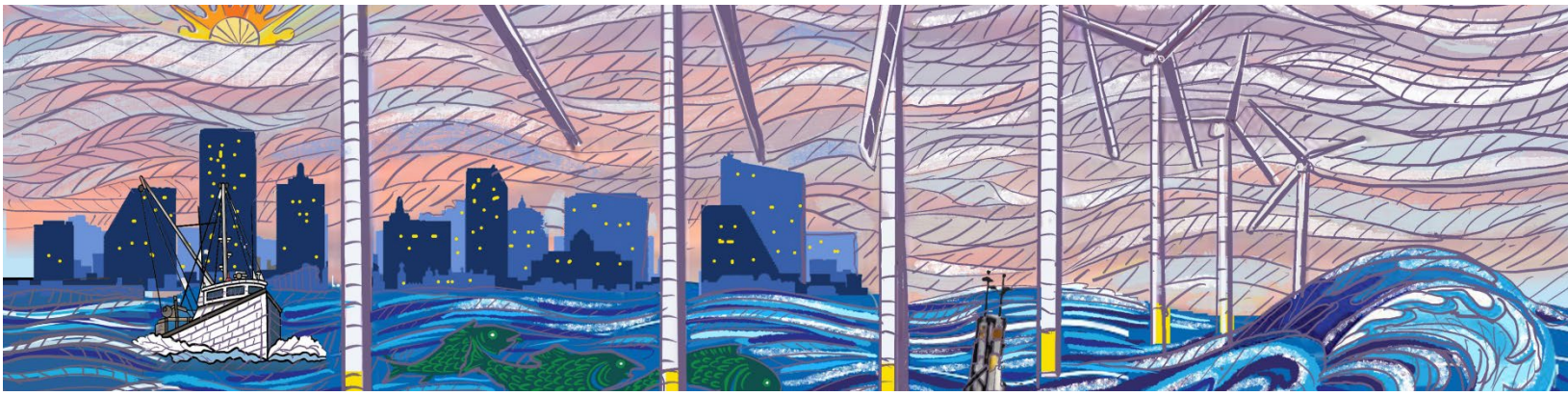

Appendix II-T3

Air Traffic Flow Analysis

Note:

On March 26, 2021, Atlantic Shores Offshore Wind, LLC (Atlantic Shores) submitted a Construction and Operations Plan (COP) to BOEM for the southern portion of Lease OCS-A 0499. On June 30, 2021, the New Jersey Board of Public Utilities (NJ BPU) awarded Atlantic Shores an Offshore Renewable Energy Credit (OREC) allowance to deliver 1,509.6 megawatts (MW) of offshore renewable wind energy into the State of New Jersey. In response to this award, Atlantic Shores updated Volume 1 of the COP to divide the southern portion of Lease OCS-A 0499 into two separate and electrically distinct Projects. Project 1 will deliver renewable energy under this OREC allowance and Project 2 will be developed to support future New Jersey solicitations and power purchase agreements.

As a result of the June 30, 2021 NJ BPU OREC award, Atlantic Shores updated Volume I (Project Information) of the COP in August 2021 to reflect the two Projects. COP Volume II (Affected Environment) and applicable Appendices do not currently include this update and will be updated to reflect Projects 1 and 2 as part Atlantic Shores' December 2021 COP revision.

Atlantic Shores Offshore Wind Project

Environmental Design & Research

Offshore Atlantic and Ocean Counties, New Jersey

Air Traffic Flow Analysis

August 17, 2021

Capitol Airspace Group

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Summary

Capitol Airspace conducted an air traffic flow analysis for the Atlantic Shores offshore wind project (black outline, ***Figure 1***) located off the coast of Atlantic and Ocean Counties, New Jersey. At the time of this analysis, 200 individual wind turbine locations had been identified (black points, ***Figure 1***) within the wind turbine area (dashed orange outline, ***Figure 1***). At 880, 890, or 1,048 feet tall, proposed wind turbines could impact visual flight rules (VFR) routes, low-altitude enroute airway minimum altitudes, and Atlantic City (ACY) TRACON minimum vectoring altitudes (MVA). Additionally, at 1,048 feet tall, proposed wind turbines throughout the study area would require an increase to Atlantic City International (ACY) instrument approach procedure minimum holding altitudes (MHA). The purpose for this analysis was to assess the likelihood that proposed wind turbines could have a substantial adverse effect on aircraft operating along potential VFR routes, as well as to determine the number of operations potentially affected by the airspace changes required to accommodate wind development up to 1,048-feet tall.

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.

Historical air traffic data indicates that 880- and 890-foot-tall wind turbines throughout the study area would not affect any regularly-used VFR routes. Additionally, historical air traffic data indicates that the increases to low-altitude enroute airway minimum altitudes and MVAs required to accommodate wind development up to 890 feet tall should not affect a significant volume of operations. As a result, it possible that the FAA would be willing to increase these altitudes to accommodate wind development up to 890 feet tall. These mitigation options are available and subject to FAA approval.

Historical air traffic data indicates that 1,048-foot tall wind turbines throughout the study area would not affect any regularly-used VFR routes, and that the increases to low-altitude enroute airway minimum altitudes and MVAs required to accommodate wind development up to 1,048 feet tall should not affect a significant volume of operations. However, historical air traffic data indicates that as many as 53 flights utilized the Atlantic City International (ACY) holding patterns at the affected altitudes, while these MHAs could be increased based on FAA instrument approach procedure design criteria, Atlantic City (ACY) TRACON may object due to the loss of the cardinal 2,000-foot AMSL MHA.

