Berwick Bank Wind Farm

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1 Introduction

1.1 Introduction

Berwick Bank Wind Farm Ltd (Berwick Bank), a wholly owned subsidiary of SSE Renewables Ltd (SSE) are proposing a wind farm site in the North Sea, in the Outer Firth of Forth. This wind farm has the potential to deliver up to 4.1 gigawatt (GW) of installed capacity, making it one of the largest offshore opportunities in the world. The site of the Berwick Bank Wind Farm is located approximately 47 nautical miles (nm) to the south-east of Aberdeen Airport and 31nm to the east of Ministry of Defence (MOD) Leuchars Station (Leuchars). Figure 1 provides the location of the site (outlined in red) of the Berwick Bank development.

As part of a scheme for mitigation of the predicted wind turbine effects on the Leuchars and Perwinnes Primary Surveillance Radars (PSR), Berwick Bank are progressing with an Airspace Change Proposal (ACP) in accordance with Civil Aviation Authority (CAA) Civil Aviation Publication 1616 (CAP 1616) [Ref 001] and CAP 1616h [Ref 002]. As this ACP has been designated a Level 3 by the CAA, the Change Sponsor will be exploring an airspace-based mitigation option that focuses on PSR Range Azimuth Gating (RAG) Blanking and the establishment of a Transponder Mandatory Zone (TMZ). This airspace solution will ensure that any unacceptable operational impact created by the wind farm on MOD Leuchars Station (Leuchars PSR), Prestwick Centre and Aberdeen Offshore (Perwinnes PSR) has been mitigated.

Figure 1 - Berwick Bank Wind Farm Location

The potential to generate 4.1 GW of clean energy, is estimated to be sufficient to power over six million homes[1] and eliminate eight million tonnes of carbon dioxide annually, which is the equivalent to all of Scotland's car emissions. Currently in advanced development, the project awaits approval from the Scottish Government and if granted, could increase Scotland's renewable energy capacity by nearly 30% while creating a multi-billion-pound investment opportunity with job creation and supply chain benefits throughout the UK, particularly in East Lothian and Northumberland.

1.2 Who is the Change Sponsor?

Berwick Bank Wind Farm Ltd, a wholly owned subsidiary of SSE Renewables Ltd are the Change Sponsor for this ACP.

1.3 Purpose of the Document

The purpose of this document is to provide information regarding the proposal to establish a PSR RAG blanking and TMZ at the location of the proposed Berwick Bank Wind Farm, which will mitigate the effects of the detection of unwanted wind turbine radar returns by the Leuchars and Perwinnes PSR. This document has been prepared by Osprey Consulting Services Limited, on behalf of Berwick Bank and in accordance with CAP 1616.

[1] 6 million homes powered per annum based on Typical Domestic Consumption Values (Medium Electricity Profile Class 1, 2,900kWh per household; OFGEM, January 2020), minimum projected 50% wind load factor, and projected installed capacity of up to 4.1GW. All homes in Scotland based on Household Estimates Scotland 2019 (National Records of Scotland, June 2020).

2 Executive Summary

2.1 The Drivers for Change

The wind turbine generators (WTGs) which form the Berwick Bank Wind Farm development have the potential to be detected by the Leuchars and Perwinnes PSR. This would cause unacceptable interference through the creation of false radar returns (radar clutter). This radar clutter could affect the ability of an Air Traffic Control Officer (ATCO) to identify primary radar aircraft returns and increase the risk of an ATCO not detecting a potential confliction between aircraft.

To mitigate against this risk, measures need to be put in place prior to wind farm operation to ensure that aircraft can be identified. The wind farm aims to be operational no earlier than Q3 2026 when the grid connection for the project will be available.

The proposed mitigation is to deploy RAG blanking on both the Leuchars and Perwinnes PSR's to remove all primary radar returns from the wind turbines from the radar display. RAG radar blanking blocks any primary radar return within selected ranges and azimuth sectors. The primary blanking in any area is complete, which means that RAG radar blanking will remove primary radar returns from aircraft within the blanked area. To mitigate against this removal of primary radar coverage, it will be necessary to establish an airspace solution over the consented wind farm so that aircraft can be visible to Air Traffic Control (ATC) via another means.

2.2 Statement of Need

A DAP1916 Statement of Need (SoN) [Ref 003] was submitted to the CAA via the Airspace Change Portal in December 2022. However, following guidance from the Airspace Regulator at Stage 1, an updated Version 2 [Ref 004] was submitted to the Airspace Change Portal in September 2023.

The SoN is a required document as part of the ACP submission. Its purpose is to capture details of the sponsor of the ACP, alongside details pertaining to the objectives of the ACP, a summary of the issue or opportunity that the ACP is seeking to address, a description of the current airspace design, and a description of the current prevailing air traffic situation.

The text at paras 2.2.1 to 2.2.4 is extracted directly from the DAP 1916 Statement of Need Version 2, as submitted in September 2023:

2.2.1 The Objective of the Proposed Change

The objective of the proposed airspace change is to develop suitable mitigations to ensure that aviation operations and air traffic control provision for both the National Air Traffic Services En-Route Limited (NERL) and the MOD remain unhindered

despite the presence of the Berwick Bank Offshore Wind Farm's wind turbine generators in the North Sea.

2.2.2 A Summary of the Issue or Opportunity this ACP is Seeking to Address

The issue under consideration pertains to the potential impact of the wind turbine generators from the Berwick Bank wind farm on aviation radar systems and operations. The Change Sponsor has identified the need for potential mitigations to ensure the safe and efficient flow of air traffic in the vicinity of the Berwick Bank site. The Berwick Bank Environmental Impact Assessment (EIA) Report [Ref 005] has identified that the NERL Radars located at Perwinnes and Alanshill, MoD radars at MoD Leuchars Station and Deadwater Fell, as well as the Air Defence (AD) Remote Radar Heads (RRH) at Brizlee Wood and Buchan as equipment that could be affected by false radar contacts. NERL has already expressed that such an impact would be unacceptable, necessitating the implementation of a mitigation solution to meet this requirement. There are existing technical solutions to this issue, successfully employed in other projects, which will be considered alongside any other technical solutions during this ACP. Any technical solution to the issues will also consider the economic and environmental impact on airspace users and the broader community, as appropriate.

2.2.3 A Description of the Current Airspace Design

The location for the proposed Berwick Bank wind turbine generators is in the North Sea, in the Outer Firth of Forth. The site is wholly located within Class G, uncontrolled airspace. Part of the proposed site sits beneath Danger Area D613C and D613D which are only activated periodically from Flight Level (FL)100 ((approximately 10,000 feet (ft)) to FL660 and a proportion of the site sits beneath the airway P18 which in the vicinity has a base level of FL135 and FL155 in its respective portions, and is Class D, controlled airspace[2]. Figure 2 highlights the surrounding airspace.

[2] Since this SoN was submitted, EGD514 has now been established above the Berwick Bank Development Area from FL85 – FL660 and will be activated by NOTAM. This addition has been considered throughout the ACP.

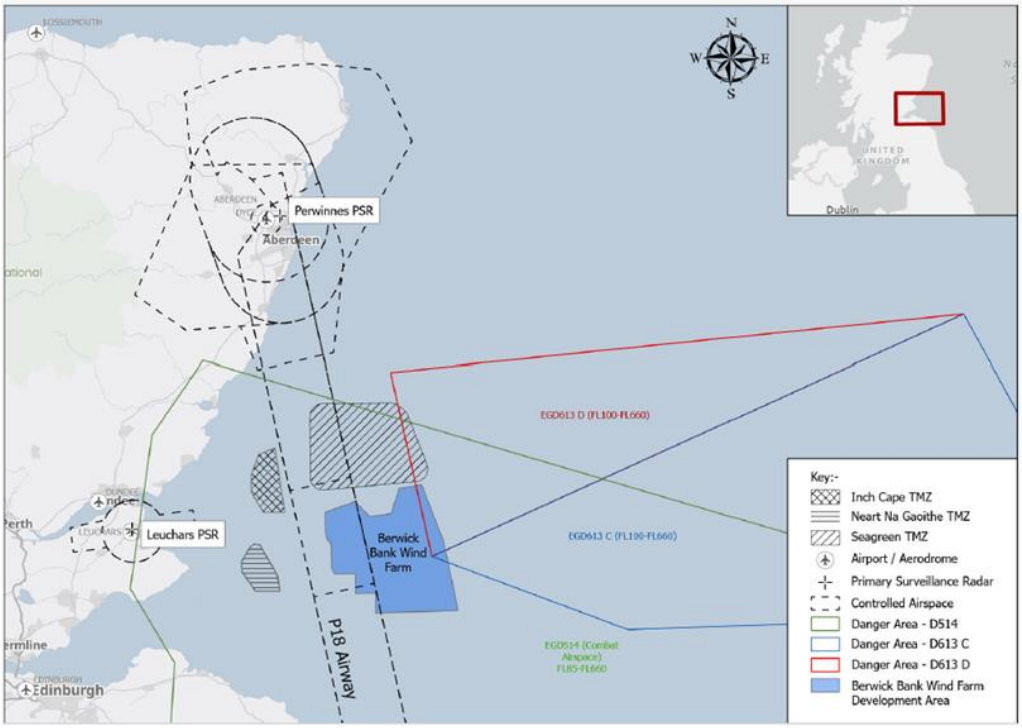


Figure 2 - Surrounding Airspace Overview

2.2.4 A Description of the Current Prevailing Air Traffic Situation

In the Class G uncontrolled airspace in the vicinity of the proposed area, low traffic levels have been assessed, primarily because of the significant distance of the site from the nearest point of land, approximately 30nm to the north-east of MoD Leuchars Station. This area is open to all users, and the Change Sponsor is aware that various activities, including those of the MOD, general aviation (GA), and Search and Rescue operations conducted by the Maritime and Coastguard Agency (MCA), occur within the proposed area. These entities are just some of the stakeholders with whom the Change Sponsor has engaged with during the engagement process.

2.2.5 Alignment with the CAA Airspace Modernisation Strategy

This proposal aligns with the key principles of the CAA's Airspace Modernisation Strategy (AMS) [Ref 006] as follows:

- **Safety:** Maintaining the UK's high level of aviation safety is paramount. A comprehensive safety assessment has been conducted at each step of this ACP to ensure the final design achieves this goal. The chosen mitigation strategy, RAG blanking with a TMZ, prioritises safety by eliminating radar clutter from wind turbines while still enabling ATC to track aircraft through transponders.
- **User Integration:** Stakeholder engagement throughout the process considered the needs of all airspace users, including existing traffic and potential future developments. The design options that were considered managed the airspace in a flexible, near real-time operation, and tried to ensure that multiple users could access the airspace for the longest time possible.

- **Efficiency:** The proposed solution balances efficient airspace utilisation with the technical requirements of the wind farm and prioritises safety throughout the design. The design options to be considered aimed where possible to introduce the least complex airspace design to satisfy the objectives of the ACP.
- **Sustainability:** While the wind farm itself promotes environmental sustainability, the airspace solution minimises any potential increase in fuel burn or flight path deviations. However, the design options considered, provide an overall improvement in environmental impact, and ensure that the benefits of the wind farm green energy production can be realised.

