 355 m (1,165 ft) AMSL, data contamination due to clutter is possible over and in the immediate vicinity of the proposed locations that fall within a notification zone.

Philadelphia WSR-88D

Westslope's NEXRAD screening analysis results show that all 118 proposed locations will fall within a no-impact zone for the Philadelphia WSR-88D at a blade-tip height of 355 m (1,165 ft) AMSL. See Figure 6. As a result, Westslope does not expect any impacts to Philadelphia WSR-88D operations at or below this blade-tip height.

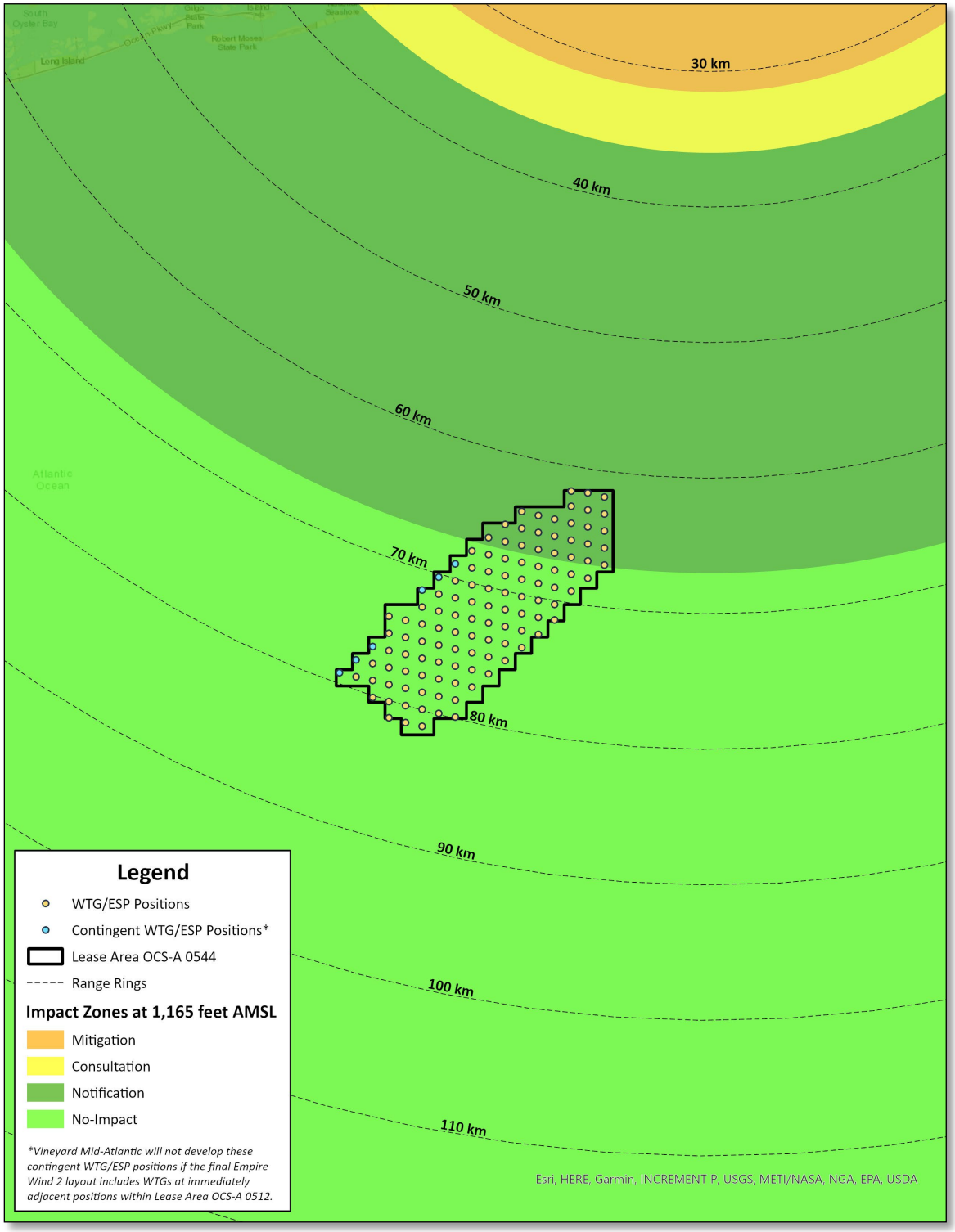

Figure 5 Impact Zones at 355 m (1,165) feet AMSL for the Brookhaven WSR-88D using 3DEP Data

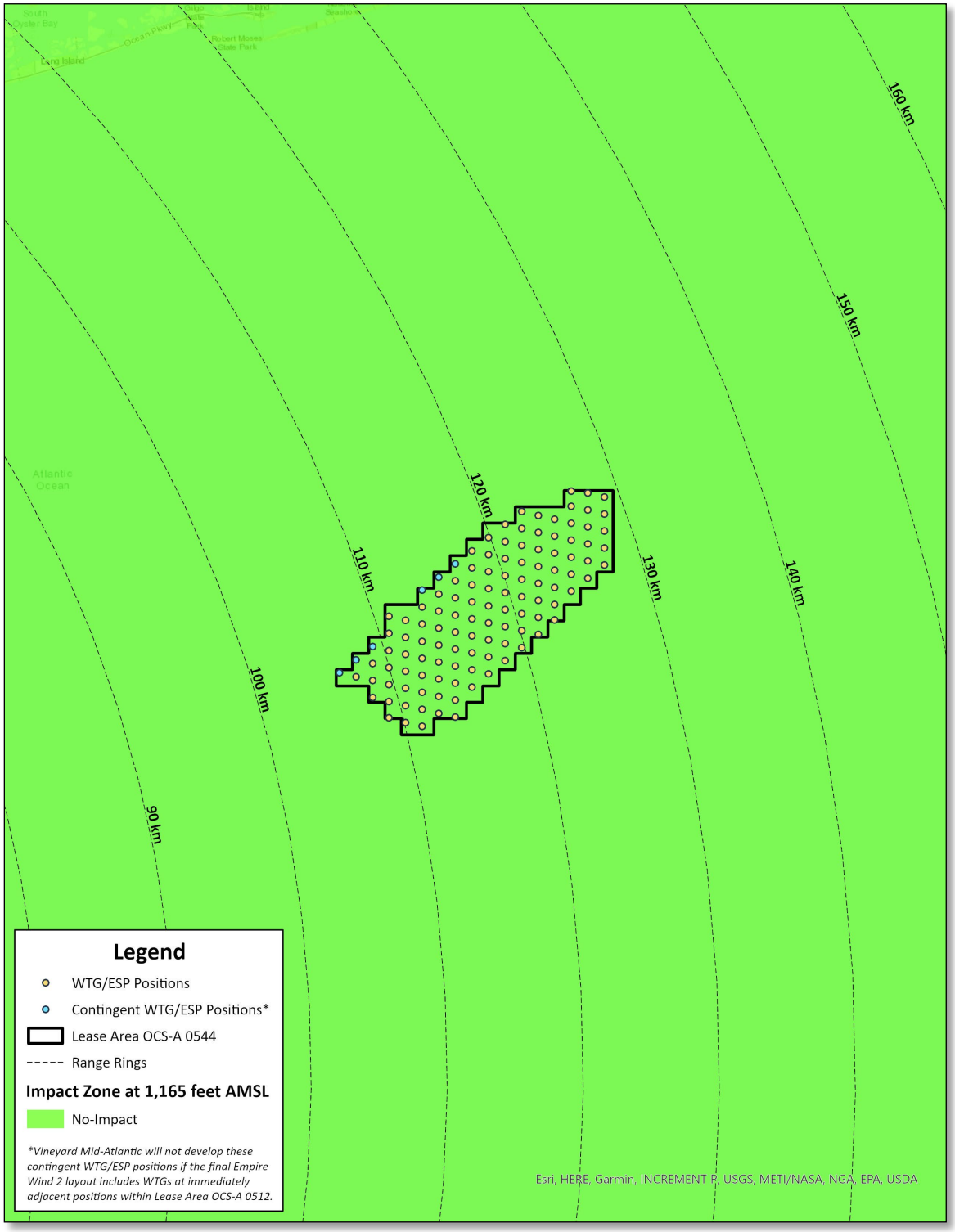

Figure 6 Impact Zone at 355 m (1,165 ft) AMSL for the Philadelphia WSR-88D using 3DEP Data

HF Radar Line-of-Sight Analysis

Westslope conducted an HF radar line-of-sight analysis using the 4/3rd Effective Earth's Radius Model and USGS 1/3rd arc-second 3DEP bare-earth data. Westslope's analysis shows whether the proposed locations at a blade-tip height of 355 m (1,165 ft) AMSL will be within line-of-sight of HF radar sites.