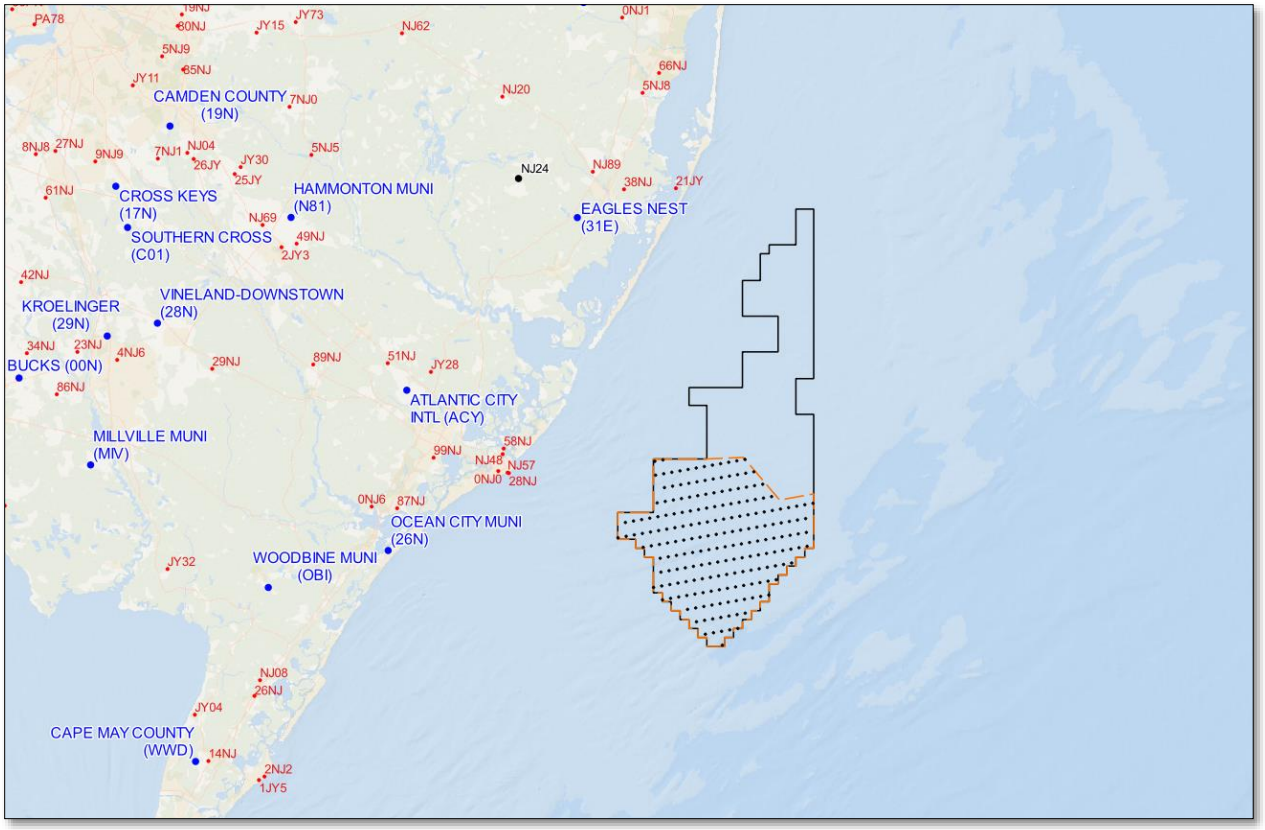

Figure 1: Public-use (blue), military (black), and private-use (red) airports in proximity to the Atlantic Shores offshore wind project

Methodology

Capitol Airspace evaluated FAA National Offload Program (NOP) radar returns in proximity to the Atlantic Shores offshore wind project for the period between January 1, 2019 and December 31, 2019. The FAA NOP data contained 936,495,259 radar returns associated with 8,016,455 flights receiving air traffic control services.[1] Radar tracks were created for each flight that had at least one radar return within the affected airspace and at the affected altitudes. In order to understand the nature of flight operations in and around the affected airspace, Capitol Airspace analyzed each track for altitude and direction trends. Historical flights that operated along low-altitude enroute airways, utilized instrument approach procedures, or possibly received radar vectoring services within the affected airspace are an indicator that the required airspace changes could affect future VFR and IFR operations.

Visual Flight Rules (VFR) Routes

During periods of marginal weather – low cloud ceilings and visibility – pilots often operate below the floor of controlled airspace. According to FAA Order 7400.2N 6-3-8(b)(8), operating during these weather conditions requires pilots to remain within one statute mile of recognizable landmarks such as roads, rivers, transmission lines, railroad tracks, and low-altitude enroute airways. The FAA protects for known and regularly used VFR routes by limiting structure heights within two statute miles of these routes (hatched orange, ***Figure 2***) to no greater than 499 feet AGL. Since there is no dataset that identifies unpublished VFR routes, historical usage becomes the defining factor in protecting these routes.

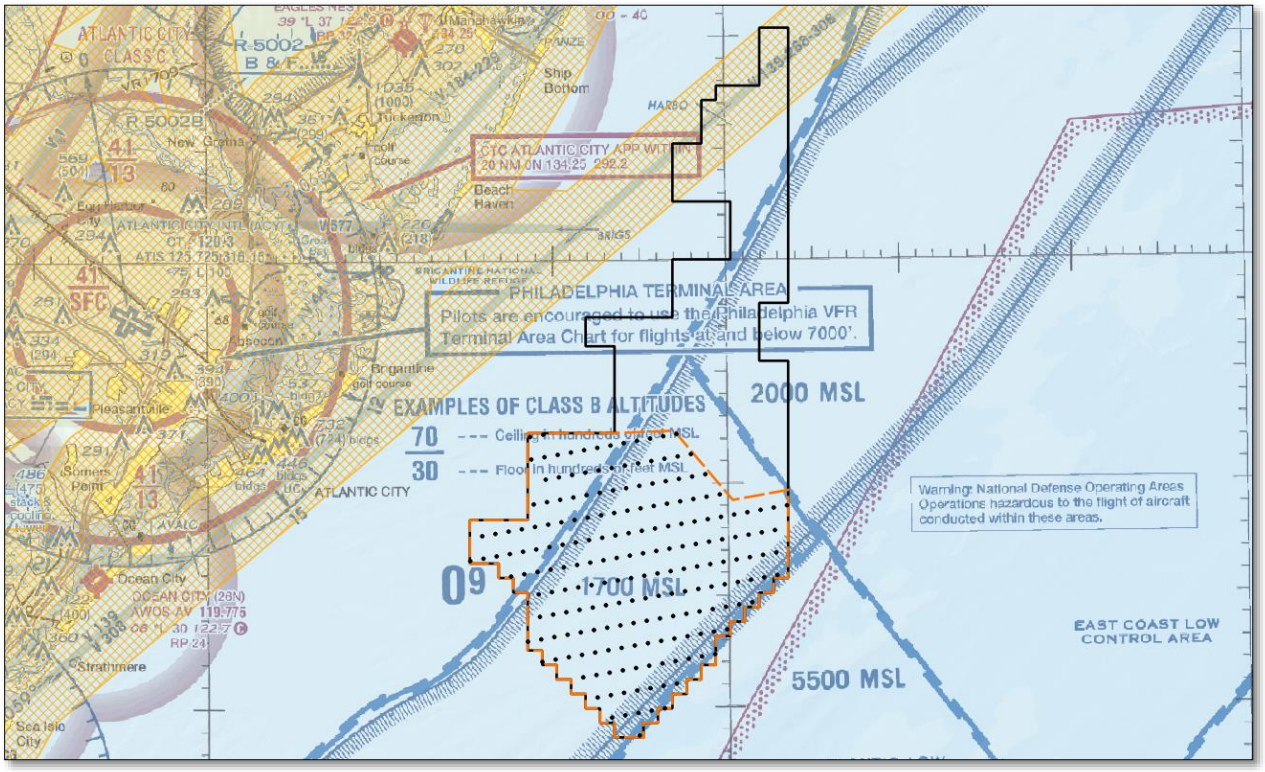

Figure 2: Potential VFR Routes in proximity to Atlantic Shores offshore wind

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

Instrument Approach Procedures

The FAA publishes instrument approach procedures that provide course guidance to on-board avionics that aid the pilot in locating the runway during periods of reduced visibility and low cloud ceilings. Proposed wind turbines 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.

At 1,048 feet tall, proposed wind turbines in the western sections of the study area (e.g., yellow areas, ***Figure 3***) would require an increase to multiple Atlantic City International (ACY) instrument approach procedure holding pattern MHAs from 2,000 to 2,100 feet AMSL.