2.3 High-Level Aims, Objectives, and Requirements for the ACP

2.3.1 Why an Airspace Solution is Needed:

The Berwick Bank wind farm poses a significant threat to the safe and effective operation of ATC services provided by Leuchars Station, Prestwick Centre, and Aberdeen Offshore. The wind turbines could be detected by PSRs, generating false radar returns (clutter) that could:

- Distract controllers: Clutter can appear as "twinkling" objects and mask real aircraft targets, potentially leading to missed conflicts.
- Reduce radar effectiveness: Clutter can overload the radar system, causing desensitisation and loss of legitimate aircraft targets.
- Compromise separation assurance: Clutter makes it difficult for controllers to maintain safe separation distances between aircraft.

2.3.2 Requirement for Mitigation:

Without mitigation measures, the wind farm development will:

- Significantly impact the performance of ATC radars and potentially compromise air traffic safety.
- Prevent the issuance of a development consent for the Berwick Bank wind farm project.

2.3.3 Proposed Mitigation and Potential Compromise:

The proposed solution involves deploying RAG on the Leuchars and Perwinnes PSRs. RAG will suppress clutter from the wind turbines on the radar display, significantly enhancing the safety of ATC operations. However, RAG also removes primary radar returns from aircraft within the blanked area.

To compensate for the loss of primary radar coverage and ensure continued and efficient ATC services, this ACP recommends establishing a TMZ airspace solution over the wind farm. The TMZ will ensure that ATC have uninterrupted visibility of transponder-equipped aircraft. It may however introduce a minor impact for non-transponder equipped aircraft who may be required to route around the TMZ if they cannot establish two-way communication with ATC, or their request to transit the TMZ cannot be approved.

2.3.4 Performance Against Design Principles

The chosen mitigation strategy prioritises safety by eliminating wind turbine clutter from the radar displays, directly addressing a critical safety concern. Additionally, the proposed TMZ design offers a user-centric approach.

- **User Integration:** The TMZ design minimises airspace restrictions for the vast majority of transponder-equipped modern aircraft. While non-transponder equipped users may require alternative routing in some cases, the overall impact on airspace users is minimised.
- **Efficiency:** The proposed solution avoids complex airspace redesign. By utilising existing technologies (RAG and TMZ), the chosen option achieves the mitigation goals efficiently.

2.4 Assumptions and Constraints

The Berwick Bank Wind Farm is expected to generate renewable energy for approximately 30 years, the expected operational life cycle of the wind farm. After this time, it would be expected that the WTGs are removed and the airspace returned to its original structure, i.e. the TMZ be removed and the associated RAG blanking on the PSR. Given this timeframe, it is challenging to predict the lifespan of any radar systems currently operating in the area. This proposal assumes that any future changes to these radar systems, including upgrades or removal, will be effectively managed by the ATC providers. These providers will remain cognisant of the established mitigation measures for this development to ensure continued safe operation.

As radar technology is constantly evolving, it is anticipated that advancements in areas like advanced clutter filtering or next-generation radar systems could offer a fully technical solution for wind turbine clutter in the future. If such a solution becomes available, it could potentially reduce or eliminate the need for a TMZ at the Berwick Bank site. The specific process for reviewing and potentially removing the TMZ would be determined at that time, considering factors such as the effectiveness of the new technology and the potential impact on airspace users in that area.

2.5 Summary Description of the Current Airspace and Operation

2.5.1 Airspace Classification:

The proposed Berwick Bank Wind Farm site is located within Class G airspace, which extends from the ground up to FL 195. This is uncontrolled airspace where aircraft can operate without needing to contact ATC. However, it is mandatory for all aircraft in the United Kingdom (UK) to operate a transponder when flying above FL100. A transponder is a piece of electronic equipment that transmits a signal identifying the aircraft and its altitude. This signal is received by a ground-based Secondary Surveillance Radar (SSR), which displays the information to ATC.

2.5.2 Flight Rules and Routing:

- **Visual Flight Rules (VFR):** Most aircraft operating in this area are expected to be flying under VFR. This means they rely on visual reference for

navigation and separation from other aircraft. There are no designated flight paths within Class G airspace.

- **Instrument Flight Rules (IFR):** Aircraft flying IFR in this airspace would rely on instrument-based navigation systems to determine their position, heading and level. Whilst there is no requirement to operate a radio, or gain approval to use the airspace, most users would maintain communication with ATC, to ensure that they are kept up to date with the traffic situation and location of other possible conflictors. Whilst separation from other aircraft remains the pilot's responsibility, flying IFR means that sometimes a look out may not be appropriate and therefore ATC may assist.

2.5.3 Surrounding Airspace Features:

- **Transponder Mandatory Zones:** Established TMZs already exist to the north (Seagreen) and west (NnG) of the development site. These zones require all aircraft to operate transponders, allowing ATC to identify and track them as they transit the area.
- **Airway (P18):** A higher-altitude commercial air traffic route (P18) passes north to south above the development site. A portion of this navigation route is conditional and is only active at specific times and altitudes (FL115 to FL255[3]) and the remainder is permanent. The portion that overflies the proposed development area is conditional and will not be affected by the proposed mitigation strategy.
- **Military Danger Area (EG D514):** This recently established danger area operates between FL85 and FL660 for military exercises. When active, it would incorporate a portion of the TMZ (FL85-FL100). During this time, GA traffic would be restricted to below FL85 for their operation, unless specific permission had been achieved with the Danger Area Controlling Authority. Activity times are notified by Notice to Aviation (NOTAM).
- **Military Danger Area (EG D613 C/D):** This danger area operates between FL100 and FL660 for military exercises. It is located toward the eastern edge of the proposed TMZ, and due to its base level will not interact with the operation of the TMZ but has been included here for improved situational awareness. Activity times of this MDA are notified by NOTAM.

Figure 3 highlights the airspace that surrounds the proposed development area.

[3] In accordance with the UK Civil AIP ENR 3.2

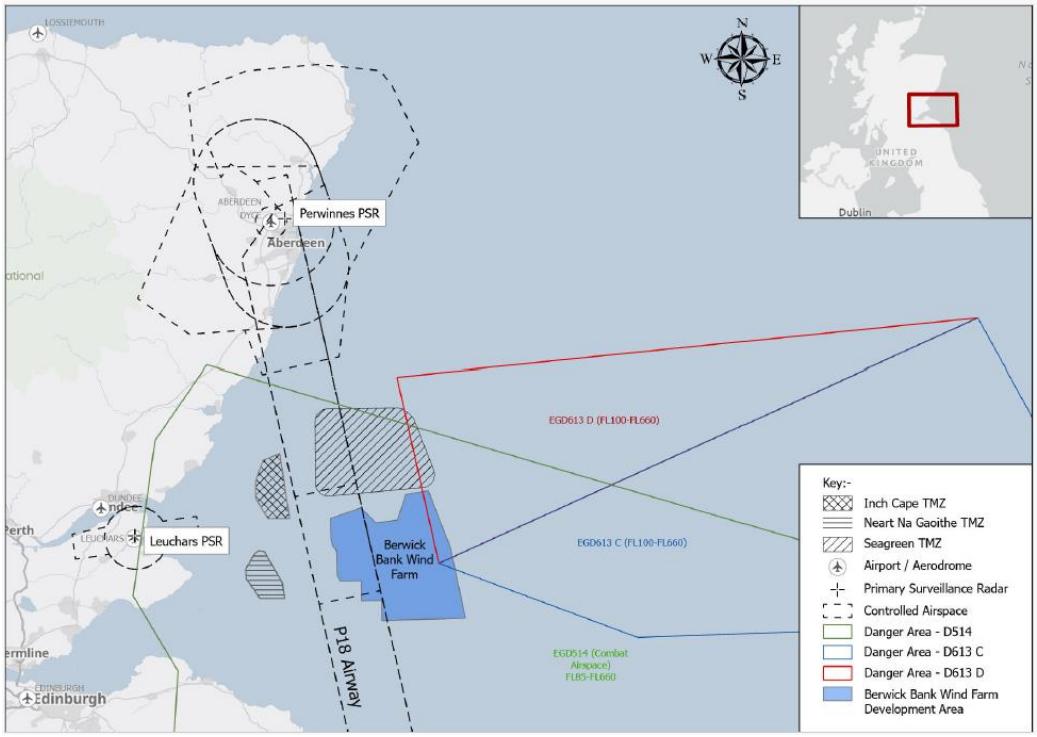


Figure 3 - Airspace in the Vicinity of the Berwick Bank Development Area

2.5.4 Airspace Usage:

A two-week traffic survey conducted in July 2023 [Ref 007] revealed low-density air traffic in the vicinity of the proposed wind farm site. The survey primarily captured aircraft equipped with transponders, identifying only seven entering the proposed TMZ boundary during the survey period. Among these, one was a GA aircraft, while the remaining six were commercial or military and already transponder equipped. To account for potential non-transponding traffic, the study results were further adjusted. This analysis suggests that approximately 26 transponding GA aircraft movements might occur in the area annually, with an estimated 31 non-transponding GA aircraft potentially using the airspace each year (roughly one every 11 days).

Overall, the current airspace surrounding the Berwick Bank development site experiences low-density traffic, particularly for non-transponding GA aircraft.

2.6 Summary Description of the Changes to Airspace Design and Operation

The presence of the Berwick Bank Wind Farm could create radar clutter on ATC radar screens, making it difficult for ATC to see aircraft. To address this safety concern, two changes are proposed to the airspace design and operation as follows:

- **Reduced Area Coverage Blanking:** A permanent setting will be applied to ATC radars to electronically suppress the radar clutter caused by the wind turbines. This will create a "blank" area on the radar screens where the wind farm is located.

- **Temporary Mandatory Zone:** To compensate for the loss of radar information within the RAG blanked area, a new airspace zone called a TMZ will be established over the wind farm. The TMZ will be active in line with the opening hours of the Controlling Authority, MOD Leuchars Station.

Here is what this means for different aircraft:

- **Transponder-equipped aircraft:** Most modern aircraft carry a device called a transponder that allows them to be identified by ATC. These aircraft will still be visible to ATC within the TMZ and can fly through it without needing special permission, and there is no requirement for them to communicate with ATC.
- **Non-transponder-equipped aircraft:** These aircraft cannot be identified by ATC radar within the RAG blanked area. They will not be allowed to fly through the TMZ without obtaining permission from ATC beforehand.

The specific shape of the TMZ will closely follow the outline of the wind farm, like a "rubber band," to minimise the overall airspace impact. It will also include a small buffer zone for safety. This design avoids creating a complex shape and ensures a smooth connection to an existing TMZ to the north. Figure 4 illustrates how the "rubber-banded" outline simplifies the airspace design compared to following the exact wind farm footprint (darker blue area). This simplifies airspace management for ATC and improves situational awareness for pilots, making flight planning in the area easier.