Westslope conducted the line-of-sight analysis for the following 10 HF radar sites:

- Amagansett HF radar
- Block Island Long Range HF radar
- Bradley Beach HF radar
- Brigantine Long Range HF radar
- Hempstead HF radar
- Loveladies HF radar
- Moriches HF radar
- Sandy Hook HF radar
- Sea Bright HF radar
- Seaside Park HF radar

Amagansett HF Radar

The line-of-sight analysis results show that the 118 proposed locations will not be within line-of-sight of the Amagansett HF radar at a blade-tip height of 355 m (1,165 ft) AMSL. See Figure 7. Although the proposed locations will not be within line-of-sight of this radar site, radar effects are still possible beyond line-of-sight due to the propagation of HF electromagnetic waves over the ocean surface.

Block Island Long Range HF Radar

The line-of-sight analysis results show that the 118 proposed locations will not be within line-of-sight of the Block Island Long Range HF radar at a blade-tip height of 355 m (1,165 ft) AMSL. See Figure 8. Although the proposed locations will not be within line-of-sight of this radar site, radar effects are still possible beyond line-of-sight due to the propagation of HF electromagnetic waves over the ocean surface.

Bradley Beach HF Radar

The line-of-sight analysis results show that all 118 proposed locations will be within line-of-sight of the Bradley Beach HF radar at a blade-tip height of 355 m (1,165 ft) AMSL. See Figure 9. The radar effects will include clutter in the vicinity of the proposed locations. As a result, impacts to Bradley Beach HF radar operations are possible.

Brigantine Long Range HF Radar

The line-of-sight analysis results show that the 118 proposed locations will not be within line-of-sight of the Brigantine Long Range HF radar at a blade-tip height of 355 m (1,165 ft) AMSL. See Figure 10. Although the proposed locations will not be within line-of-sight of this radar site, radar effects are still possible beyond line-of-sight due to the propagation of HF electromagnetic waves over the ocean surface.

Hempstead HF Radar

The line-of-sight analysis results show that all 118 proposed locations will be within line-of-sight of the Hempstead HF radar at a blade-tip height of 355 m (1,165 ft) AMSL. See Figure 11. The radar effects will include clutter in the vicinity of the proposed locations. As a result, impacts to Hempstead HF radar operations are possible.

Loveladies HF Radar

The line-of-sight analysis results show that the 118 proposed locations will not be within line-of-sight of the Loveladies HF radar at a blade-tip height of 355 m (1,165 ft) AMSL. See Figure 12. Although the proposed locations will not be within line-of-sight of this radar site, radar effects are still possible beyond line-of-sight due to the propagation of HF electromagnetic waves over the ocean surface.

Moriches HF Radar

The line-of-sight analysis results show that all 118 proposed locations will be within line-of-sight of the Moriches HF radar at a blade-tip height of 355 m (1,165 ft) AMSL. See Figure 13. The radar effects will include clutter in the vicinity of the proposed locations. As a result, impacts to Moriches HF radar operations are possible.

Sandy Hook HF Radar

The line-of-sight analysis results show that all 118 proposed locations will be within line-of-sight of the Sandy Hook HF radar at a blade-tip height of 355 m (1,165 ft) AMSL. See Figure 14. The radar effects will include clutter in the vicinity of the proposed locations. As a result, impacts to Sandy Hook HF radar operations are possible.

Sea Bright HF Radar

The line-of-sight analysis results show that all 118 proposed locations will be within line-of-sight of the Sea Bright HF radar at a blade-tip height of 355 m (1,165 ft) AMSL. See Figure 15. The radar effects will include clutter in the vicinity of the proposed locations. As a result, impacts to Sea Bright HF radar operations are possible.

Seaside Park HF Radar

The line-of-sight analysis results show that 52 of the 118 proposed locations will be within line-of-sight of the Seaside Park HF radar at a blade-tip height of 355 m (1,165 ft) AMSL. See Figure 16. The radar effects will include clutter in the vicinity of the proposed locations within line-of-sight. As a result, impacts to Seaside Park HF radar operations are possible.