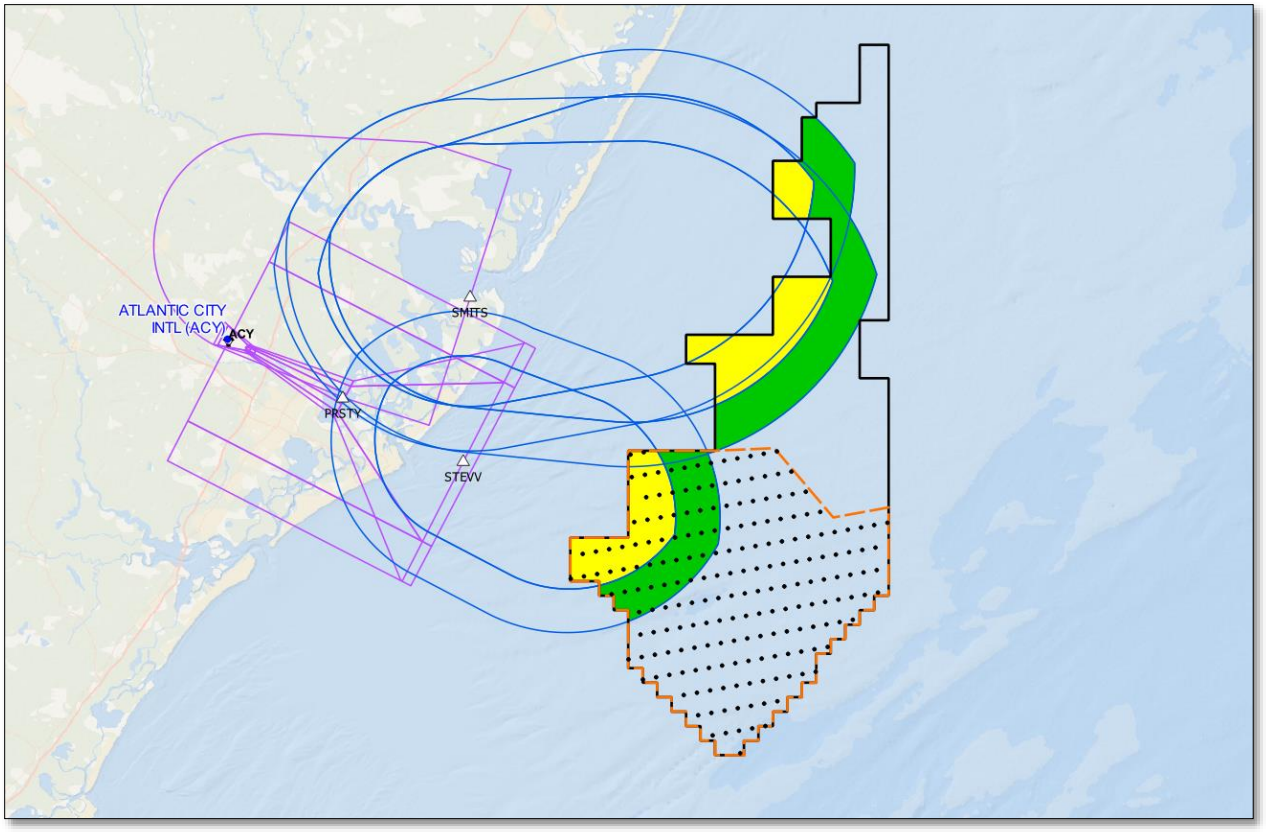

Figure 3: Atlantic City International (ACY) Localizer/DME Approach to Runway 31

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). At 880, 890, and 1,048 feet tall, proposed wind turbines in the northwestern section of the study area (red areas, ***Figure 4***), would require an increase to the V577 westbound MEA. If the FAA determines that this impact would affect as few as one flight per week, it could result in determinations of hazard.

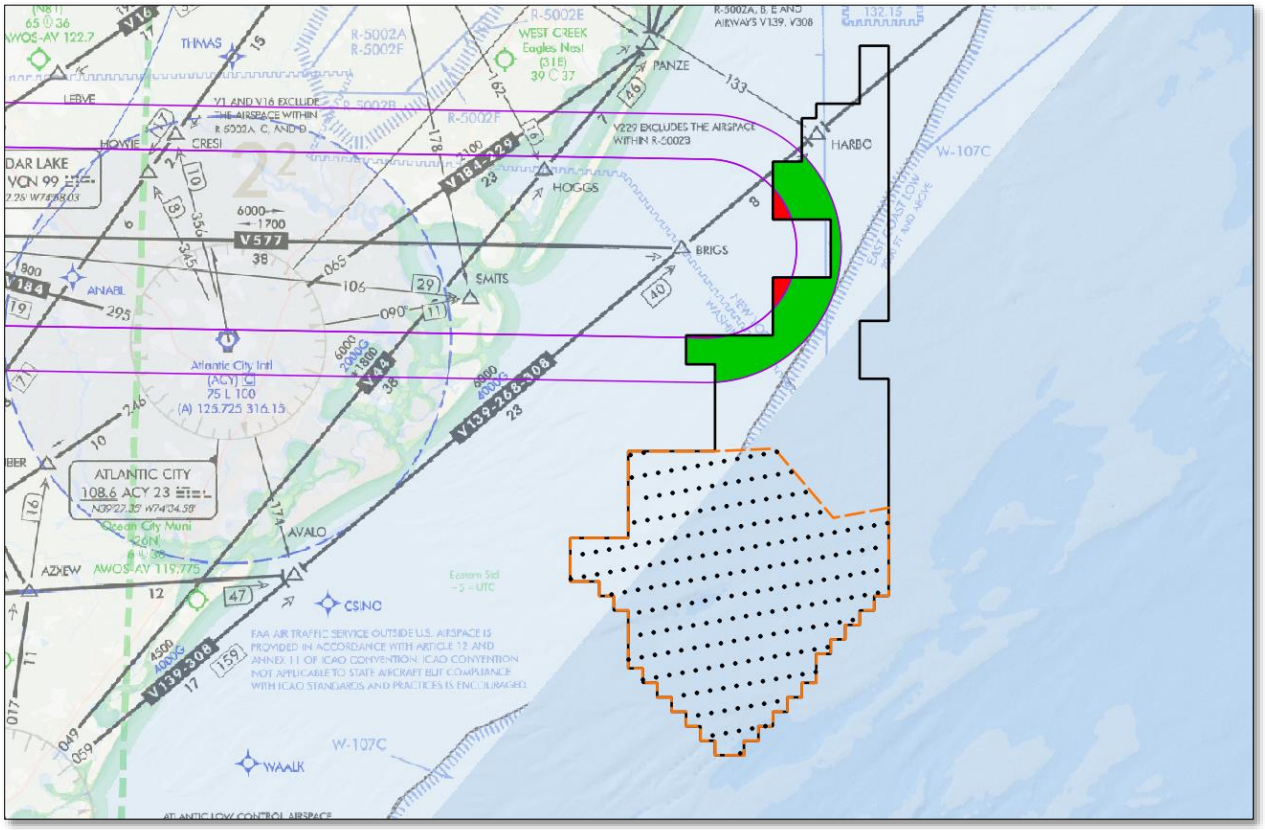

Figure 4: Low altitude enroute chart L-34 with V577 obstacle evaluation area (purple outline)

Minimum Vectoring/IFR Altitudes[2]

The FAA publishes MVA charts that define sectors with the lowest altitudes at which air traffic controllers can issue radar vectors to aircraft. Proposed structures that exceed MVA sector obstacle clearance surfaces (e.g., hatched blue, ***Figure 5***) would require an increase to the altitudes usable by air traffic control for vectoring aircraft. At 880, 890, and 1,048 feet tall, proposed wind turbines in the northern and western sections of the Atlantic Shores offshore wind project (red area, ***Figure 5***) would require an increase to Atlantic City (ACY) TRACON MVAs.

In order to accommodate wind development up to 1,048 feet AMSL, the FAA must establish isolation areas with an increased MVA or MIA. Depending on the chart affected, the isolation area would implement either a three or five nautical mile (NM) buffer around wind turbines in excess of the obstacle clearance surface. If the FAA determines that these impacts would affect as few as one flight per week, it could result in determinations of hazard.