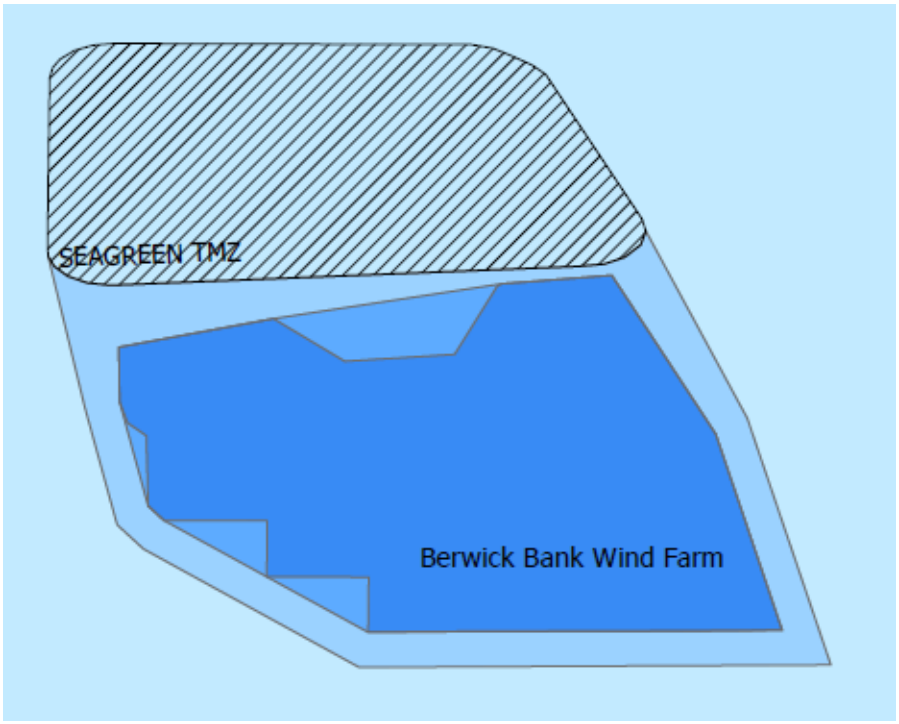


Figure 4 – Proposed Rubber-Banded Airspace Solution

This solution ensures that ATC can maintain a clear picture of air traffic, even with the wind farm present, and continue providing an air traffic service.

2.6.1 TMZ Activation Details

The TMZ will be active in line with the opening hours of the Controlling Authority, MOD Leuchars Station. These timings are currently Monday – Friday, 0900 - 1700[4]. Outside of these times, there would be no method for non-transponding aircraft to cross the TMZ and they would be required to re-route. However, there is a higher-priority MDA (EG D514) located nearby. When this DA is active (by NOTAM), the TMZ will be limited to FL85 to avoid airspace conflicts. Aircraft operating within the danger area will have special permission to operate in support of the requirements of the military exercise and are not affected by this airspace change proposal.

2.7 Summary of Options Analysis

2.7.1 Design Principles

At the initial stage of the Design Process, the Change Sponsor identified ten key design principles (DP) to guide the selection of a solution for the wind farm's impact on ATC radar. These DPs addressed Operational, Environmental, and Economic issues for all airspace users. Aviation and Community stakeholders and members of the NATMAC[5] were engaged to review the proposed design principles and suggest if any additional design principles were necessary. The final choice of DPs was subsequently approved by the CAA; the shortlist of DPs is shown in Table 1.

Design principle	Description
DP1 - Safety	Our airspace change will maintain or enhance current levels of safety for all airspace users.
DP2 - Economic	Our airspace change should seek to minimise economic impact by ensuring where possible, expeditious routings to reduce fuel burn.
DP3 - Environmental 1	Our airspace change should seek to minimise $C0_2$ emissions by ensuring where possible, expeditious routing.
DP4 - Environmental 2	Our airspace change should seek to minimise the impact of noise below 7,000ft and 4,000ft in the vicinity of the airspace change.
DP5 - Operational (Aircraft Operators)	Our airspace change should enable aircraft operators including GA, the MOD, Maritime and Coastguard Agency and United Kingdom Search and Rescue to operate with minimal impact compared to current day operations.
DP6 - Operational (ANSPs[6])	Our airspace change should maintain operational resilience of the ATC network.

[4] All times are Local
[5] National Air Traffic Management Advisory Committee
[6] Air Navigation Service Providers

Design principle	Description
DP7 - Technical 1	The volume of airspace affected should be the minimum necessary to deliver a safe solution to counter the effects of wind turbine generators on ATC surveillance infrastructure.
DP8 - Technical 2	The airspace change should be designed to fit with existing background airspace classification and any known planned changes.
DP9 - Technical 3	Our airspace change should be compatible with the requirements of the MOD to be able to continue to provide operational radar coverage as required in the vicinity of the airspace change.
DP10 - Policy	Our proposed airspace change must align with the Airspace Modernisation Strategy (AMS) and should take account of Government Policy documents.

Table 1 - List of Design Principles

2.7.2 List of Options and Design Principles Evaluation

Following successful completion of Gateway 1B, a number of design options were identified to provide the required mitigation. The following comprehensive list of design options were proposed for consideration:

Option 0: Baseline (Do nothing).

- Berwick Bank Wind Farm is not constructed, and the benefits of the wind farm will not be realised.

Option 1: Temporary wind turbine suspension of operation.

- This would have involved a direct line to the operational team at SSE who would have stopped the wind turbines from turning on request, thus eliminating the clutter. This would not be very effective, and the time required to stop the wind turbine operation would not have been conducive with airspace operations.

Option 2: SSR Alone operations.

- This would have involved removing the use of primary radar in its entirety for all users of the Leuchars and Perwinnes PSR. This would have impacted many more users than a RAG blank and TMZ, and therefore would not align with the broader AMS that was part of the overall design principle consideration.

Option 3: The use of In-fill radar.

- This would involve the use of an existing or new source of radar to provide a picture from inside the wind farm development area to overcome the RAG blanked area. Whilst this idea is feasible, it is prohibitively expense, and would require planning permission and would need to be safety assessed to ensure that is 100% safe and accurate for use.

Option 4: Introduction of Class D or E Airspace.

- This would have seen the introduction of more restrictive airspace (controlled airspace) in the area of the wind farm development. This is prohibitive to a lot more airspace users and would significantly increase the training burden on ATC teams and can make their workload considerably busier. This would have failed our Design Principle (Technical 2) which aimed to keep the existing airspace, Class G in operation.

Option5: Class E+ Transponder Mandatory Zone Airspace.

- Like Option 4, this would have altered the airspace classification and at this time, the introduction of Class E+ airspace does not provide a provision to go down to the surface and therefore would not have been a viable mitigation for this project.

Option 6: Radio Mandatory Zone (RMZ).

- Much like a TMZ, the RMZ is an area where airspace users must use a radio to gain access to a portion of the airspace. This is more restrictive, as a radio licence is required to operate one, and there is a financial impact on users gaining the licence and having an operational radio in their aircraft. This is much more restrictive than a TMZ and does not address the underlying RAG blanking which would eliminate the clutter.

Option 7: Range Azimuth Gating blanking and Transponder Mandatory Zone which falls into seven possibilities of implementation as follows:

- This solution involves the introduction of a TMZ over the wind farm area to mitigate against the implementation of a RAG blanked area. This is the least restrictive option to implement in terms of impact on airspace users and were the ones that performed the best against the Design principles. Not all of the Option A-G are effective, and ultimately only a few of these final options fit with the requirement of the airspace.

- **A.** RAG blanking of the MOD Leuchars Station and the Perwinnes PSRs.
- **B.** TMZ (without RAG blanking) over the wind farm array locations.
- **C.** RAG blanking and TMZ over the proposed wind farm array locations.
- **D.** RAG blanking and TMZ over the proposed wind farm array locations. TMZ extended to include a 2nm buffer.

- **E.** RAG blanking over the proposed wind farm array locations. Simplified polygon TMZ 'rubber banded' around the proposed wind farm locations with no buffer.
- **F.** RAG blanking over the proposed wind farm array locations. Simplified polygon TMZ 'rubber banded' around the proposed wind farm locations extended to include a 2nm buffer.
- **G.** RAG blanking over the proposed wind farm array locations. Simplified polygon TMZ 'rubber banded.' TMZ is extended to include a 2nm buffer and to the North, the TMZ joins together with the established Seagreen TMZ.

All of the options above were scored against the DPs, with each receiving a score of either: Met (green), Partially Met (yellow) or Not Met (red). The Change Sponsor decided that any option that did not meet a DP would not be able to progress. If an option Met or Partially Met a DP then it would be considered and progress to further engagement with Stakeholders. This approach allowed the Change Sponsor to either Accept or Reject a design option based on how it performed against the DP. The simplified outcome is shown in Figure 5. For a more detailed overview, The Design Principles Evaluation (DPE) document is available on the ACP Portal.

		Options													
		0	1	2	3	4	5	6	7						
									A	B	C	D	E	F	G
Design Principle	1														
	2														
	3														
	4														
	5														
	6														
	7														
	8														
	9														
	10														
Overall Outcome vs Design Principle		Reject	Reject	Reject	Reject	Reject	Reject	Reject	Reject	Reject	Accept	Accept	Accept	Accept	Accept

Figure 5 - Simplified Options Appraisal vs Design Principle

It can be seen from Figure 5, that whilst Option 3 Met or Partially Met all of the Design Principles, it was ultimately rejected. The reason for this was that the Change Sponsor, the MOD and National Air Traffic Services (NATS) require a high degree of certainty that an infill radar will provide a successful mitigation solution. Recently, a

number of infill radar systems have successfully mitigated the impact created by the detection of operational wind farms with respect to civilian ATC PSR systems; however, no such solution has yet been applied to any military airfield-based ATC PSR systems.

This option also requires a suitable site for the infill radar to be identified, and provision of suitable power and telecommunications links. A new radar will itself require planning consent, which itself may not be granted. Furthermore, it is estimated that an upfront cost of at least £10.5m not including any land lease or utilities would be necessary; this may prove commercially unacceptable. This option was therefore considered to be unviable but could potentially be an option in the future. It should be noted that this option would itself be classed as a technical solution and as such would not need to follow the CAP 1616 ACP process.

As has been stated already, although at first glance, Option 0 may appear to be an attractive option in terms of meeting the DPs, it is unviable as it does not consist of any airspace solution and therefore annuls the CAP 1616 process. Each of the DPs have been assessed as Met (green) for this option, simply because there is no airspace solution (and therefore no change to extant circumstances). However, as there is no airspace solution and it is unviable, this option has been rejected but shall be taken forward into subsequent stages of the process for comparative purposes only.

After completion of the appraisal process, Option 7C – 7G were accepted and were taken forward for further engagement with Stakeholders.

2.7.3 Appraisal Update

After conducting a Hazard Identification (HazID) session as part of the overall Safety Assessment of the ACP, the MOD were asked to verify that the PSR at Leuchars could accept another RAG blanking on the radar, as two were already in place on it, one for Neart Na Gaoithe and the other for Seagreen. The response received was as follows.