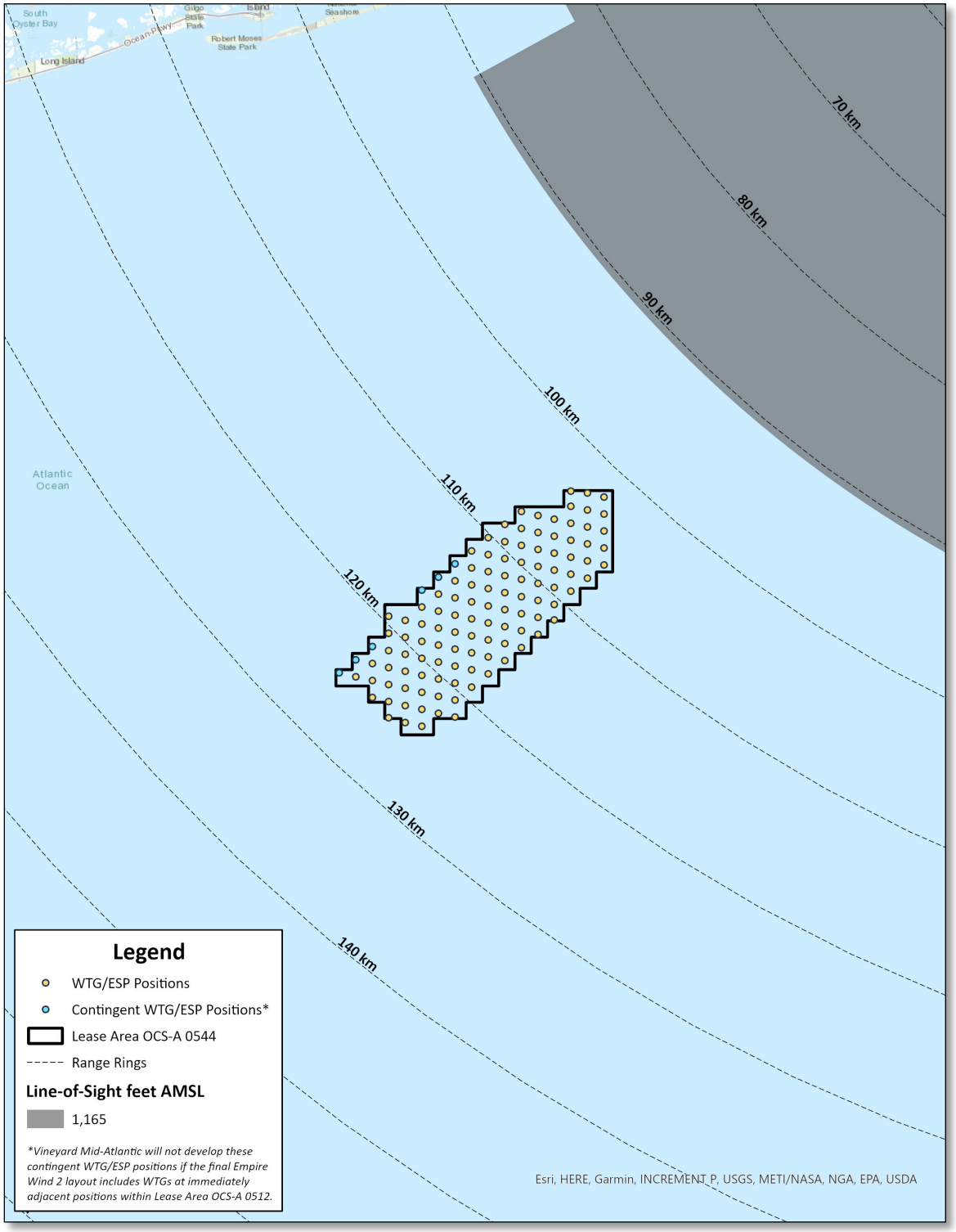

Figure 7 Line-of-Sight Analysis Results for the Amagansett HF radar using 3DEP Data

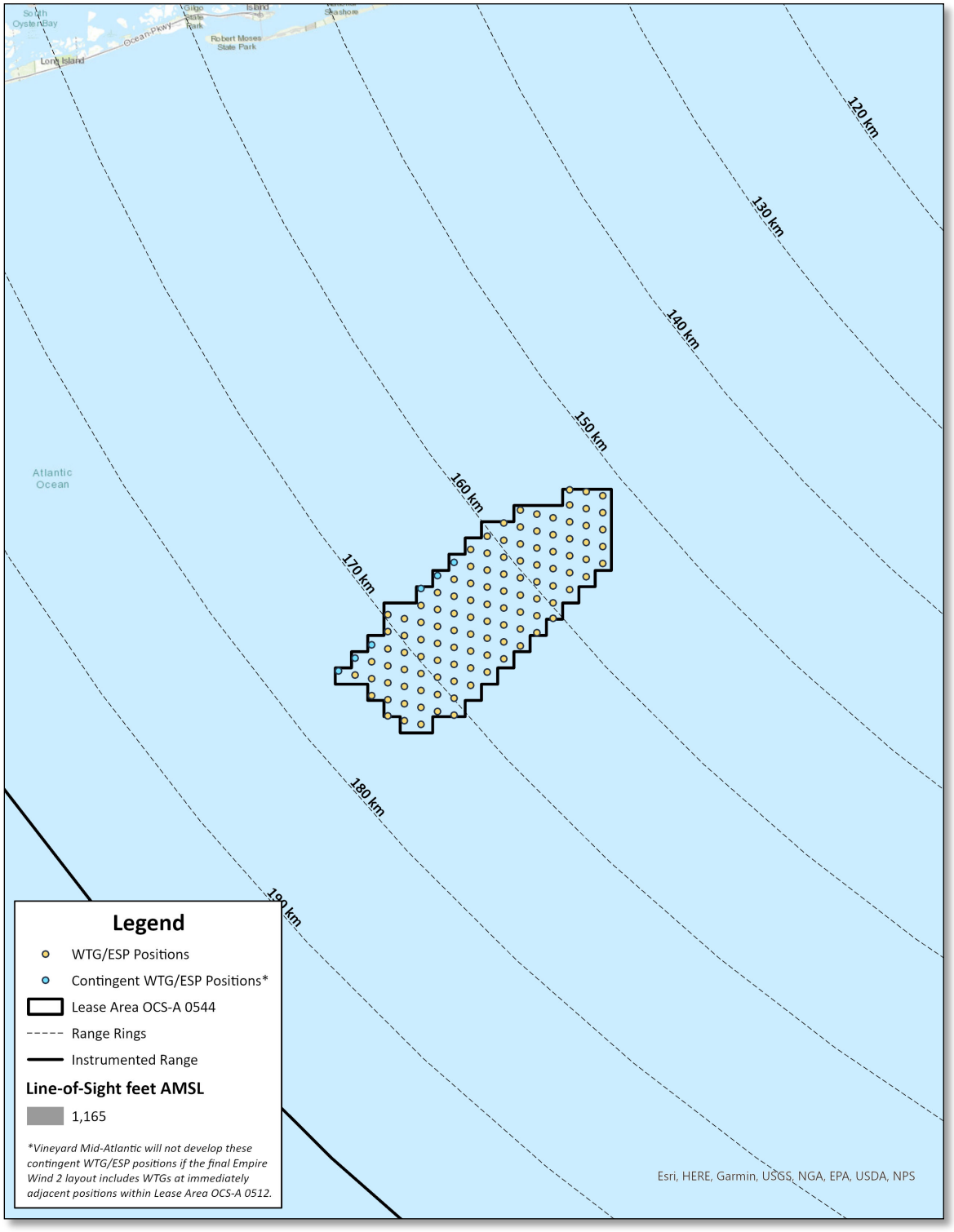

Figure 8 Line-of-Sight Analysis Results for the Block Island Long Range HF radar using 3DEP Data