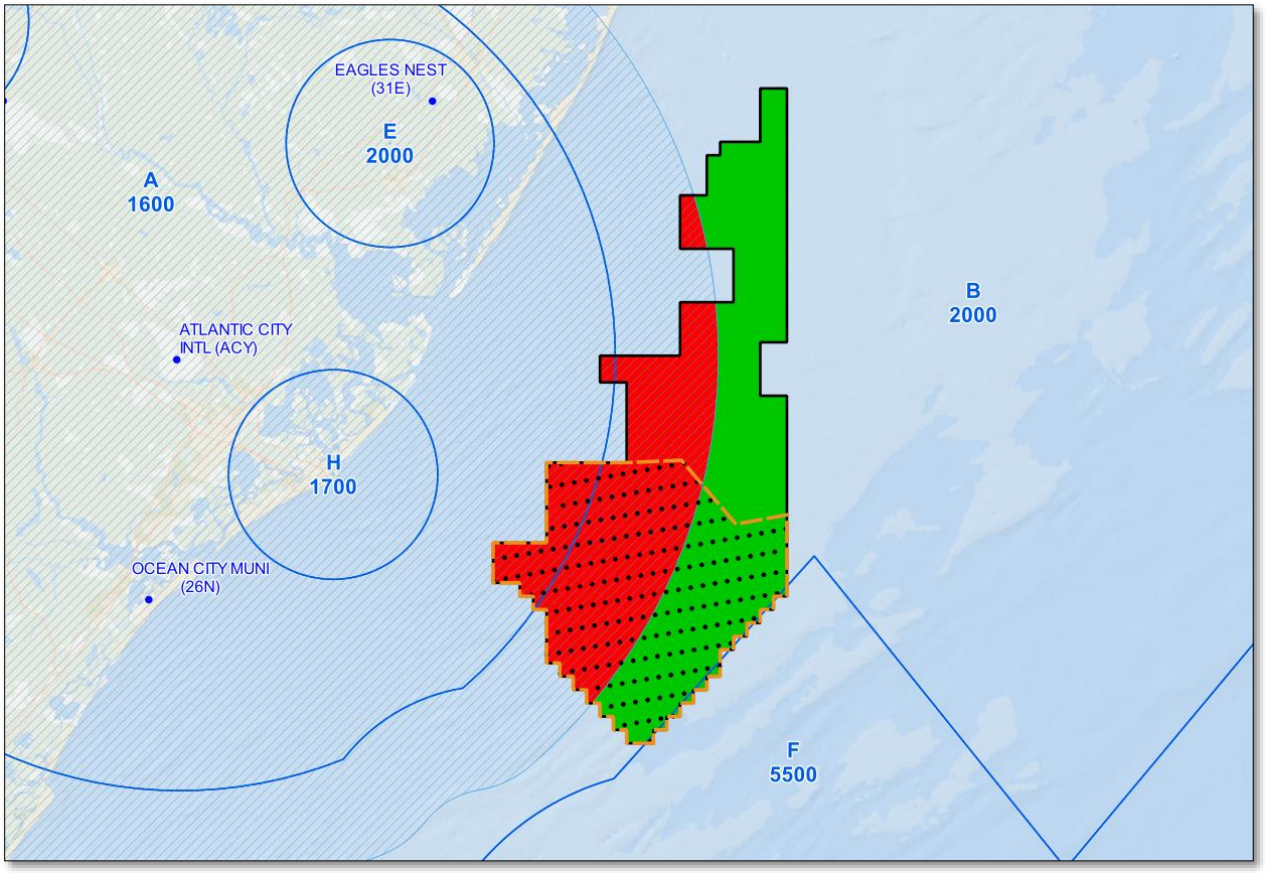

Figure 5: Atlantic City (ACY) TRACON FUSION 5 MVA sectors (blue) with Sector A obstacle evaluation area (hatched blue)

[2] The study area is in proximity to Dover (DOV) Radar Approach Control (RAPCON) and McGuire (WRI) RAPCON airspace. However, Department of Defense (DoD) MVA charts, including those for Navy Radar Air Traffic Control Facilities (RATCF), Army Radar Approach Control Facilities (ARAC), and Air Force RAPCON facilities, are not publicly released and could not be assessed. It is possible that MVA sectors associated with these facilities overlie the study area and result in lower height constraints than those depicted in this report.

Findings

Visual Flight Rules (VFR) Routes

FAA NOP data indicates that 537 flight tracks (purple tracks, ***Figure 6***), an average of *1.47 flights per day*, operated within two statute miles of the entire study area (dashed blue outline, ***Figure 6***). However, none of these flights operated along the same headings as low altitude airways V139-268-308 which could be used as VFR routes.[3] This flight total represents an average of *0.00 flights per day* which is below the FAA's threshold for a significant volume of operations. As a result of these findings, 880-, 890-, or 1,048-foot-tall wind turbines within the defined study area should not have an impact on regularly used VFR routes.

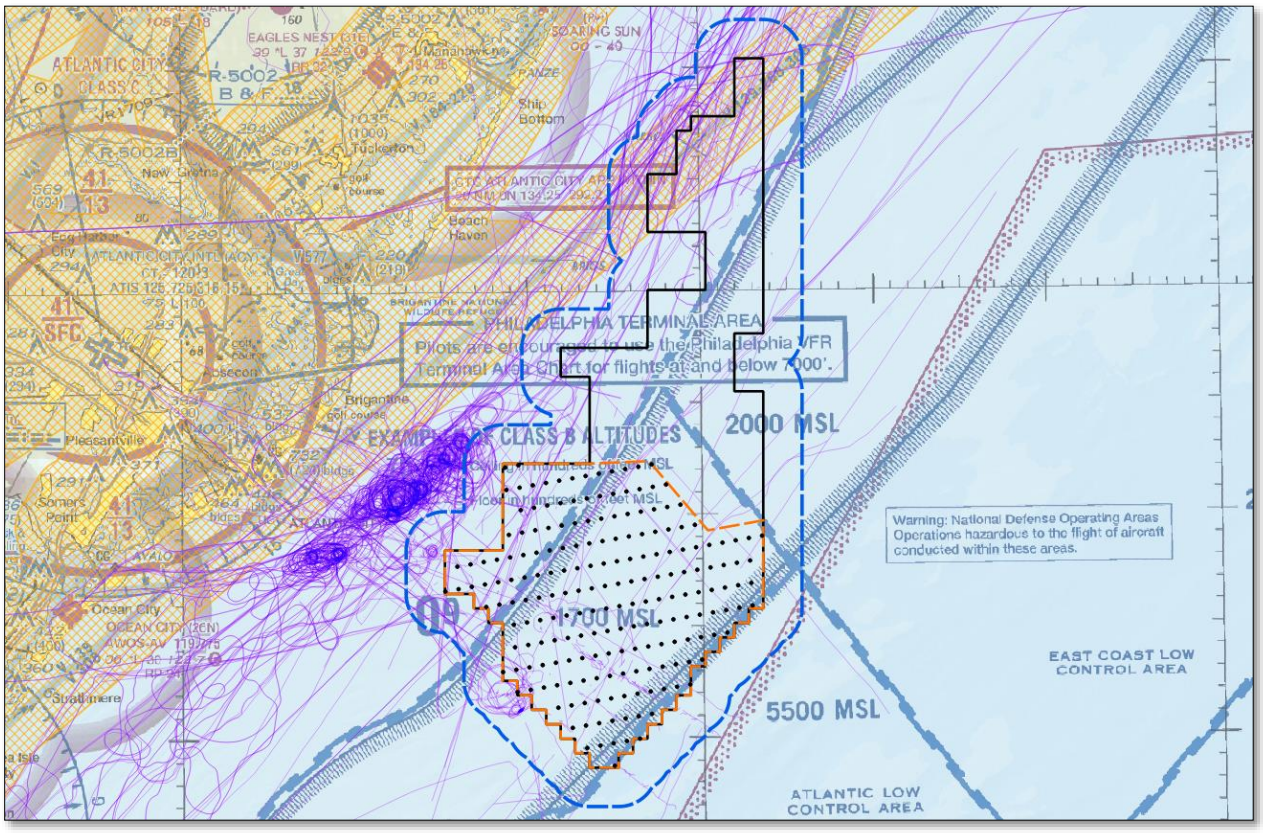

Figure 6: Historical VFR flight tracks (purple) that transited within two statue miles of the Atlantic Shores offshore wind project