"Post consulting the ADEWS[7] Windfarm SME[8], Leuchars DSATCO[9] and the Aquila commissioning engineer for the Watchman at Leuchars: The Watchman PSR does have a limitation of only being able to blank out 2 Range Azimuth Gated (RAG) polygon areas. These are currently used for Seagreen and NnG. Whilst the update that changed the Watchman to an A4 variant did include 4 RAG maps these maps do not expand on the PSR limitation, but only allows the operator to change the PSR receiver sensitivity level for changing weather conditions. Any change to the Seagreen TMZ to encompass the Berwick Bank wind farm could be done but this would require the current Seagreen RAG polygon area to be expanded (remapped) to include the Seagreen / Berwick Bank TMZ(s)."

This information has meant that out of the options 7C - G that were originally accepted, Options 7C – F had to be rejected because in order for them to work, a third RAG blanking would have had to be available on the PSR. As option 7G was the only option that matched the above criteria, it became the only and final design option

[7] ADEWS – Air Defence and Electronic Warfare Systems
[8] SME – Subject Matter Expert
[9] DSATCO – Deputy Senior Air Traffic Controller

that passed both the Design Principles Evaluation, and the technical requirement as detailed in the above statement.

2.8 Summary of Engagement

Throughout the development of the final airspace design option, stakeholders potentially impacted by the proposed RAG Blanking and TMZ were actively engaged to gather feedback and ensure their voices were heard.

2.8.1 Stages 1 & 2 of the Airspace Change Process

Stakeholders participated in defining the ten key DPs that would guide the development of a solution (Table 1 – Section 2). They also helped create a comprehensive list of potential options and provided valuable insights into the potential impacts of each option. Details of these engagement activities, including a summary of the responses received, can be found in the Stage 1 Design Principles Engagement Record [Ref 008] and Stage 2 Stakeholder Engagement Document [Ref 009] available on the Berwick Bank Wind Farm airspace change portal.

2.8.2 Stage 3: Focused Engagement on Option 7G

A dedicated 6-week engagement period was held specifically to gather feedback on Option 7G, the final proposed design option. Stakeholders were informed about the proposed changes through various channels, including email, social media posts, and an online engagement document. This document provided details on the engagement process, the current airspace situation, the proposed changes with Option 7G, and the potential impacts. Stakeholders were encouraged to submit their feedback through a convenient online form. The engagement period closed on 17th June 2024.

2.8.3 Feedback Received and Influence on Outcome

A total of seven responses were received during the Stage 3 engagement period. Importantly, there were no negative comments or suggestions for improvements on Option 7G itself. This positive feedback, or lack of negative feedback, played a significant role in the Change Sponsor's decision to move forward with Option 7G without the need for further re-engagement.

2.8.4 Rationale for No Re-engagement

The Change Sponsor believes that re-engagement is not necessary for the following reasons.

- **Broad Stakeholder Acceptance:** The lack of negative feedback during the Stage 3 engagement suggests that stakeholders are generally accepting of the proposed design (Option 7G).
- **Exhaustive Exploration and Design Principles:** Stakeholders were actively involved in the earlier stages (Stages 1 & 2) where design principles were established, and a wide range of options were explored. Option 7G emerged as the most feasible solution that meets all the established design principles, addressing safety, economic impact, environmental factors, and operational considerations for all airspace users.

- **Technically Feasible Solution:** Option 7G also meets all the technical requirements, particularly the limitations identified with applying multiple "RAG blankings" on radar systems.

Considering these factors, the Change Sponsor is confident that Option 7G represents the best possible solution that addresses the radar clutter issue from the wind farm while minimising airspace restrictions for most aircraft users.

2.9 Summary of Anticipated Impacts

The proposed airspace change is designed to address radar interference caused by the Berwick Bank Wind Farm, ultimately enhancing safety for all airspace users. This section outlines the anticipated impacts across various stakeholders and aspects of airspace management.

2.9.1 Impact on Airspace Users

- **General Aviation**: A transponder requirement within the TMZ may impact some GA users who lack this equipment. There will be the opportunity to request entry into the TMZ using 2-way communications with the Controlling Authority. Displaced non-transponder-equipped GA traffic may affect other airspace users, but due to the low levels of traffic in and around the proposed site, this impact is expected to be minimal.
- **Military Aviation:** The MOD through Defence Airspace and Air Traffic Management (DAATM) expressed concerns about the introduction of the Berwick Bank Wind Farm without any suitable mitigation. DAATM confirmed during engagement that they are supportive of Option 7G and through their help, MOD Leuchars Station have agreed to be the TMZ Controlling Authority which will allow MOD Leuchars Station to manage the airspace more effectively, by allowing them to sequence aircraft in the TMZ who may not operate a transponder, and also better aircraft handling for emergencies.
- **Commercial Aviation:** Commercial aircraft in the UK will use a transponder and Airway P18, there is expected to be no impact on this type of airspace user. NATS did raise a concern that the wind farm could impact their PSR at Perwinnes and are supportive that Option 7G will provide the required mitigation for that.

2.9.2 Safety Impact

The primary objective of the airspace changes is to improve safety by mitigating radar interference and ensuring a clear radar picture for ATC. This will enhance situational awareness and allow for more informed decision-making by ATCOs. A comprehensive safety assessment has been developed and through a Hazard Identification meeting, all relevant points have been addressed and further mitigation introduced as required.

2.9.3 Impact on Aircraft Operators and Owners

The transponder requirement within the TMZ may necessitate upgrades for some GA users. Alternatively, these users can still request to transit the TMZ area without a

transponder subject to the Controlling Authorities workload and the traffic in the TMZ. Due to the low-level traffic density in and around the area of the development, there is expected to be minimal impact on users.

2.9.4 Impact on Other Airspace Users

There may be minor disruptions to other airspace users due to displaced non-transponder equipped GA traffic. However, the overall impact is expected to be minimal.

2.9.5 Impact on Spaceflight Activities

There are no Spaceflight activities or ACPs notified in this area and the proposed changes are not expected to affect spaceflight activities.

2.9.6 Environmental Impact

The displaced air traffic due to the TMZ may cause slightly more greenhouse gas emissions, and fuel burn. However, this is expected to be negligible compared to the wind farm's environmental benefit of saving approximately 8 million tonnes of carbon dioxide (CO_2) emissions per year. There will be no noise impact to local communities due to the geographic location of the development area over the sea.

2.9.7 Impact on Air Traffic Services

MOD Leuchars Station ATC has been identified as the proposed Controlling Authority. Controller workload may increase due to additional communication with aircraft transiting the TMZ. However, the increase is anticipated to be manageable and may improve situational awareness for controllers. There is not expected to be any impact to other ATC providers who rely on the Perwinnes PSR for their radar data.

2.9.8 Impact on national security

The MOD has been consulted throughout the process, and the proposed mitigation strategy is not expected to negatively impact national security.

2.9.9 Overall Conclusion

The proposed airspace change is designed to have a minimal negative impact on airspace users whilst addressing the radar clutter issue. Option 7(G) (TMZ with a buffer zone and joined to Seagreen TMZ) has been identified as the most favourable option due to its alignment with Stakeholder feedback, adherence to the AMS objectives, as its minimal impact on airspace users. The environmental benefits of the wind farm significantly outweigh any minor inconveniences caused by the airspace change.

2.10 Assessment of criteria for the Secretary of State for Transport's Call-in Process

While the Secretary of State for Transport's call-in process typically applies during Stage 5 of the ACP, it is still prudent to assess this Level 3 ACP against the relevant

call-in criteria outlined in the Air Navigation Directions 2017. This assessment will determine if the proposal warrants escalation to the Secretary of State.

The call-in criteria focus on airspace changes with potentially significant national implications. Here is an analysis of why this proposal is unlikely to trigger the call-in process.

- **Strategic National Importance:** The proposed changes are specific to the Berwick Bank Wind Farm and do not hold broader strategic significance for the national airspace.
- **Economic Impact:** The ACP is not anticipated to have a substantial positive or negative impact on the UK's economic growth.
- **Noise Impact:** Crucially, the wind farm and the proposed airspace changes are located over the sea. This eliminates the possibility of a 10,000 net increase in people subjected to noise levels exceeding the 54 dB LAeq[10] 16hr threshold, nor will there be any identified adverse impact on health or quality of life for communities on land.

Based on this assessment, the proposed airspace change is not expected to meet any of the call-in criteria set forth in the Air Navigation Directions 2017. Therefore, the Secretary of State's call-in process is unlikely to be triggered for this Level 3 ACP.

2.11 Timeline for Implementation

Timeline

Formal AIRAC[11] Change Submission: To achieve AIRAC 06/26, effective on the 11th of June 2026, the Change Sponsor will submit a formal Change Request to the CAA to amend the Aeronautical Information Publication (AIP) by 13th of March 2026, initiating the official implementation process.

Staff Training: Training will be provided for ATCOs at MOD Leuchars Station. This training will ensure they are fully prepared to operate as the TMZ Controlling Authority by the implementation date. (These dates are to be confirmed based on the projected operational date for the Berwick Bank Wind Farm).

Engineering Updates: Equipment modifications will be undertaken on the Perwinnes and Leuchars PSR. These modifications will ensure the facilities can accommodate the PSR blanking and display the TMZ on radar screens. This work will be completed concurrently with the training program. (These dates are to be confirmed based on the projected operational date for the Berwick Bank Wind Farm).

Letters of Agreement (if applicable): If required, completion and sign-off on any Letters of Agreement (LOAs) with stakeholders will be finalised before implementation. (These dates are to be confirmed based on the projected operational date for the Berwick Bank Wind Farm).

[10] A weighted, equivalent continuous sound level
[11] Aeronautical Information Regulation and Control

This pre-implementation plan ensures all necessary steps are completed in a timely manner, paving the way for a successful implementation on the targeted operational date. This date is currently not expected to be before Q3 2026.

3 Detailed Description of the Current Airspace and Operations

3.1 Structure

The proposed site for the Berwick Bank Wind Farm, highlighted in Figure 6, is located within Class G airspace. The airspace extends from surface (SFC) to FL 195. It is uncontrolled airspace, meaning that aircraft can fly through it without needing a flight plan, contacting ATC, or displaying any transponder signal when operating above FL100 for ATC detection. There are no flight paths within this Class G airspace, and aircraft are free to navigate unrestricted in any direction, as long as they comply with the minimum weather visibility requirements for VFR operations[12]. Aircraft flying under IFR and receiving an ATS can also fly in this airspace. In such cases where a pilot is operating under IFR, then they may request a deconfliction service[13] from ATC who will provide directional information to the pilot to ensure a minimum of 5nm lateral separation or 3,000ft vertical separation[14] between the aircraft receiving a radar derived ATS and any other aircraft in the area, unless suitable coordination[15] has been agreed, where these original lateral and vertical requirements can be reduced.

3.1.1 Surrounding Airspace Features

Transponder Mandatory Zones: North of the development site lies the established Seagreen TMZ, and to the west lies the NnG (Neart na Gaoithe) TMZ. Both TMZs are active from SFC to FL100. This airspace requires the carriage and operation of transponders, allowing ATC to identify and track them. Aircraft unequipped can request permission to enter this airspace through suitable two-way communication and this will be approved at the discretion of the TMZ controlling authority.