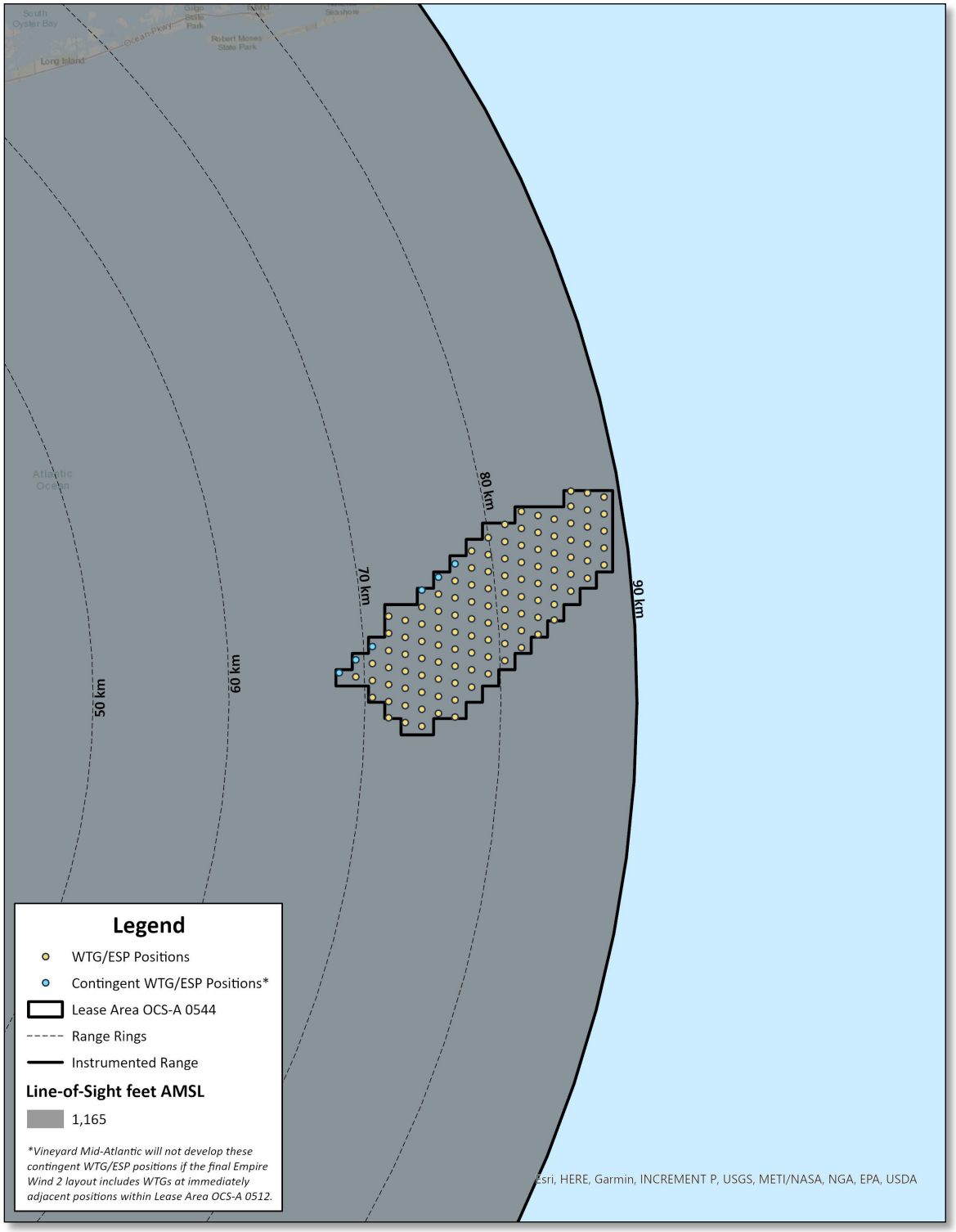

Figure 9 Line-of-Sight Analysis Results for the Bradley Beach HF radar using 3DEP Data

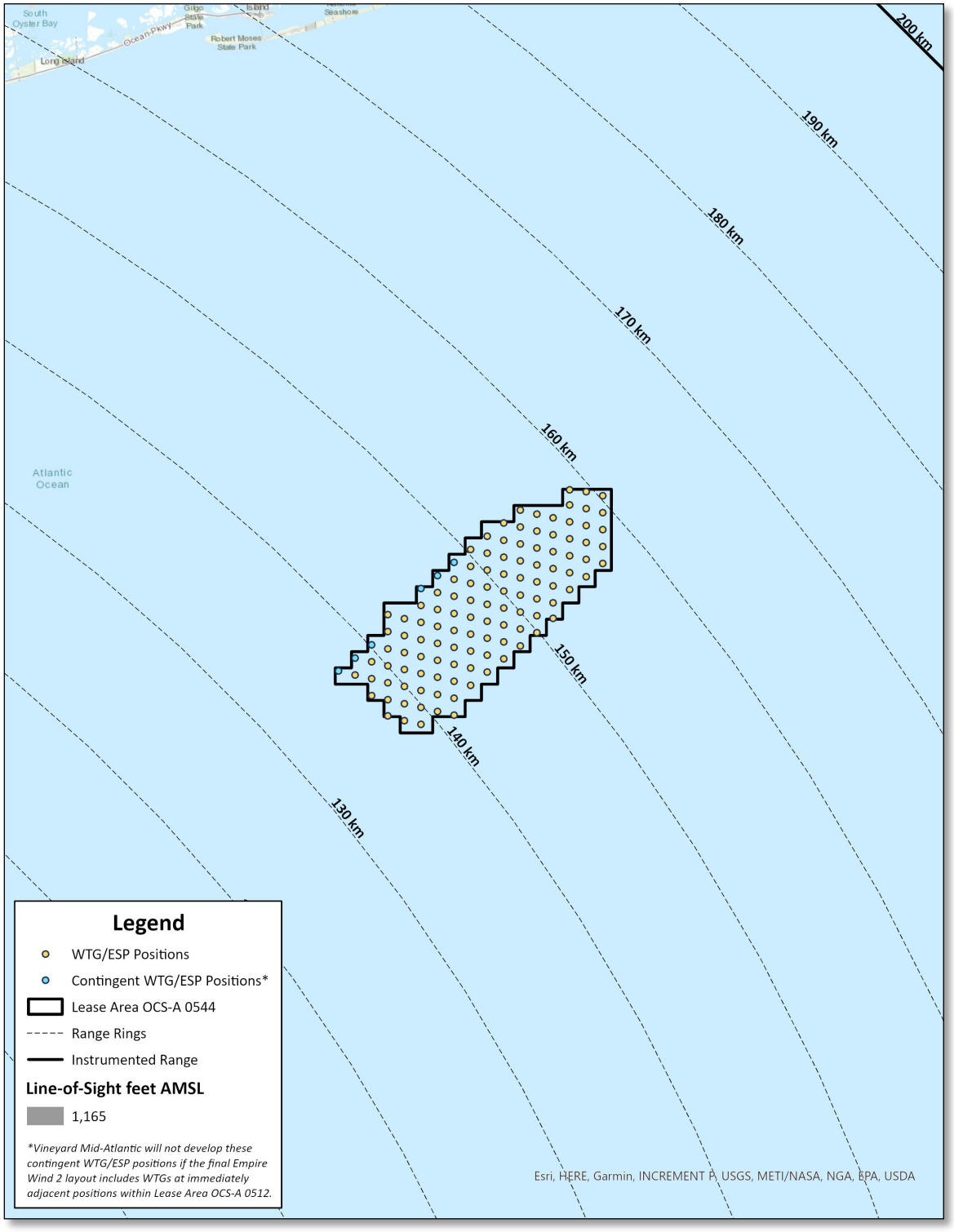

Figure 10 Line-of-Sight Analysis Results for the Brigantine Long Range HF radar using 3DEP Data