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

Instrument Approach Procedures

Atlantic City International (ACY) - Multiple Instrument Approaches

At 1,048 feet tall, proposed wind turbines in the northwestern section of the study area (yellow areas, ***Figure 7***) would require an increase to multiple *SMITS* missed approach holding pattern MHAs from 2,000 to 2,100 feet AMSL. FAA instrument approach procedure design criteria would allow the holding pattern MHA to be increased to 2,100 feet AMSL. However, flight track data indicates that as many as 53 flights (purple tracks, ***Figure 7***), an average of *1.02 flights per week*, utilized the *SMITS* missed approach holding patterns at the affected altitude. As a result, it is possible that Atlantic City (ACY) TRACON may object to increasing the *SMITS* MHA due to the loss of a cardinal altitude for a significant volume of operations.

Atlantic City International (ACY) - ILS or Localizer/DME Approach to Runway 31

At 1,048 feet tall, proposed wind turbines in the southwestern section of the study area (yellow areas, ***Figure 7***), including 25 proposed locations within the wind turbine study area (dashed orange outline, ***Figure 7***), would require an increase to the ILS or Localizer/DME Approach to Runway 31 *STEVV* hold-in-lieu of procedure turn MHA from 2,000 to 2,100 feet AMSL. FAA instrument approach procedure design criteria would allow the holding pattern MHA to be increased to 2,100 feet AMSL. Additionally, flight track data indicates that only 14 flights (purple tracks, ***Figure 7***), an average of *0.27 flights per week*, utilized the *STEVV* missed approach holding pattern at the affected altitude. As a result, it is possible that the FAA would increase the *STEVV* MHA in order to accommodate wind development up to 1,048 feet AMSL. This mitigation option is subject to FAA approval.

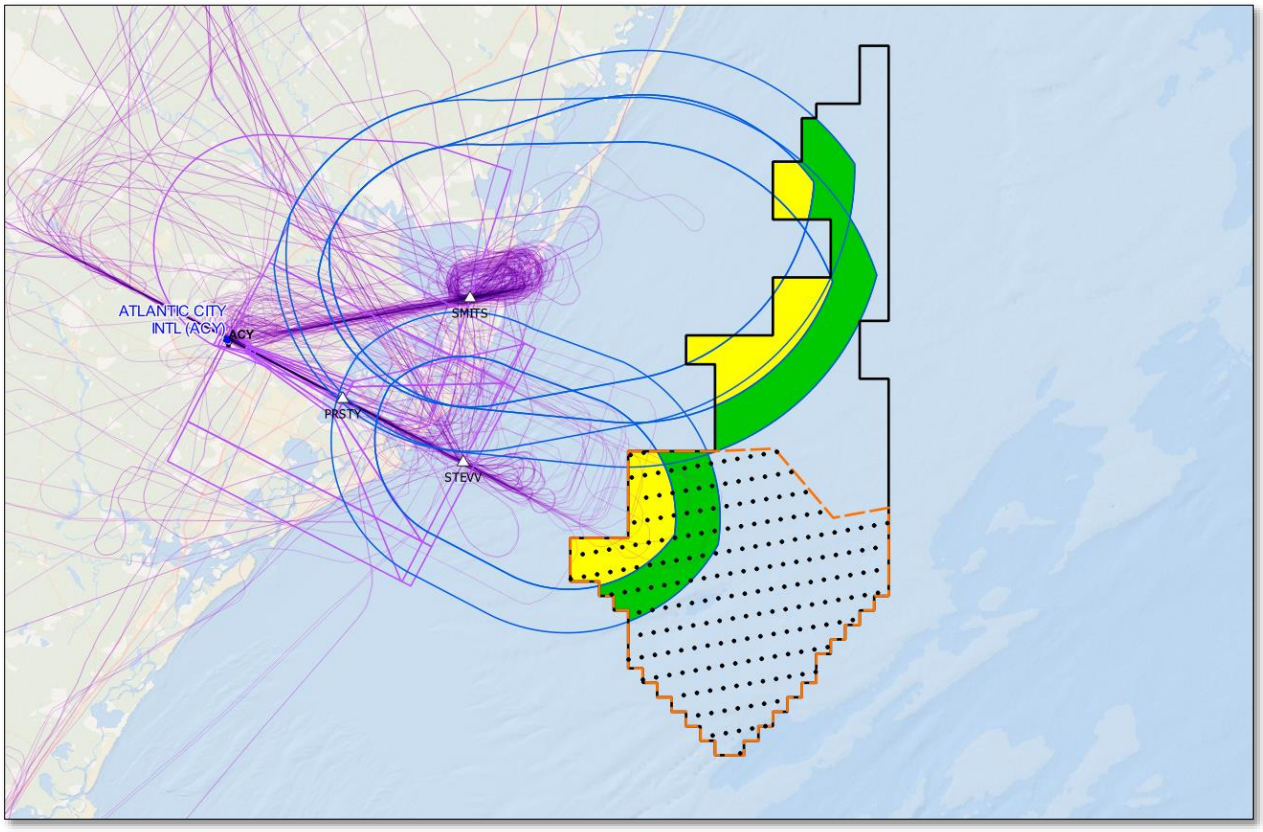

Figure 7: Atlantic City International (ACY) - ILS or Localizer/DME Approach to Runway 31

V577

Cedar Lake (VCN) VOR/DME to *BRIGS* (***Figure 8***)

At 880, 890, or 1,048 feet tall, proposed wind turbines in the northwestern section of the study area would require an increase to the existing westbound MEA from 1,700 to as high as 2,100 feet AMSL. Flight track data indicates that no flights operated along the *Cedar Lake (VCN) VOR/DME* to *BRIGS* segment at the affected altitudes. 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.

As a result of these findings, it is possible that the FAA would not object to increasing the V577 Cedar Lake (VCN) to BRIGS westbound segment MEA in order to accommodate wind development up to 1,048 feet AMSL. This mitigation option is subject to FAA approval.