Airway P18: This commercial air traffic route runs roughly north to south above the development area. The portion of the airway that overlaps the site is classified as a Conditional Route (CDR), meaning it not always active. The vertical limits of the airway over the development site start at FL135 and extends upwards to FL255. Airway P18 is classified as Class D airspace and is primarily used by commercial air transport for routing between airports and connecting with other airway structures. The proposed mitigation strategy for the wind farm will not affect this airway.

Military Danger Areas (MDAs):

EG D514: Established in February 2024, this danger area operates between FL85 and FL660 (when active) to accommodate military exercises or other aircraft involved in such activities. When active, it takes precedence over the surrounding

[12] UK Civil AIP - ENR 1.2 Visual Flight Rules
[13] CAP 774 - Ch4 - 4.1 (Definition)
[14] CAP 774 - Ch4 - Para 4.10
[15] Coordination is the process of obtaining agreement on clearances, transfer of control, advice, or information to be issued to aircraft, by means of information exchanged between air traffic services units or between controller positions within such units. (ICAO Doc 9426)

TMZs, restricting GA traffic operations to below FL85. Activity times for this zone are disseminated through NOTAM.

EG D613 C/D: Located towards the eastern edge of the proposed wind farm TMZ, this danger area is active between FL100 and FL660 for military exercises. Due to its base level, it will not directly interact with the wind farm's TMZ operations. Activity times are notified via NOTAM.

VFR Traffic Patterns: There are no VFR traffic routes within the surrounding Class G airspace and therefore unlike in controlled airspace, airspace users can operate wherever they wish as long as they comply with the rules as stated in paragraph 3.1 Footnote 11.

Aerodromes: Due to the geographic location of the proposed wind farm, there are no aerodromes affected by the proposed development, and this has been confirmed by both NATS and the MOD through the EIA[16]. It has also been confirmed by Highlands and Islands Airports Ltd (HIAL) that Dundee Airport will be unaffected by the proposed wind farm development[17].

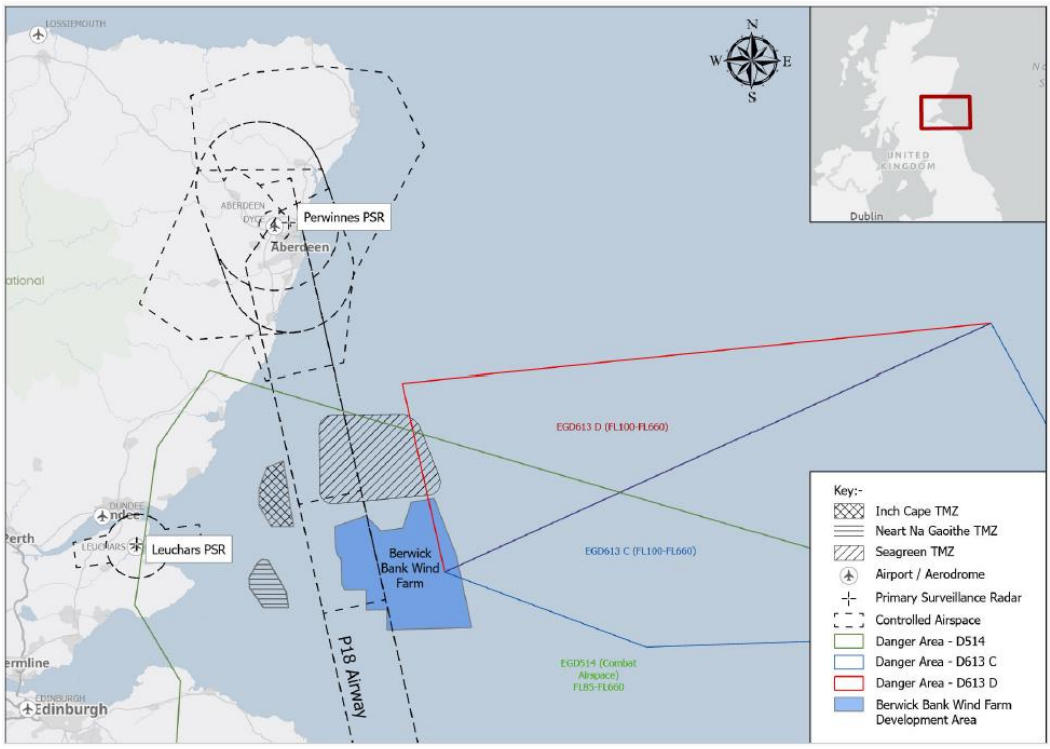


Figure 6 - Airspace in the Vicinity of the Berwick Bank Development Area

3.1.2 Transponder Requirement

In accordance with CAA policy[18], all civilian aircraft operating above FL100 within UK airspace must have a functioning transponder. This electronic equipment

[16] Environmental Impact Assessment Download Page
[17] Engagement Summary Report – Section A7.6 (via ACP Portal)
[18] UK Civil AIP – GEN 1.5 – Section 5.3

transmits a signal that identifies the aircraft and its altitude, which is then picked up by a ground based SSR and displayed on ATC screens.

3.2 Airspace Usage

A detailed quantitative analysis of traffic within the vicinity of the proposed wind farm development was conducted at Stage 2 of the ACP[19]. The analysis aimed to determine the type and density of airspace users and estimate the numbers of aircraft potentially affected by the proposed airspace solution.

3.2.1 Traffic Survey Methodology

The analysis involved monitoring air traffic within a designated area surrounding the proposed Berwick Bank site for a two-week period in July 2023. This timeframe was chosen to represent a potentially busy period for recreational flying in the area. An air traffic monitoring system[20] utilising Automatic Dependent Surveillance-Broadcast (ADS-B) data was employed to track aircraft movements.

3.2.2 Survey Results

The survey captured seven aircraft entering the proposed TMZ boundary during the two-week period. A breakdown of these aircraft is provided in Table 2. As highlighted in Table 2, the majority of the transiting aircraft were either commercial or military aircraft and were transponder equipped as detailed in the traffic survey methodology. Only one transponding GA aircraft was recorded.

Date	Time (UTC)	Registration	Type	Category	Flight Level/Altitude
11-July	11:50	G-CGYW	Sikorsky S-92	Commercial	1,400ft
13-July	12:25	ZP801	Boeing Poseidon	Military	7,000 – 13,000ft
16-July	11:45	G-ZATG	DA-42M	Commercial	8,000ft
19-July	08:15	OY-VPA	Vulcanair P68	Commercial	8,000ft
20-July	06:50	G-WNSV	Sikorsky S-92	Commercial	4,000ft
20-July	06:50	N626JG	PA-34	General Aviation	6,500 – 8,000ft

[19] Berwick Bank Aviation Survey (Issue 2)
[20] FlightRadar24

Date	Time (UTC)	Registration	Type	Category	Flight Level/Altitude
21-July	14:45	C-FPSH	Dornier 228	Commercial	7,000ft

Table 2 - Details of the 2023 Aviation Survey

Figure 7 illustrates the heatmap of those aircraft listed in Table 2 to provide a better awareness as to the direction of transit of these aircraft.

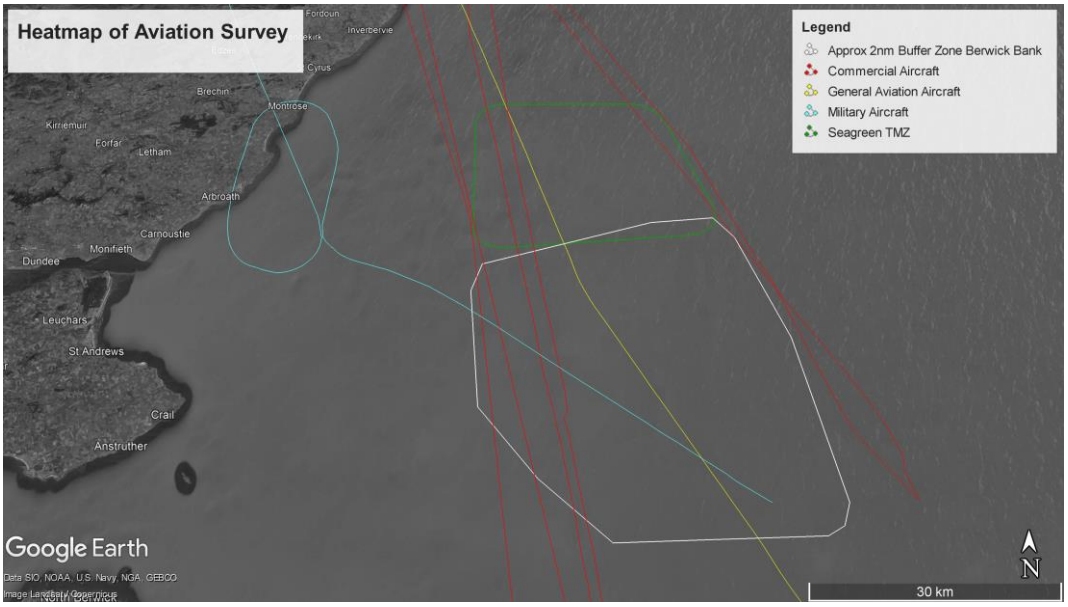


Figure 7 - Heatmap of 2023 Findings

3.2.3 Extrapolating Annual Traffic Figures

Extrapolating the findings from the two-week survey to a full year suggests that approximately 26 transponding GA aircraft movements might transit the area annually.

3.2.4 Accounting for Non-Transponding Traffic

To account for potential non-transponding traffic, particularly GA aircraft, a scaling factor was applied specifically to the GA aircraft data. Commercial and military aircraft are mandated to operate transponders, ensuring their capture in the survey data. The scaling factor considers the estimated percentage of GA aircraft within the UK register that are not equipped with transponders.

3.2.5 Scaling Factor Calculation

Data from the CAA document CAP 2498A[21], paragraph 4.5.2, indicates that approximately 46% of aircraft on the 2021 UK Register were equipped with Mode-S

[21] Minimum Technical Standards For Electronic Conspicuity and Associated Surveillance (30 March 2022)

Transponders (a requirement for entering a TMZ in the UK). Therefore, the following calculation is applied to account for non-transponding GA aircraft:

(# of transponding a/c) ÷ (% of equipped a/c) = Total # of a/c expected.

When the figures are included, this gives:

(26) ÷ (0.46) = 56.52 which can be rounded to 57.

This suggests that in addition to the 26 transponding GA aircraft movements captured in the survey, an estimated 31 non-transponding GA aircraft movements are likely to occur within the designated area each year which is approximately one non-transponder aircraft every 11 days).

3.2.6 Conclusion

The quantitative traffic survey revealed that the airspace surrounding the Berwick Bank Wind Farm development experiences low-density traffic, particularly for non-transponding GA aircraft. Therefore, the change sponsor believes that it is highly unlikely to cause significant implications to a large number of airspace users.