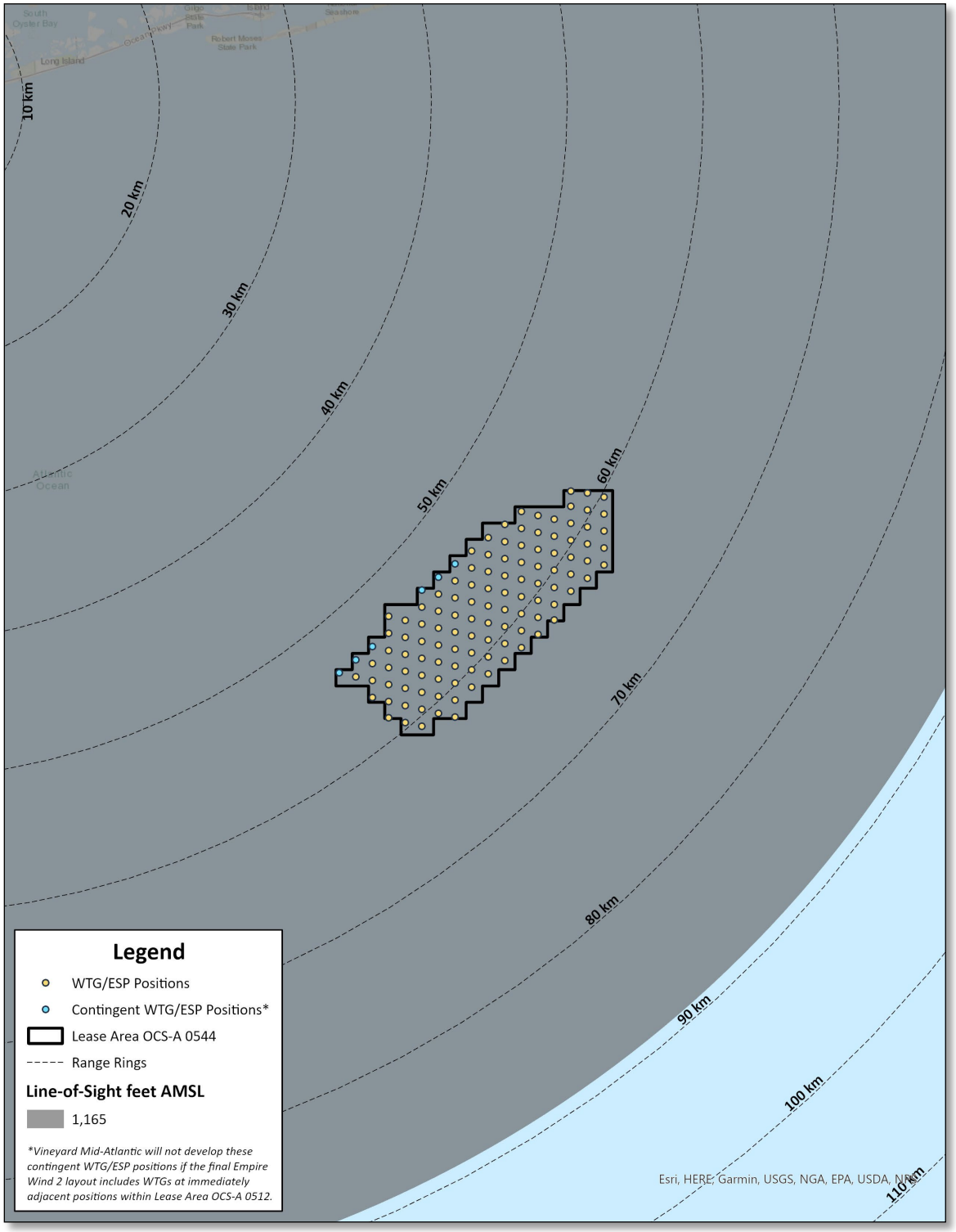

Figure 11 Line-of-Sight Analysis Results for the Hempstead HF radar using 3DEP Data

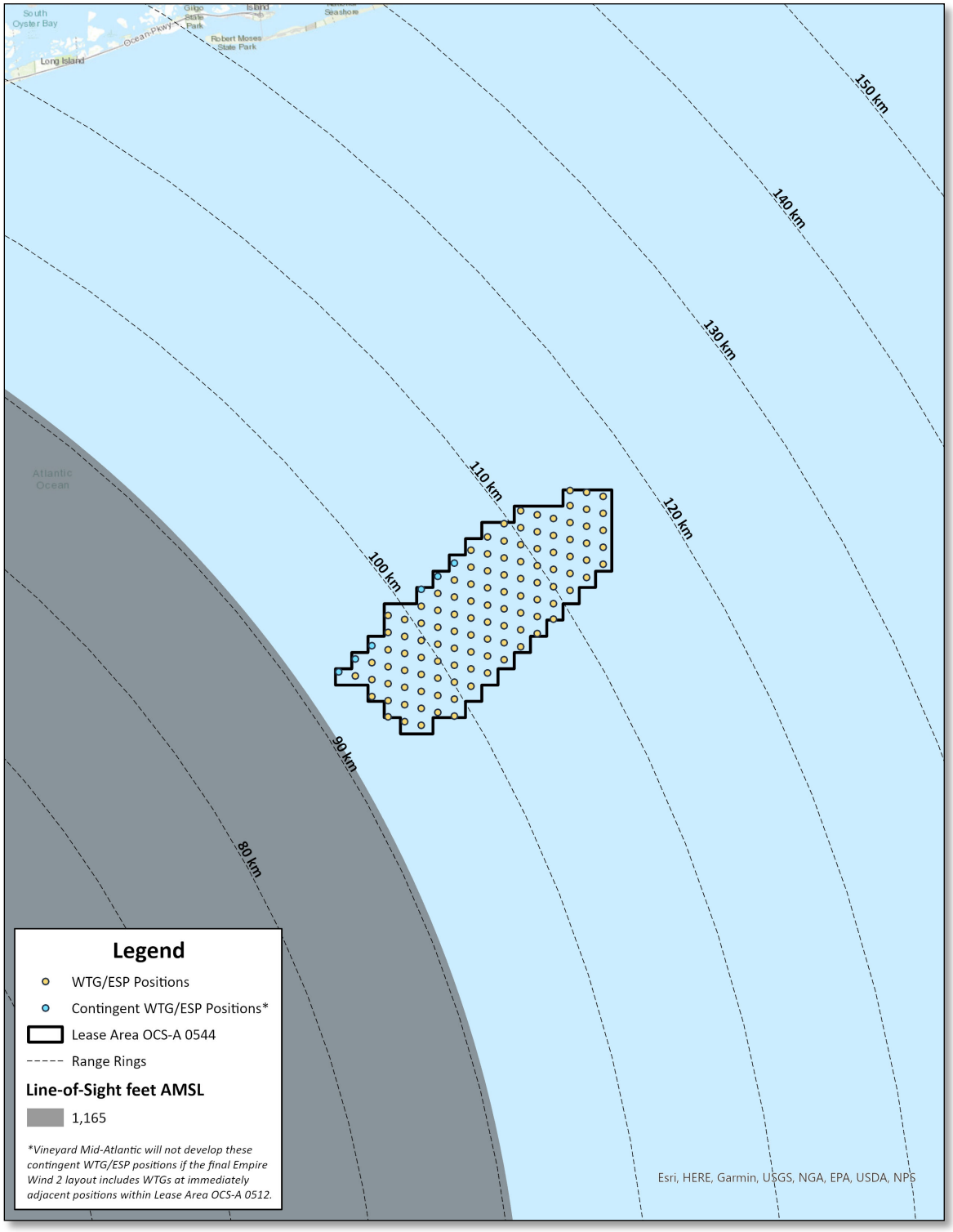

Figure 12 Line-of-Sight Analysis Results for the Loveladies HF radar using 3DEP Data