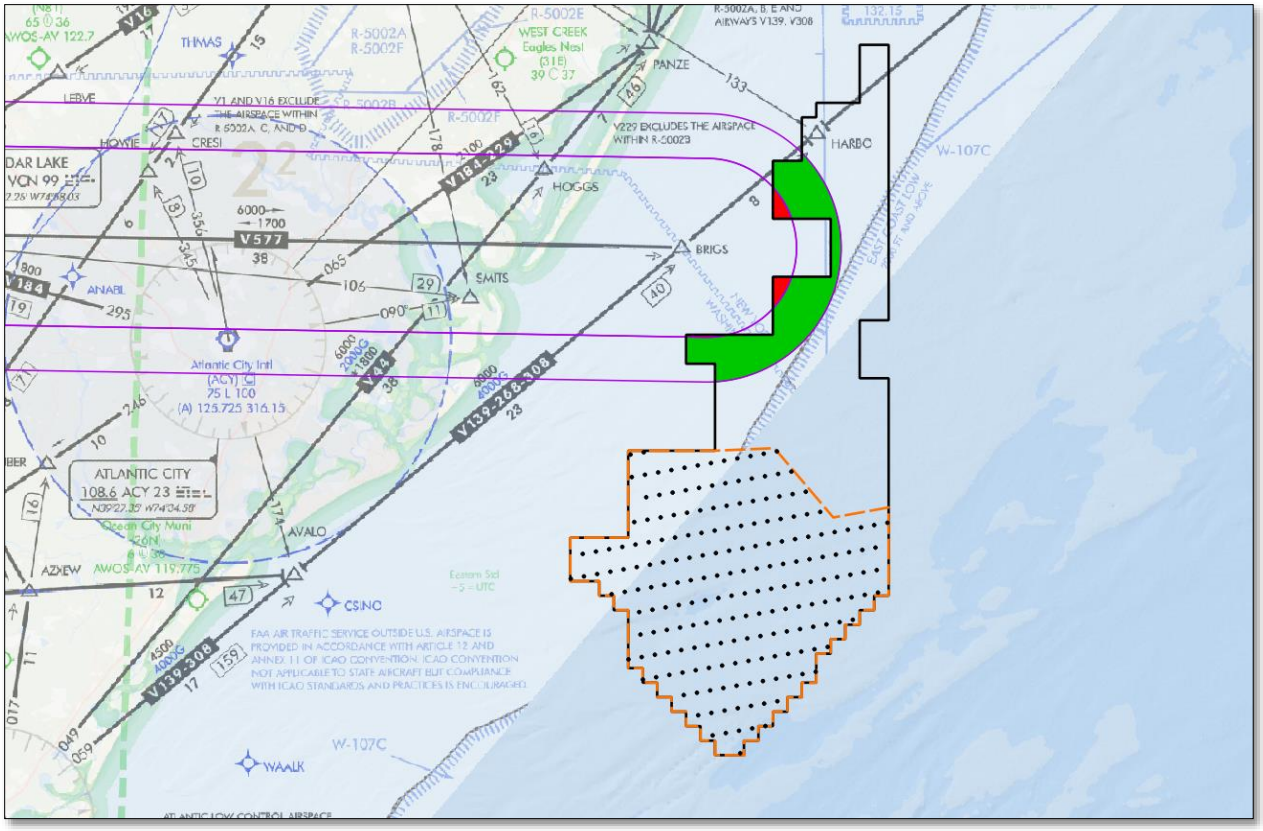

Figure 8: Low altitude enroute chart L-34 with V577 obstacle evaluation area (purple outline)

Atlantic City (ACY) TRACON

ACY_MVA_FUS3_2019

At 880 or 890 feet tall, proposed wind turbines in the western section of the study area (red area, ***Figure 9***) would require an increased MVA that would affect portions of Sector A. Flight track data indicates that only one flight (yellow track, ***Figure 9***) operated at the affected altitudes within the Sector A isolation area (dashed green outline, ***Figure 9***). However, it is likely that this flight was on its own navigation and not receiving radar vectoring services. This flight total represents an average of *0.00 flights per week*. The smaller isolation area required to accommodate wind development up to 890 feet AMSL only within the wind turbine area (dashed orange outline, ***Figure 9***) would not affect any flights.

Table 1: Atlantic City (ACY) TRACON FUS3 MVA impact summary and flight track analysis results based on 880- or 890-foot-tall wind turbines

Sector	MVA		Entire Study Area		Wind Turbine Area	
	Current	Required	Flights Within Affected Airspace	Flights Potentially Receiving Radar Vectors	Flights Within Affected Airspace	Flights Potentially Receiving Radar Vectors
A	1600	1900	1	0 (*0.00 flights per week*)	1	0 (*0.00 flights per week*)

At 1,048 feet tall, proposed wind turbines throughout the study area (red area, ***Figure 10***) would require an increased MVA that would affect portions of Sectors A. Flight track data indicates that as many as five unique flights operated at the affected altitudes within the isolation area (dashed green outline, ***Figure 10***). As many as three unique flights (purple tracks, ***Figure 10***) could have been receiving radar vectoring services within the isolation area. This flight total represents an average of *0.06 flights per week*. The smaller isolation area required to accommodate wind development up to 1,048 feet AMSL only within the wind turbine area (dashed orange outline, ***Figure 10***) would affect two flights, an average of *0.04 flights per week*.

Table 2: Atlantic City (ACY) TRACON FUS3 MVA impact summary and flight track analysis results based on 1,048-foot-tall wind turbines

Sector	MVA		Entire Study Area		Wind Turbine Area	
	Current	Required	Flights Within Affected Airspace	Flights Potentially Receiving Radar Vectors	Flights Within Affected Airspace	Flights Potentially Receiving Radar Vectors
A	1600	2000	5	3 (*0.06 flights per week*)	4	2 (*0. 04 flights per week*)

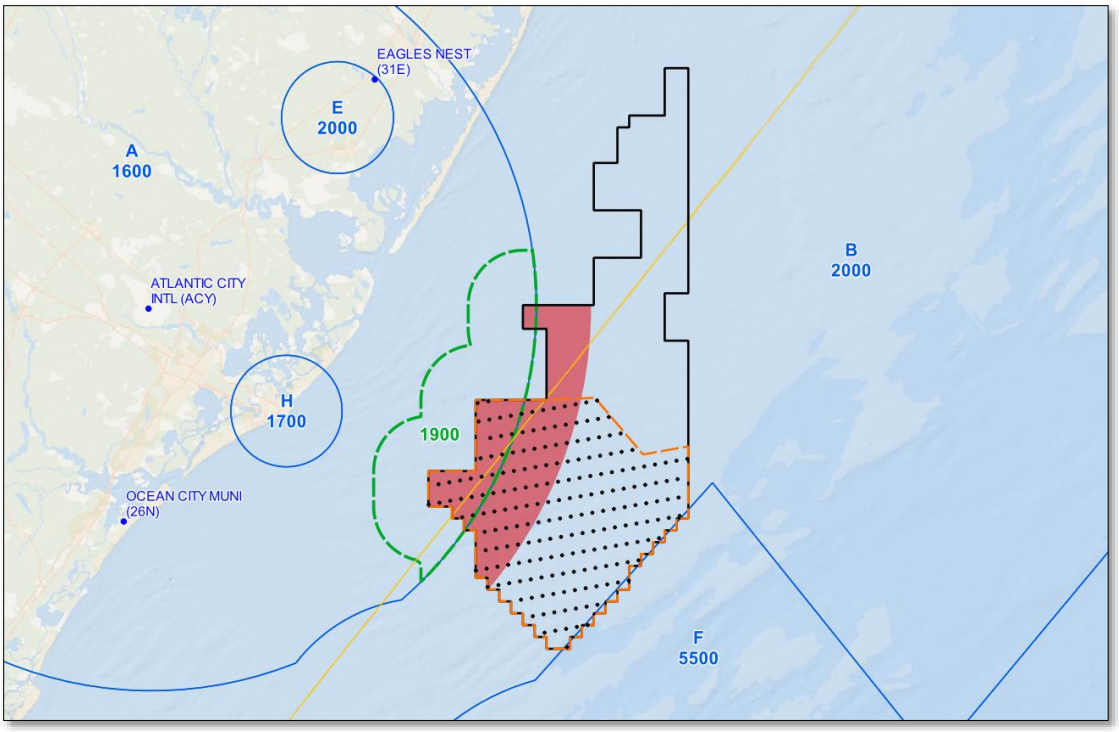

Figure 9: Historical flight track (yellow) that operated within the required 3 NM isolation area (dashed green) based on 880- or 890-foot-tall wind turbines