4 Detailed Description of the Changes to Airspace Design and Operation

4.1 Introduction

This section details the proposed changes to airspace design and operation to mitigate the potential impact of the Berwick Bank Wind Farm on ATC radar functionality and safety. The proposed design aligns with the key principles of the CAA's AMS while considering the existing traffic situation and user needs.

4.2 Addressing Radar Clutter

The presence of the wind farm poses a challenge for ATC radar systems. Wind turbines can generate clutter on radar displays, potentially obscuring aircraft returns and hindering ATC's ability to maintain situational awareness. To address this safety concern, two mitigation measures are proposed:

4.2.1 Range Azimuth Gating (RAG)

RAG will be deployed on the Leuchars and Perwinnes PSRs. This technology electronically filters out clutter from the wind turbines, eliminating their misleading returns from the radar display. However, RAG also has a drawback: it suppresses primary radar returns from aircraft within the designated blanked area, which means that any aircraft entering the RAG blanked area will not be seen by ATC, leading to reduced situational awareness

4.2.2 Temporary Mandatory Zone

To compensate for the loss of primary radar coverage caused by RAG, the establishment of a TMZ over the wind farm area is recommended. This airspace classification mandates all transponder-equipped aircraft to operate their transponders within the zone. Transponders are electronic devices that identify and broadcast an aircraft's position and altitude data to ATC.

4.3 Impact on Different Types of Aircraft

The proposed mitigation strategy has varying implications for different types of aircraft as follows:

4.3.1 Transponder-Equipped Aircraft

These aircraft are readily identifiable by ATC due to their transponders. They will remain visible within the TMZ and can freely transit the airspace while maintaining communication with ATC.

4.3.2 Non-Transponder-Equipped Aircraft

These aircraft lack transponders and cannot be actively identified by ATC. They will be prohibited from entering the TMZ without obtaining prior clearance from ATC.

4.4 TMZ Design and Operation

The proposed TMZ will be specifically designed to:

- **Minimise airspace impact:** The TMZ's shape will closely follow the wind farm's outline, minimizing the overall airspace volume affected. This "rubber band" approach reduces the impact on surrounding airspace users compared to a box-shaped zone.
- **Connect to existing TMZ:** The new TMZ will connect seamlessly with an existing northern TMZ, ensuring a smooth flow of traffic and avoiding any potential "choke points" in the airspace.
- **Maintain situational awareness:** The adoption of the proposed measures will enhance situational awareness for both ATC and airspace users. By eliminating wind turbine clutter and ensuring transponder usage within the TMZ, ATC can maintain a clear picture of air traffic and provide safe air traffic services.

4.4.1 Hours of Operation

The RAG blanked area will be permanently active on ATC equipment. The TMZ will operate 24 hours a day. Non-transponder equipped aircraft can request permission to enter the airspace on a case-by-case basis during the operational hours of the Controlling Authority (MOD Leuchars Station).

4.4.2 Impacted Airspace

The TMZ will have minimal impact on the airspace above the proposed wind farm development site. Its shape is designed to minimise the airspace volume required to establish it, and it seamlessly connects to an existing TMZ to enhance a pilot's situational awareness. This TMZ design has ensured no choke points are established and maintains safety in the area of the wind farm. The coordinates of the proposed TMZ boundary and the draft AIP changes for the proposed TMZ area are in Appendix A1.

4.5 Compliance with Regulations

The proposed airspace design adheres to the relevant International Civil Aviation Organisation (ICAO) standards and recommended practices, as well as applicable UK CAA policies. The design prioritises safety while minimising disruption to existing traffic patterns and user's needs. Data from the traffic survey conducted during Stage 2 of the ACP process (Table 2 – Section 3) has been used to assess the potential impact on airspace users and inform the design choices.

5 Detailed Description of Anticipated Operational Impacts

5.1 Introduction

This section explores the anticipated operational impacts of the proposed airspace changes associated with the Berwick Bank Wind Farm development on various stakeholders and air traffic operations. It builds upon the summary provided earlier in the report.

5.2 Operational Impact on Airspace Users

5.2.1 General Aviation

The introduction of the TMZ will mandate transponder usage within the designated airspace. This requirement may pose a challenge for some GA aircraft that lack transponders; however, these non-transponder equipped aircraft can still request permission to enter the TMZ by establishing two-way communication with the Controlling Authority. While displaced non-transponder equipped GA traffic might cause minor disruptions to other users, the low traffic density in the vicinity of this proposed TMZ minimises this impact.

5.2.2 Military Aviation

The Ministry of Defence (MOD) initially expressed concerns regarding the wind farm's potential impact on airspace safety. However, they have shown support for Option 7G, the proposed mitigation strategy involving a TMZ. Additionally, MOD Leuchars Station has agreed to act as the TMZ Controlling Authority, allowing them greater flexibility and situational awareness to use all the airspace within the proposed development area, through careful management and integration of non-transponder equipped aircraft.

5.2.3 Commercial Aviation

Most commercial aircraft in the UK operate with transponders. In the area above the proposed development area of the wind farm is the Airway P18, which can be utilised by commercial aircraft transiting the area. The proposed changes are expected to have minimal impact on commercial air traffic. Furthermore, NATS, the air navigation service provider, supports the implementation of Option 7G to mitigate potential radar interference with the Perwinnes PSR.

5.3 Operational Efficiency, Complexity, Delays and Choke Points

There is no impact for operational efficiency, complexity, delays, and choke points in the current situation. The flight patterns detected based on the evidence collected suggests that GA activity tends to be concentrated over land or within close

proximity to the coastline. The proposed airspace solution is designed to minimise disruption, with a focus on avoiding choke points and simplifying airspace structure. The airspace design will maintain safety, and the small size of the TMZ will not impact operational efficiency and will only lead to minimal delays for non-transponder equipped aircraft.

5.4 Impact on Stakeholders

5.4.1 Aircraft Operators and Owners

While aircraft operators without transponders can still operate in the area of the proposed wind farm site, they will be required to seek permission from the Controlling Authority if they wish to transit through the TMZ. Operators seeking to optimise flight paths within the TMZ should seek to upgrade to equip with a transponder. Given the low traffic volume in the region, any potential impacts are expected to be minimal.

5.4.2 Other Airspace Users

While there may be minor disruptions for other airspace users due to the potential rerouting of non-transponder-equipped GA traffic, the overall impact is expected to be minimal.

5.5 Impact on Air Traffic Services

MOD Leuchars Station ATC: This entity has been identified as the proposed Controlling Authority for the TMZ. There might be a slight increase in controller workload due to additional communication with aircraft transiting the zone. However, this increase is deemed to be manageable by the ATC provider and may even improve situational awareness for controllers.

National Air Traffic Services: The impact on this ATC providers which rely on the Perwinnes PSR for radar data is expected to be minimal.

5.6 Impact on National Security

The MOD has been actively involved throughout the engagement process. The proposed mitigation strategy, including the establishment of a TMZ, is not anticipated to have any impact on national security.

5.7 Overall Conclusion

The proposed airspace changes are expected to have minimal negative impacts on airspace users, outweighed by the significant environmental benefits associated with the wind farm development. Option 7G (TMZ with a buffer zone and joined to Seagreen TMZ) has been identified as the most favourable option due to its focus on minimising disruption, aligning with stakeholder feedback, and adhering to the objectives of the CAA's AMS.

6 Supporting Infrastructure and Resilience

6.1 Introduction

This section examines the anticipated impacts of the proposed airspace change on supporting infrastructure and resilience. It analyses these impacts against relevant regulations, policies, and guidance documents.

6.2 Communication Equipment and Services

The introduction of the TMZ will not require changes to existing communication equipment and services. Transponding aircraft operating within the TMZ will not be required to communicate with the Controlling Authority (MOD Leuchars Station). However, non-transponding aircraft requiring access will need to establish contact with the Controlling Authority on designated radio frequencies.

6.3 Navigations Equipment and Services

The proposed changes have no impact on conventional navigation equipment and services. Existing procedures and infrastructure for these systems remain fully operational. The airspace design is also compatible with existing satellite-based navigation (SBN) procedures and specifications. RNAV (Area Navigation) capabilities are not expected to be affected.

6.4 Surveillance Equipment and Services

6.4.1 Primary Radar

The primary objective of the airspace design is to address the radar clutter issue caused by the wind farm. The proposed deployment of RAG on the Leuchars and Prestwick PSRs eliminates wind turbine clutter from radar displays. However, this also suppresses primary radar returns from aircraft within the blanked area. To ensure that this does not have a detrimental impact on safety, the introduction of a TMZ over the blanked area will help to mitigate the impact of the blanking.

6.4.2 Secondary Surveillance Radar and Electronic Conspicuity

SSR is not impacted by any radar blanking and will remain fully operational within the TMZ, ensuring continued aircraft identification and tracking. The mandatory transponder requirement within the TMZ mitigates the limitations of primary radar coverage in this area. All transponder compliant aircraft will be identifiable by ATC due to their transponders acting as electronic conspicuity devices, transmitting aircraft identification and position data.

6.4.3 Contingency Procedures

In the unlikely event of both primary and secondary radar failure, operational units affected will implement their already established loss of surveillance equipment contingency procedures. If their rules allow, they may wish to operate by providing a procedural service, and where required, information on the outage will be promulgated as a NOTAM to keep airspace users fully informed.

6.4.4 Communications and Infrastructure Availability

The existing communication infrastructure, including R/T (Radio Telephony) Designated Operational Coverage (DOC) coverage, has sufficient capacity to handle the anticipated traffic volume within the TMZ. Contingency procedures, as outlined in Section 1.1, will be implemented to address any unforeseen communication disruptions.

6.4.5 System Failure and Contingency Planning

The potential effects of equipment, procedural, or personnel failures on airspace management have been considered. Contingency plans are already in place at the affected units to address these scenarios and maintain safe and efficient air traffic operations. Specific examples of these contingency measures may include:

- Utilising alternative navigation aids, communication channels, or surveillance methods in case of specific system failures.
- Implementing procedural separation measures (if approved) to maintain safety when necessary.
- Maintaining appropriate staffing levels at ATC facilities to ensure adequate service provision.
- Regularly reviewing and updating contingency plans to reflect evolving technologies and procedures.

6.4.6 Staffing Requirements (Controlling Authority)

The proposed airspace change is not expected to necessitate any increase in ATC staffing levels at MOD Leuchars Station. The existing ATC team is qualified and experienced in managing the airspace in this area. However, potential adjustments to workload distribution and training may be considered based on post-implementation monitoring and analysis.

7 Regulations, Policies and Harmonisation

7.1 Introduction

This section analyses the proposed Berwick Bank Wind Farm airspace change proposal against relevant regulations, policies, and guidance material. It also addresses potential requests for dispensations and demonstrates compliance with key principles.

7.2 Regulations and Policies

7.2.1 SARG[22] Policy 123 (13 Jan 2022) - Policy for Radio Mandatory Zones and Transponder Mandatory Zones (TMZs) [Ref 010]

The proposed airspace change adheres to this policy by establishing a TMZ around the wind farm, requiring all aircraft within its boundaries to be equipped with functioning transponders. This ensures continued safe operation of ATC despite potential wind turbine clutter on radar displays.