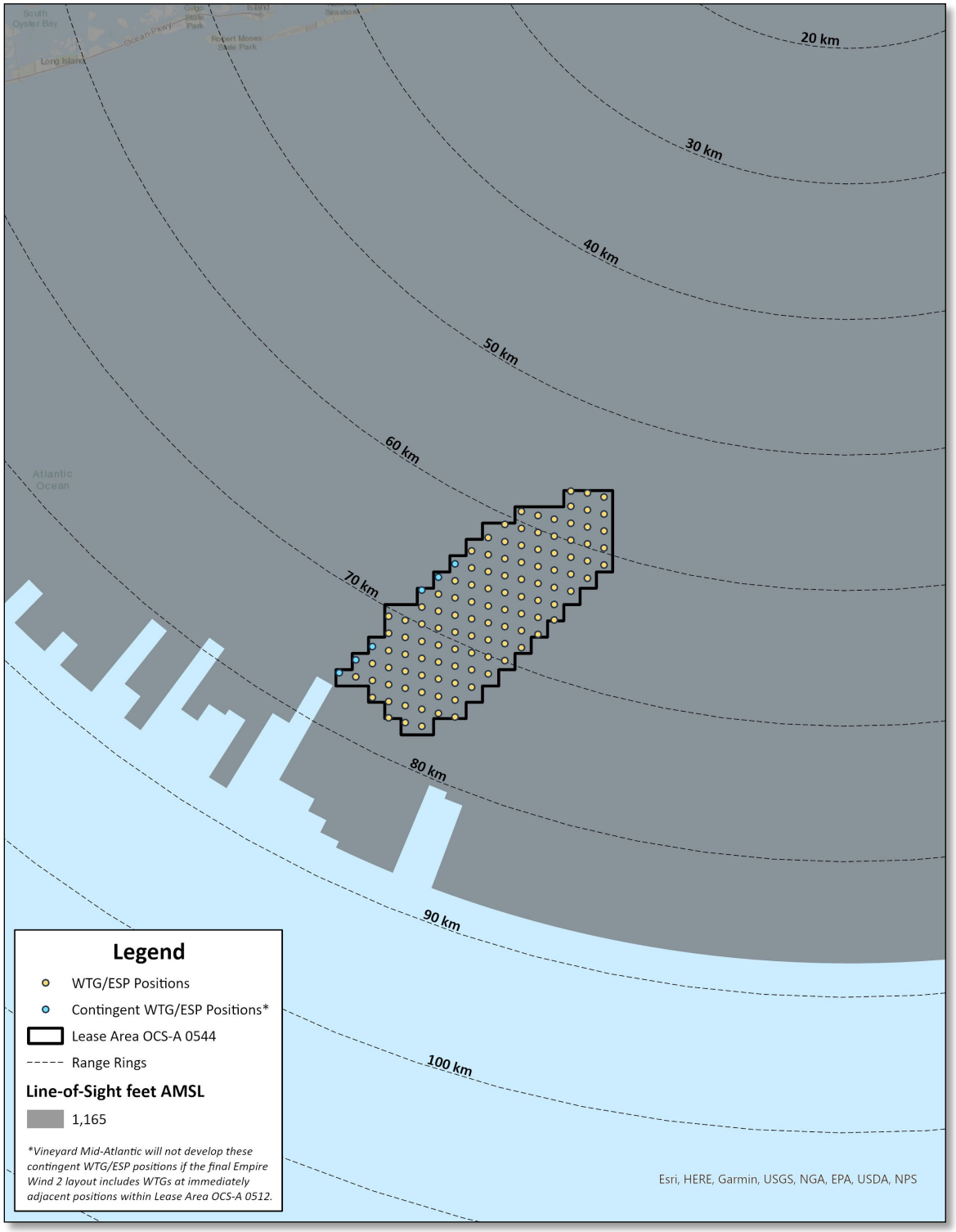

Figure 13 Line-of-Sight Analysis Results for the Moriches HF radar using 3DEP Data

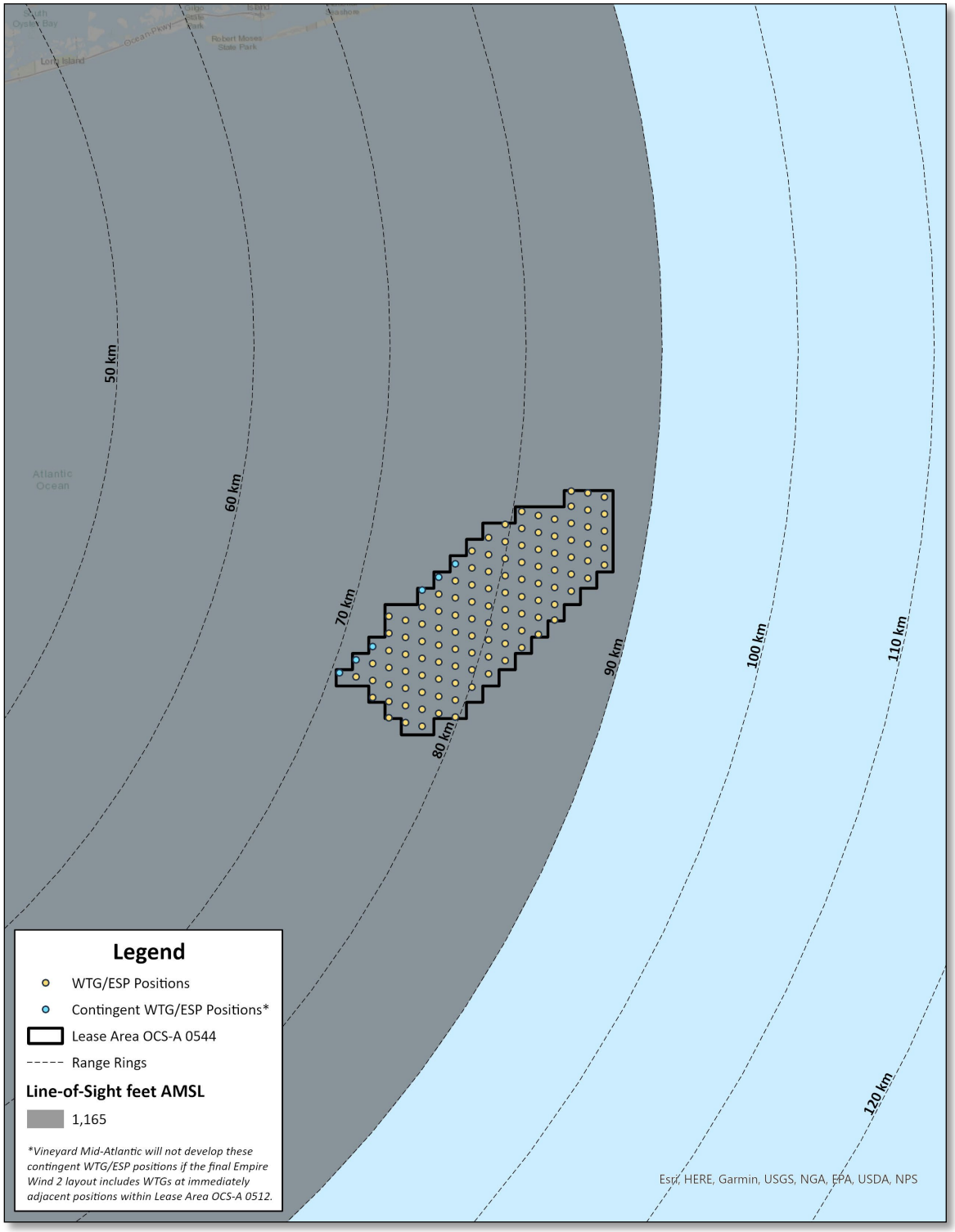

Figure 14 Line-of-Sight Analysis Results for the Sandy Hook HF radar using 3DEP Data