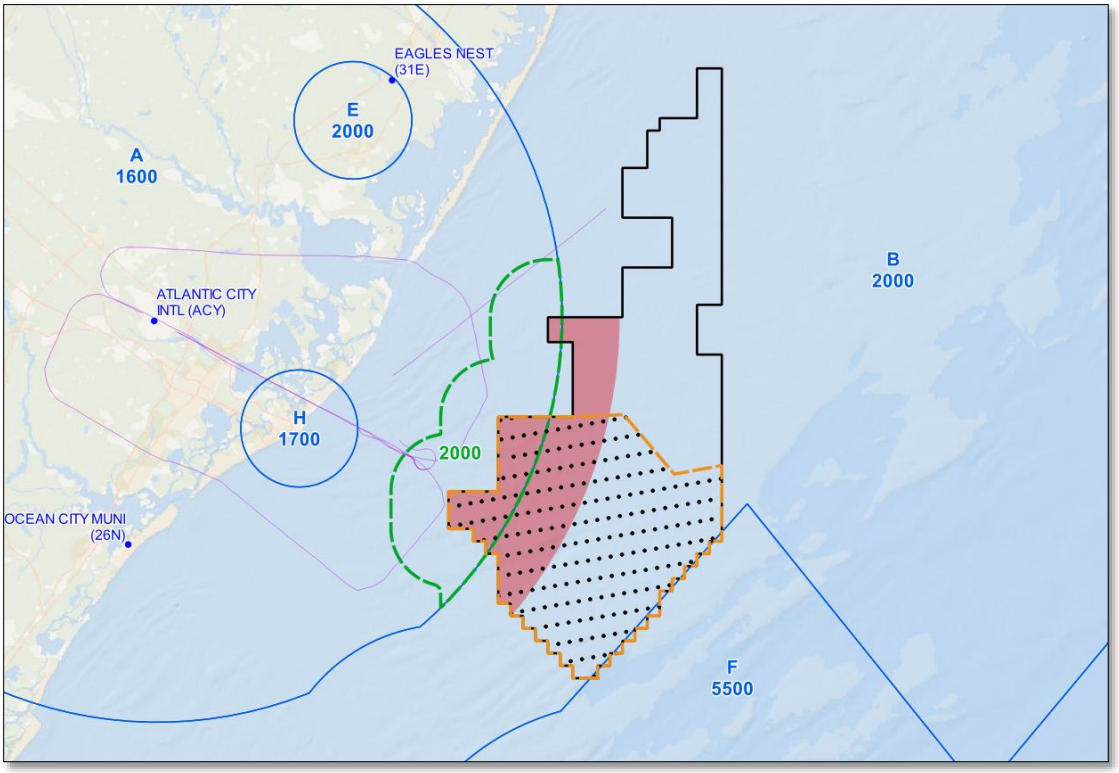

Figure 10: Historical flight tracks (purple) that potentially received radar vectoring services within the required 5 NM isolation area (dashed green) based on 1,048-foot-tall wind turbines

ACY_MVA_FUS5_2019

At 880 or 890 feet tall, proposed wind turbines in the northern and western sections of the study area (red area, ***Figure 11***) would require an increased MVA that would affect portions of Sectors A and H. Flight track data indicates that as many as 12 unique flights operated at the affected altitudes within the merged isolation area (dashed green outline, ***Figure 11***). As many as seven unique flights (purple tracks, ***Figure 11***) could have been receiving radar vectoring services within the isolation area. This flight total represents an average of *0.13 flights per week*. The smaller isolation area required to accommodate wind development up to 890 feet AMSL only within the wind turbine area (dashed orange outline, ***Figure 11***) would also affect seven flights, an average of *0.13 flights per week*.

Table 3: Atlantic City (ACY) TRACON FUSION 3 MVA impact summary and flight track analysis results based on 880- or 890-foot-tall wind turbines

Sector	MVA		Entire Study Area		Wind Turbine Area	
	Current	Required	Flights Within Affected Airspace	Flights Potentially Receiving Radar Vectors	Flights Within Affected Airspace	Flights Potentially Receiving Radar Vectors
A	1600	1900	12	7 (*0.13 flights per week*)	10	7 (*0.13 flights per week*)
H	1700					

At 1,048 feet tall, proposed wind turbines throughout the study area (red areas, ***Figure 12***) would require an increased MVA that would affect portions of Sectors A and H. Due to the proximity of the potential isolation areas it is likely that they would be merged for charting purposes. Flight track data indicates that as many as 42 unique flights operated at the affected altitudes within the merged isolation area (dashed green outline, ***Figure 12***). As many as 22 unique flights (purple tracks, ***Figure 12***) could have been receiving radar vectoring services within the isolation area. This flight total represents an average of *0.42 flights per week*. The smaller isolation area required to accommodate wind development up to 1,048 feet AMSL only within the wind turbine area (dashed orange outline, ***Figure 12***) would affect 20 flights, an average of *0.38 15 flights per week*.

Table 4: Atlantic City (ACY) TRACON FUSION 3 MVA impact summary and flight track analysis results based on 1,048-foot-tall wind turbines

Sector	MVA		Entire Study Area		Wind Turbine Area	
	Current	Required	Flights Within Affected Airspace	Flights Potentially Receiving Radar Vectors	Flights Within Affected Airspace	Flights Potentially Receiving Radar Vectors
A	1600	2000	42	22 (0.42 *flights per week*)	37	20 (*0.38 flights per week*)
H	1700					

These findings indicate that 880-, 890-, or 1,048-foot-tall wind turbines would require an increase to Atlantic City (ACY) TRACON MVAs, but should not affect a significant volume of radar vectoring operations. As a result of these findings, it is possible that Atlantic City (ACY) TRACON would not object to modifying the affected MVA sectors to accommodate wind development up to 1,048 feet tall.