7.2.2 SARG Policy (12 Feb) Policy for the Establishment and Operation of Special Use Airspace [Ref 011]

This policy will be followed in establishing the Berwick Bank Wind Farm TMZ as a special use airspace. The proposal ensures compatibility with existing special use airspace and will not create an undue burden on other airspace users.

7.3 Interaction with Existing Airspace Structures

The proposed TMZ will be designed to integrate seamlessly with existing domestic and international en-route structures, Terminal Manoeuvring Areas (TMAs), and Controlled Traffic Areas (CTAs). Here's how connectivity will be achieved:

En-route structures: The TMZ will be established at a sufficient altitude to avoid any impact on existing en-route minimum flight levels.

TMAs and CTAs: The TMZ boundary has been carefully designed to ensure no impact on existing TMAs and CTAs.

7.4 Airspace Buffer Requirements

The CAA policy statement on the establishment and operation of special use airspace was considered during the detailed design phase of the TMZ. A 2nm buffer zones will be established around the TMZ to ensure adequate separation between the proposed wind farm and non-transponding aircraft who may operate too close to the TMZ and disappear if no buffer was implemented.

[22] Safety and Airspace Regulation Group

7.5 Letters of Agreement

LOAs will be prepared (as required) with relevant stakeholders, including the MOD and neighbouring ANSPs, to ensure coordinated implementation and management of the Airspace Change. These LOAs will address potential airspace user concerns and establish clear communication protocols.

A discussion with the MOD has already taken place to manage the operation of the TMZ and EG D514 when it is activated, concerning the passing of relevant traffic information, and this will be explored prior to the TMZ becoming operational. (Expected to be not before Q3 2026)

7.6 Access to Airspace

The proposed airspace change is committed to providing equitable access to all airspace users. The TMZ will not be implemented through "management by exclusion." Access to Airspace will be achieved via the following.

Stakeholder Engagement: Extensive engagements were held with airspace users, including GA operators, to understand their needs and concerns. The final design took into account any feedback received in order to minimise disruption to existing flight patterns.

Published Procedures: Clear and concise procedures for entering, transiting, and exiting the TMZ will be published in relevant aeronautical publications. This will ensure all airspace users have access to the information necessary for safe and efficient operations.

Monitoring and Review: The impact of the airspace change on traffic patterns will be continuously monitored. Adjustments to the TMZ design or operating procedures may be implemented if necessary to maintain equitable access.

By following these principles, the Berwick Bank Wind Farm ACP aims to strike a balance between safety, efficiency, and equitable access for all airspace users.

8 Safety

8.1 Safety Case

This section outlines the safety considerations for the proposed RAG blanking and TMZ around the Berwick Bank Wind Farm. The Safety Case demonstrates how the proposed airspace change maintains a high standard of safety and integrates effectively with existing operations. The safety assessment is aligned with CAA guidance, including CAP 760: Guidance on the Conduct of Hazard Identification, Risk Assessment, and the Production of Safety Cases [Ref 012].

8.2 Introduction

The Berwick Bank Wind Farm will introduce potential hazards to ATC due to wind turbine clutter on radar displays. To mitigate these risks and ensure continued safe operation of ATC, a TMZ will be established around the proposed wind farm. This section details the anticipated impacts of the RAG and TMZ, associated safety assessments, and proposed mitigation strategies.

8.3 Anticipated Impacts

The primary objective of the airspace change is to address radar clutter caused by the proposed wind farm, which could hinder ATC's ability to maintain situational awareness and potentially compromise safety. The proposed RAG and TMZ with a transponder requirement for entry ensures clear identification of aircraft within the designated zone, enhancing overall airspace safety for all users.

The primary impact of the Berwick Bank Wind Farm is the degradation of ATC radar performance due to wind turbine clutter. This can lead to:

- **Reduced situational awareness:** ATC may have difficulty tracking aircraft in the vicinity of the wind farm.
- **Inaccurate radar data:** Clutter can introduce errors in position and altitude information displayed to ATC.
- **Increased workload for ATC controllers:** Controllers may need to rely on alternative methods (e.g., voice communication) to maintain separation between aircraft.

8.4 Safety Assessment Work

A comprehensive safety assessment has been conducted, addressing potential hazards associated with the RAG and TMZ and incorporating additional mitigation measures, as necessary. The assessment is aligned with CAP 760 and includes the following.

Hazard Identification: A structured HazID process was conducted in November 2023 to identify all potential hazards associated with the introduction of the RAG and

TMZ. This process involved participation from relevant stakeholders, including ATC personnel, engineers, and air traffic safety experts. The methodology employed brainstorming sessions and workshops to comprehensively explore potential failure scenarios.

8.4.1 Proposed Mitigations

The following mitigation strategies will be implemented to address the safety concerns associated with the RAG and TMZ.

- **Radar Blanking:** PSR displays at MOD Leuchars Station, Prestwick Centre, and Aberdeen Offshore will be electronically blanked in the area of the wind farm. RAG technology will be employed to minimise clutter in the proposed development site, whilst still preserving real aircraft data on ATC screens in other areas.
- **TMZ Implementation:** The TMZ will require all aircraft within its boundaries to be equipped with functioning transponders. This ensures that ATC can track and identify aircraft.
- **Communication Protocols:** Clear communication protocols will be established between ATC and aircraft operating within the TMZ.
- **Training and Procedures:** ATC personnel at affected locations will undergo comprehensive training on the operation of the TMZ and the potential impact on radar displays. Updated procedures will be developed to address potential safety concerns arising from the TMZ, ensuring controllers can maintain the safe separation of air traffic.
- **Safety Management System Integration:** The operation of the TMZ will be integrated into the existing Safety Management Systems (SMS) of MOD Leuchars Station, Prestwick Centre, and Aberdeen Offshore. This ensures continuous monitoring, risk assessment, and improvement of safety procedures related to the TMZ.

8.5 Conclusion

The proposed Berwick Bank Wind Farm RAG and TMZ, along with the mitigation strategies outlined above, will effectively address the safety concerns associated with wind turbine clutter on ATC radar. The Safety Case demonstrates a commitment to maintaining a high standard of safety while facilitating the integration of this renewable energy infrastructure.

9 Environmental Assessment

9.1 Noise

This proposed development site is situated some 36km off the Scottish Coast and as such there will be no impact to any communities on the ground. The Change Sponsor included noise as an Environmental DPE (4) stating that "Our airspace change should seek to minimise the impact of noise below 7,000ft and 4,000ft in the vicinity of the airspace change". The Change Sponsor believes that there is no change at all in noise levels or its distribution such that people will be affected on the ground. To that end, the Change Sponsor is content that there will be no changes from the current baseline without the airspace solution when compared to the Year 1 and Year 10 baselines with the airspace solution in place. As there will be no change, the current baseline without the airspace change has not been assessed.

9.2 Greenhouse Gas Emissions (GHG)

The introduction of the wind farm is anticipated to provide CO_2 benefits of approximately 8 million tonnes per annum[23], which is a wider benefit enabled by, but not directly attributable to, this proposal. This wind farm will contribute directly to the UK Net Zero aim, and if approved for delivery, Berwick Bank could increase Scotland's overall renewable energy capacity by nearly 30%.

There is no expected change to fuel burn for commercial airlines as flight plannable routes will remain unchanged and commercial aircraft will not be affected by this proposal as they are all transponder equipped.

GA users may incur increased fuel burn if they are not equipped with a transponder or radio and are required to route around the TMZ. However, the likely volume of non-transponder equipped aircraft which may pass through this area is considered to be low and the small size of the proposed TMZ would mean that any potential increase in fuel burn as a result would be minimal.

9.2.1 Future Baseline Scenario Without the Airspace Change Proposal

As detailed in the DPE Document[24], the baseline scenario without the ACP is referred to as the 'do nothing' scenario. Due to the nature of the development area, the Berwick Bank Wind Farm will not be constructed without suitable mitigation. Therefore, without the ACP, the status quo would remain, therefore Class G airspace will remain, allowing any aircraft to operate anywhere it wishes whether it operates a transponder or not. Aircraft will be free to transit the development area in any direction and height they require with no restrictions imposed. Therefore the 'do nothing' scenario will have no impact on future GHG emissions.

[23] www.berwickbank.com
[24] Berwick Bank DPE Document Link

9.2.2 Design Option 7(G) with the Airspace Change proposal

In this scenario, the Change Sponsor addresses the situation in which Option 7G has been implemented within the development area. This means that in line with the rules governing a TMZ, an aircraft that is not operating a transponder cannot enter the TMZ, unless a controlling authority has granted permission. This scenario assumes that there is no controlling authority for the combined Seagreen and Berwick Bank TMZ.

From the perspective of a non-transponding aircraft, they would be expected to plan to either avoid the TMZ during the flight planning stages, or they would be required to avoid the TMZ during their transit by taking a re-route. If a controlling authority were to be established, then a non-transponder aircraft could request to transit the TMZ, and this would be at the discretion of the controller and dependent on other traffic in the TMZ at the time. The Change Sponsor acknowledges that any increase in track mileage due to the re-route would translate into an increase in GHG emissions.

In this scenario, under current day operations the Seagreen TMZ is already established and therefore non-transponding aircraft are required to avoid it. The potential impact on aircraft rerouting depends on the location of the Berwick Bank TMZ relative to existing TMZs. As it will be established south of the Seagreen TMZ, minimal to no rerouting would be necessary for most non-transponder flights routing north/south or south/north. Eastbound flights, either departing or returning, would face a different scenario. The nearest landmass to the east lies approximately 360nm away. Given this vast distance and the lack of transponders on some small GA aircraft operating below FL100, attempting such a route presents significant safety risks, particularly in the event of engine failure in a single-engine aircraft far from land.

From the aviation study conducted in 2023, aircraft were only observed transiting north to south and south to north, and therefore it can be assumed that aircraft do not routinely track to the east. Figure 8 shows the exact routing of the only transponding GA aircraft during the 2-week aviation study (White Line), a theoretical transit of a non-transponding aircraft (Black line) routing to the east of the proposed Berwick Bank TMZ and a theoretical transit of a non-transponding aircraft (Red line) routing to the west of the proposed Berwick Bank TMZ, with both non-transponding aircraft also avoiding the Seagreen TMZ. To aid comparison, a circular marker was established at two points along the route to provide accurate comparisons for distances flown. As it is impossible to ascertain which routing a non-transponder aircraft was going to take, , the Change Sponsor assumed that the transponding aircraft would cover the journey twice using the same 254.98nm journey, thus completing 509.96nm in total, rounded to 510nm, and then assumed that one non-transponder track would avoid to the east (253.83nm), and the other to the west (258.10nm) of the proposed Berwick Bank TMZ, giving a total of 511.93nm flown, rounded to 512nm. This difference over the two flights is 2nm, and therefore equates to an average increase of 1nm per flight.