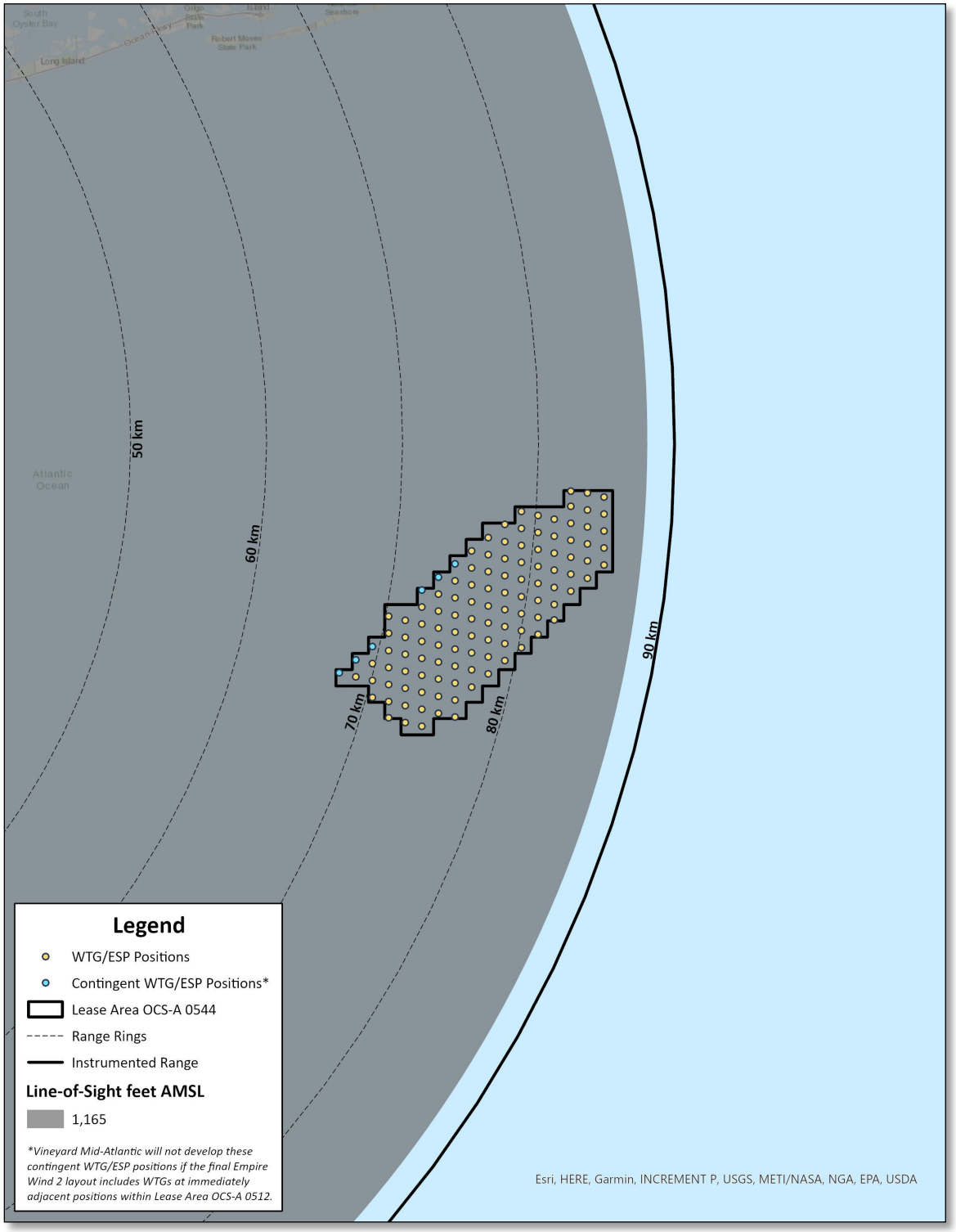

Figure 15 Line-of-Sight Analysis Results for the Sea Bright HF radar using 3DEP Data

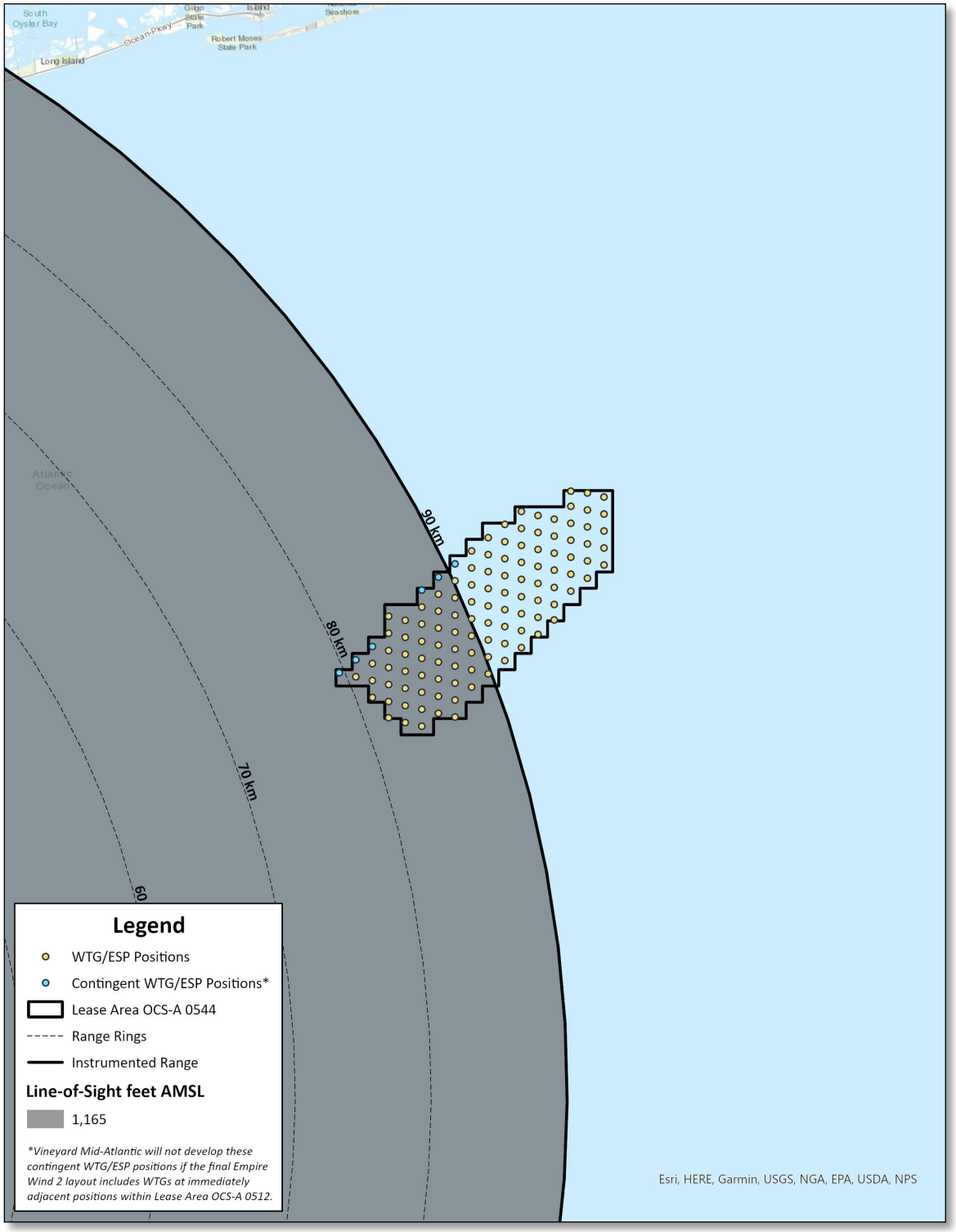

Figure 16 Line-of-Sight Analysis Results for the Seaside Park HF radar using 3DEP Data

CONCLUSIONS

Westslope conducted an ARSR and ASR line-of-sight analysis for the following 10 radar sites:

- Atlantic City ASR-9
- Gibbsboro ARSR-4
- Islip ASR-9
- McGuire AFB DASR
- NAS Willow Grove ASR-11
- New York ASR-9
- Newark ASR-9
- Philadelphia ASR-9
- Riverhead ARSR-4
- White Plains ASR-9

Vineyard Mid-Atlantic is beyond the instrumented range of the Atlantic City ASR-9, the McGuire AFB DASR, the NAS Willow Grove ASR-11, and the Philadelphia ASR-9. As such, Westslope did not consider any additional analysis necessary for these radar sites.

Westslope's ARSR and ASR line-of-sight analyses show the following:

- For the Islip ASR-9, the New York ASR-9, and the Riverhead ARSR-4, all 118 proposed locations will be within line-of-sight of and will interfere with these radar sites at a blade-tip height of 355 m (1,165 ft) AMSL.
- For the White Plains ASR-9, eight of the 118 proposed locations will be within line-of-sight of and will interfere with this radar site at a blade-tip height of 355 m (1,165 ft) AMSL.
- For the Gibbsboro ARSR-4 and the Newark ASR-9, the 118 proposed locations will not be within line-of-sight of and will not interfere with these radar sites at a blade-tip height of 355 m (1,165 ft) AMSL. As a result, Westslope does not expect any effects to these radar sites at or below this blade-tip height.

For the Islip ASR-9 and the New York ASR-9, without mitigation, the radar effects due to clutter will include a partial loss of primary target detection and false primary targets over and in the immediate vicinity of the proposed locations within line-of-sight. Other radar effects will include a partial loss of weather detection and false weather indications over and in the immediate vicinity of the proposed locations within line-of-sight.