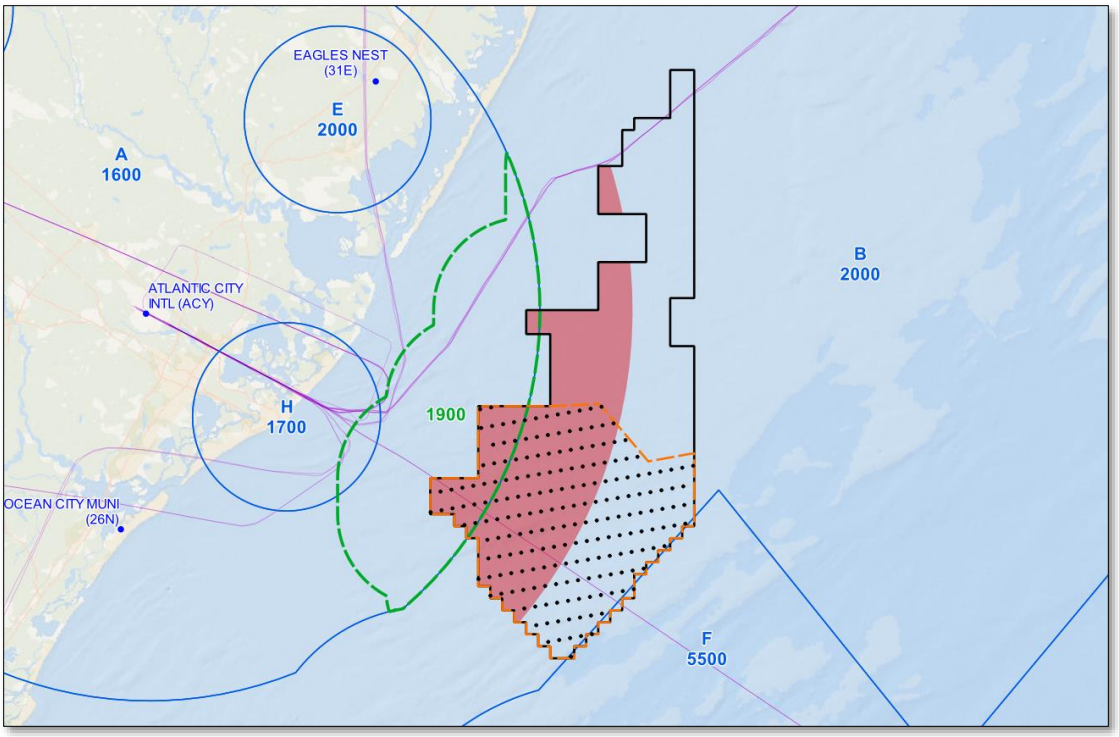

Figure 11: Historical flight tracks (purple) that potentially received radar vectoring services within the required 3 NM isolation area (dashed green) based on 880- or 890-foot-tall wind turbines

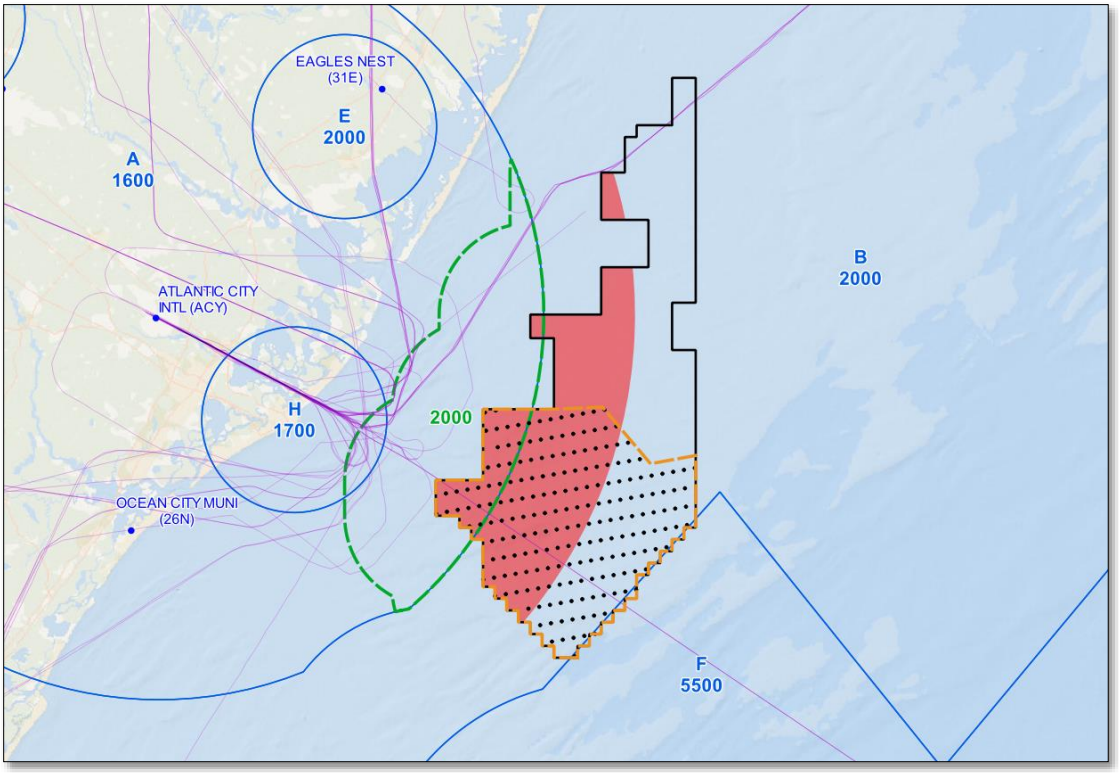

Figure 12: Historical flight tracks (purple) that potentially received radar vectoring services within the required 5 NM isolation area (dashed green) based on 1,048-foot-tall wind turbines

Conclusion

Capitol Airspace assessed FAA NOP data covering the period of one year to determine the likelihood of proposed 880-, 890-, or 1,048-foot-tall wind turbines affecting a significant volume of VFR or IFR operations:

VFR Routes

Impact: At 880, 890, or 1,048 feet tall, proposed wind turbines within two statute miles of low-altitude airways V139-268-308 could have an impact on enroute VFR operations.

Findings: 0 flights (*0.00 flights per day)* operated along the same heading as low altitude airway V139-268-308. This flight total represents an average utilization which is below the threshold for a significant volume of VFR operations (one per day).

Atlantic City International (ACY) - Holding Pattern MHAs

Impact: At 1,048 feet tall, proposed wind turbines would require an increase to several holding pattern MHAs from 2,000 to 2,100 feet AMSL.

Findings: The holding pattern MHAs could be increased to 2,100 feet AMSL while still complying with FAA instrument approach procedure design criteria. However, as many as 53 flights (*1.02 flights per week*) utilized the holding patterns at the affected altitude. This flight total represents an average utilization above the threshold for a significant volume of IFR operations (one per week). As a result, it is possible that Atlantic City (ACY) TRACON may object to increasing the affected MHAs due to the loss of a cardinal altitude for a significant volume of operations.

V577 - *Cedar Lake (VCN) VOR/DME to BRIGS*

Impact: At 880, 890, or 1,048 feet tall, proposed wind turbines would require an increase to the westbound MEA from 1,700 to as high as 2,100 feet AMSL.

Findings: 0 flights (*0.00 flights per day)* operated along the *Cedar Lake (VCN) VOR/DME to BRIGS* segment of low altitude airway V577 at the affected altitudes. This flight total represents an average utilization below the threshold for a significant volume of IFR operations (one per week).

Atlantic Shores (ACY) TRACON MVAs

Impact: At 880 or 890 feet tall, proposed wind turbines throughout the study area would require an increase to MVAs from as low as 1,600 to 1,900 feet AMSL. At 1,048 feet tall, proposed wind turbines throughout the study area would require an increase to MVAs from as low as 1,600 to 2,000 feet AMSL.

Findings: As many as 0 flights (3 NM charts) or seven flights (5 NM charts) could have been receiving radar vectoring services within the potential isolation areas required for wind development up to 890 feet AMSL. These flight totals represent an average of *0.00 flights per week* (3 NM charts) or *0.13 flights per week* (5 NM charts) which are below the threshold for a significant volume of IFR operations (one per week).

As many as three flights (3 NM charts) or 22 flights (5 NM charts) could have been receiving radar vectoring services within the potential isolation areas required for wind development up to 1,048 feet AMSL. These flight totals represent an average of *0.06 flights per week* (3 NM charts) or *0.42*

flights per week (5 NM charts) which are below 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 not object to increasing the affected altitudes in order to accommodate 880- or 890-foot-tall wind turbines. These mitigation options are available and are subject to FAA approval. However, the FAA may object to increasing the Atlantic City (ACY) holding pattern MHAs in order to accommodate 1,048-foot-tall wind turbines. This impact would result in the loss of a cardinal altitude affecting a significant volume of operations.

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