For the Riverhead ARSR-4, without mitigation, the radar effects due to clutter will include a partial loss of primary target detection and false primary targets over and in the immediate vicinity of the proposed locations.

For the White Plains ASR-9, without mitigation, the radar effects due to clutter may include a partial loss of primary target detection and false primary targets over and in the immediate vicinity of the proposed locations within line-of-sight. Other possible radar effects may include a partial loss of weather detection and false weather indications over and in the immediate vicinity of the proposed locations within line-of-sight.

Because the proposed locations will be within line-of-sight of the Islip ASR-9, the New York ASR-9, the Riverhead ARSR-4, and the White Plains ASR-9, Westslope expects that, potentially, the DoD will have concerns with the proposed locations within line-of-sight at a blade-tip height of 355 m (1,165 ft) AMSL based on electromagnetic interference to air navigation facilities. Please note that radar effects do not always translate into operational impacts. The DoD Siting Clearinghouse process will provide an official decision as to whether impacts are acceptable to operations.

Vineyard Mid-Atlantic is not within the 12 nautical mile (NM) territorial waters where the FAA currently conducts aeronautical studies.

Although possible, Westslope does not expect that the DHS will have concerns with the proposed locations within line-of-sight at a blade-tip height of 355 m (1,165 ft) AMSL based on impacts to these radar sites.

Mitigation options for the Islip ASR-9, the New York ASR-9, the Riverhead ARSR-4, and the White Plains ASR-9 include, but are not limited to, the following:

- For the Riverhead ARSR-4, optimization, referred to as Radar Adverse-impact Mitigation by the DoD, will minimize false primary targets and maximize primary target detection.
- For the Islip ASR-9, the New York ASR-9, and the White Plains ASR-9, these radar sites use adaptive processing techniques to self-optimize the radar settings to minimize false primary targets and maximize primary target detection. As such, it is unlikely that intervention will be required by FAA personnel to address primary radar performance. For the partial loss of weather detection and false weather indications, an update to the clear day map to minimize false weather indications may be required.
- The Gibbsboro ARSR-4 provides overlapping coverage over Vineyard Mid-Atlantic down to approximately 1,311 m (4,300 ft) AMSL. In addition, the Newark ASR-9 provides partial overlapping coverage over Vineyard Mid-Atlantic down to approximately 1,372 m (4,500 ft) AMSL.

Westslope does not expect that the proposed locations within line-of-sight at a blade-tip height of 355 m (1,165 ft) AMSL will affect the secondary surveillance radar systems co-located with the Islip ASR-9, the New York ASR-9, the Riverhead ARSR-4, or the White Plains ASR-9.

Westslope conducted a TDWR screening analysis for the following two radar sites:

- Floyd Bennett Field TDWR
- Woodbridge TDWR

Vineyard Mid-Atlantic is beyond the instrumented range of the Woodbridge TDWR. As such, Westslope did not consider any additional analysis necessary for this radar site.

Westslope's TDWR screening analysis for the Floyd Bennett Field TDWR shows that the 118 proposed locations at a blade-tip height of 355 m (1,165 ft) AMSL will not be within line-of-sight of and will not penetrate any of the elevation angles scanned by this radar site. As a result, Westslope does not expect any impacts to Floyd Bennett Field TDWR operations at or below this blade-tip height.

Westslope conducted a NEXRAD screening analysis for the following two WSR-88D sites:

- Brookhaven WSR-88D
- Philadelphia WSR-88D

Westslope's NEXRAD screening analyses show the following:

- For the Brookhaven WSR-88D, 27 of the 118 proposed locations will fall within a notification zone and the remaining 91 proposed locations will fall within a no-impact zone for this radar site at a blade-tip height of 355 m (1,165 ft) AMSL.
- For the Philadelphia WSR-88D, all 118 proposed locations will fall within a no-impact zone for this radar site at a blade-tip height of 355 m (1,165 ft) AMSL. As a result, Westslope does not expect any impacts to NWS WFO operations or to DoD weather operations at or below this blade-tip height.

For the Brookhaven WSR-88D, data contamination due to clutter is possible over and in the immediate vicinity of the proposed locations that fall within a notification zone at a blade-tip height of 355 m (1,165 ft) AMSL.

Because 27 of the 118 proposed locations will fall within a notification zone for this radar site, Westslope expects that the NWS, and possibly the DoD, will have concerns with the proposed locations at a blade-tip height of 355 m (1,165 ft) AMSL based on impacts to WSR-88D operations.

For the NWS, the National Telecommunications and Information Administration (NTIA) review process will provide an official decision as to whether impacts are acceptable to the New York WFO's operations. During the NTIA review process, Westslope expects that the NWS will likely state low impacts to WFO operations. The DoD Siting Clearinghouse process will provide an official decision as to whether impacts are acceptable to the DoD's weather operations.

Westslope conducted an HF radar line-of-sight analysis for the following 10 HF radar sites:

- Amagansett HF radar
- Block Island Long Range HF radar
- Bradley Beach HF radar
- Brigantine Long Range HF radar
- Hempstead HF radar
- Loveladies HF radar
- Moriches HF radar
- Sandy Hook HF radar
- Sea Bright HF radar
- Seaside Park HF radar

Westslope's HF radar line-of-sight analyses show the following:

- For the Bradley Beach HF radar, the Hempstead HF radar, the Moriches HF radar, the Sandy Hook HF radar, and the Sea Bright HF radar, all 118 proposed locations will be within line-of-sight of these radar sites at a blade-tip height of 355 m (1,165 ft) AMSL.
- For the Seaside Park HF radar, 52 of the 118 proposed locations will be within line-of-sight of this radar site at a blade-tip height of 355 m (1,165 ft) AMSL.
- For the Amagansett HF radar, the Block Island Long Range HF radar, the Brigantine Long Range HF radar, and the Loveladies HF radar, the 118 proposed locations will not be within line-of-sight of these radar sites at a blade-tip height of 355 m (1,165 ft) AMSL. Although the proposed locations will not be within line-of-sight of these radar sites, radar effects are still possible beyond line-of-sight due to the propagation of HF electromagnetic waves over the ocean surface.

For the Bradley Beach HF radar, the Hempstead HF radar, the Moriches HF radar, the Sandy Hook HF radar, the Sea Bright HF radar, and the Seaside Park HF radar, without mitigation, the radar effects will include clutter in the vicinity of the proposed locations within line-of-sight. Because the proposed locations will be within line-of-sight of these radar sites, Westslope expects that multiple federal agencies in partnership with the NOAA IOOS may have concerns with the proposed locations within line-of-sight at a blade-tip height of 355 m (1,165 ft) AMSL based on potential interference to these HF radar sites.

Mitigation options for HF radar include, but are not limited to, the following:

- Implementation of a software package to address interference from the proposed locations in real-time, which is being researched by CODAR Ocean Sensors, Ltd. under funding from BOEM.
- Installation of other wave and current sensors.

Westslope recommends submitting the proposed locations and the blade-tip height to the DoD Siting Clearinghouse for an informal review and to the NTIA for a detailed review. The NTIA is a clearinghouse for federal users of the radio spectrum, including the NWS. Additionally, Westslope recommends consultation with the NOAA IOOS Program Office.

If you have any questions regarding this analysis, please contact Geoff Blackman at (405) 816-2604 or via email at gnblackman@westslopeconsulting.com.

REFERENCES

[1] USGS, "*What is the vertical accuracy of the 3D Elevation Program (3DEP) DEMs?*," 2022. (https://www.usgs.gov/faqs/what-vertical-accuracy-3d-elevation-program-3dep-dems). Last accessed March 20, 2024.