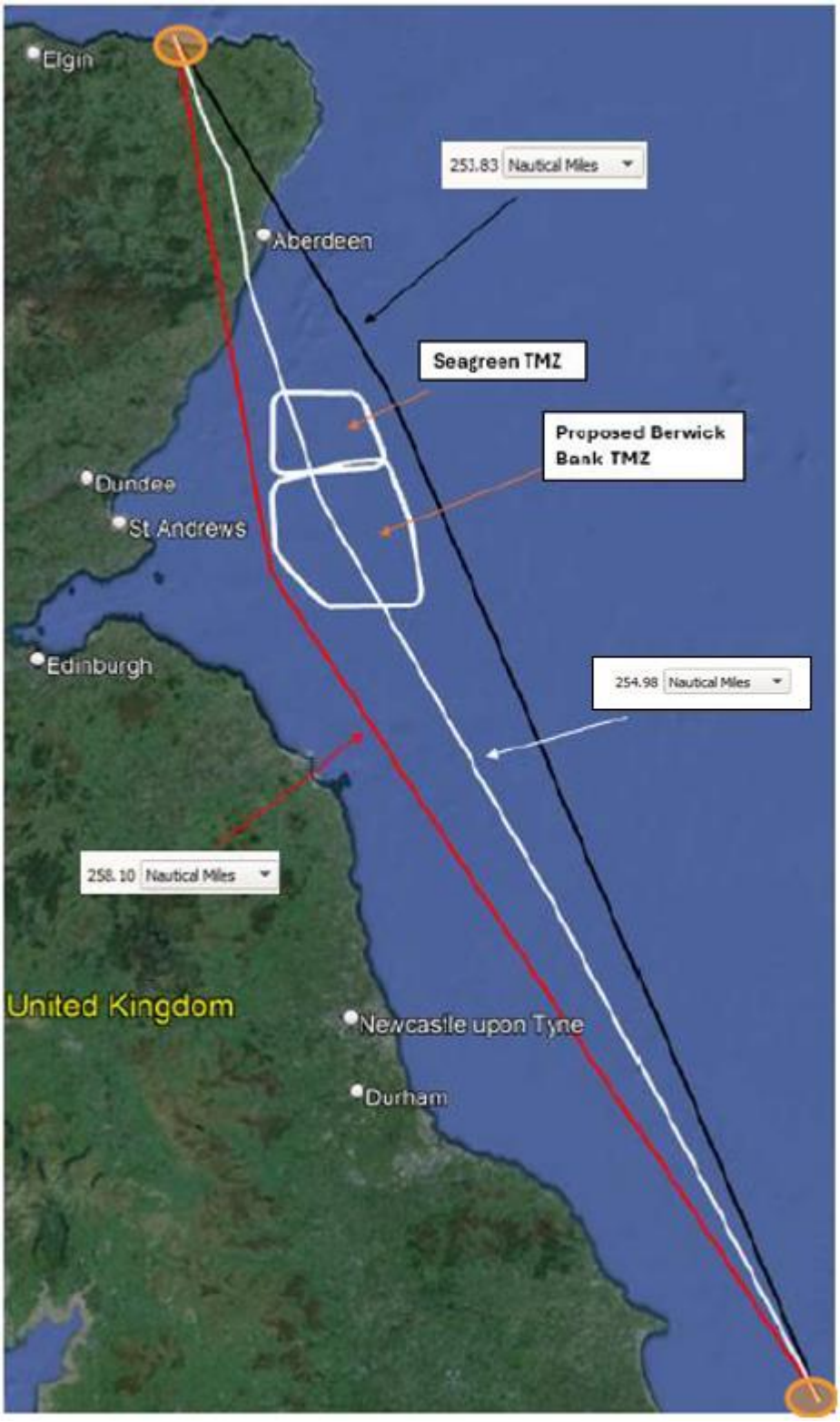


Figure 8 - Map Showing Routing Comparison

9.2.3 Greenhouse Gas Emission Rationale

The Change Sponsor, as mentioned previously, accepts that any increase in track mileage for a non-transponder aircraft having to avoid the TMZ may result in increased fuel usage and therefore a minimal increase in GHG. However, following on from the findings in an Aviation Study which has been submitted to the CAA, it can be seen from data obtained in 2023 that the number of non-transponding aircraft that operate in the area of the proposed TMZ is very small, indications put this at fewer than three a month. Due to the distance from the coastline of the TMZ, and it not being on any main VFR or IFR GA transit routes, the Change Sponsor believes that any non-transponding aircraft that could be affected by the proposed Berwick Bank TMZ and have to re-route would find that it adds on average less than 1nm to a flight (as shown in Figure 7 – Section 9).

9.2.4 Findings

Data from the 2023 study, which took place over 2-weeks in July 2023, observed just 1 GA aircraft transit the proposed Berwick Bank TMZ area. As can be seen from the calculations contained at section 3, paragraph 3.4.5 of this document, it is expected that approximately 31 non-transponder aircraft would be affected by the airspace solution per annum.

9.2.5 GHG Calculations

As the Cessna 172 is one of the most produced aircraft in the world, and widely used by members of the GA community, the Change Sponsor has used that as the basis for their GHG calculations. The Change Sponsor has used the data collected from the 2023 Aviation Study[25] to calculate the likely increases in GHG emissions for a non-transponding aircraft vs a transponding aircraft. The data set used is that contained in paragraph 9.1.4 of this document, which details that an observed transponding aircraft flew 254.98nm between two points in July 2023. To make the same flight in a non-transponding aircraft, avoiding both the already established Seagreen TMZ and the proposed Berwick Bank TMZ would see it fly approximately 253.83nm avoiding the TMZ to the east between the two same points or 258.10nm avoiding the TMZ to the west. Using the Eurocontrol Small Emitters Tool (SET) - 2023[26] the results can be seen in Table 3. [Note: The SET does not provide changes to estimated fuel use for less than 2nm differences]

[25] Aviation Survey Issue 2
[26] https://www.eurocontrol.int/tool/small-emitters-tool

Aircraft	Distance Flown (nm)	Estimated Fuel Use (kg)	Estimated CO_2 emitted (kg)
1x Flights of Transponding Aircraft	Rounded ↑ 255nm (254.98)	294	911
1x Flight of Non-Transponding Aircraft easterly route	Rounded ↑ 254nm (253.83)	294	911
1x Flight Non-Transponding Aircraft westerly route	Rounded ↓ 258nm (258.10)	296	918

Table 3 - Comparative CO_2 Usage Based on One Flight Profile

This data from Table 3 must now be converted using the UK Government 2022 GHG Conversion Factors dataset[27], the most up to date version available on the website at the time of this calculation. Using the data for Aviation Spirit (AKA Avgas), the data shows that 1 tonne (the unit) of Aviation Spirit generates a total of 3,192.76kg C02e[28] per unit. As 1 tonne equals 1,000kg, then 3,192.76 ÷ 1000 = 3.19276 kg C02e per kg of fuel used. Using the data above, and assuming that the Seagreen TMZ does not hinder the flight of a non-transponding aircraft, then the 31 non-transponding aircraft could today fly the same route as the transponding aircraft and thus 31x294 = 9,114kg (Est. Fuel Use).

With the establishment of the proposed Berwick Bank TMZ, these same 31 non-transponding aircraft would need to avoid the area. Again, using the data above and now assuming that the aircraft have to avoid both the Seagreen TMZ and the proposed Berwick Bank TMZ, the Change Sponsor has assumed that 16 aircraft route to the east of the TMZs (shorter) and 15 aircraft route to the west of the TMZs (longer). Therefore, 16x294 = 4,704kg (Est. Fuel Use) and 15x296 = 4,440kg (Est. Fuel Use) when combined equal an estimated fuel use total of 9,144kg. This figure equates to a total increase of 30kg of estimated fuel usage, or 0.97kg per flight. Using this difference of 30kg and applying the 3.19276 kg C02e per kg (fuel) from the UK Government 2022 GHG Conversion Factors dataset, it can be calculated that this increase in fuel usage would equate to an approximate increase of 95.78 kg C02e in total, or 3.09 kg C02e (3.1kg) per non-transponding aircraft flight.

[27] GHG Conversion Factors 2022 (Condensed Set)

[28] C02e stands for carbon dioxide equivalent. It is used to measure and compare emissions from GHG based on how severely they contribute to global warming.

A full overview of the traffic survey data and the calculations for the GHG emissions can also be found in the Berwick Bank Wind Farm Transition Document [Ref 012]

9.2.6 Conclusion

It is the opinion of the Change Sponsor that with the low number of GA transponding aircraft (one aircraft every 14 days), and the equally (predicted) low number of non-transponding aircraft (one every 11 days), then it would not be feasible to make any meaningful, accurate quantitative calculation as to the increase in greenhouse gas emissions. This assessment is made as the re-route distance is expected to be less than 1nm versus an average straight-line transit.

To make a comparison, the Change Sponsor has calculated using the worst-case scenario at each juncture a yearly increase of 96kg C02e. The Berwick Bank Wind Farm is expected to realise a saving of eight million tonnes of carbon dioxide emissions every year, which is similar to removing all of Scotland's annual car emissions and dwarfing the possible increase in aviation related C02e. The Change Sponsor has no data to suggest that traffic levels in the Class G airspace around the proposed development area would increase over the next 10 years, and therefore is content that the calculated 3.09 kg C02e increase per non-transponding aircraft would be the same in Year 1 as it would be in Year 10 when compared to the current baseline.

9.3 Local Air Quality

The impact on Local Air Quality is defined as impacts below 1,000ft, and due to the location of the proposed development site, as with the impact on noise on local communities, there will be no impact to people on the ground in terms of local air quality. To that end, the Change Sponsor is content that there will be no changes from the current baseline without the airspace solution when compared to the Year 1 and Year 10 baselines with the airspace solution in place.

9.4 Tranquillity

As the proposed development site is situated some 36km off the Scottish Coast and as such there will be no impact to any communities on the ground, the Change Sponsor believes there is no change at all in tranquillity levels for people on the ground. To that end, the Change Sponsor is content that there will be no changes from the current baseline without the airspace solution when compared to the Year 1 and Year 10 baselines with the airspace solution in place.

9.5 Biodiversity

The Change Sponsor has completed an EIA outside of this ACP which comprehensively evaluates the proposed wind farm development's impact on the offshore and onshore environment and is a separate process.

9.5.1 Regulatory Consents

Construction of the wind farm will require separate consents under the Electricity Act 1989 and the Marine and Coastal Access Act 2009/Marine (Scotland) Act 2010. These consents will address the transmission infrastructure and the proposed export cable. Notably, the Marine and Coastal Access Act applies to the section beyond 12nm of the coast, whilst the Marine (Scotland) Act covers the section within 12nm. These consents need to be assessed and granted before development of the wind farm site can proceed.

9.5.2 Habitats Regulations Assessment (HRA):

In parallel with the ACP, a HRA was conducted to ensure the airspace changes comply with relevant regulations. This HRA focuses on potential effects on European Sites from altered air traffic patterns or increased low-level movements (below 3,000ft) as outlined in CAP 1616i. The HRA specifically addressed the following question:

Are there any changes to air traffic patterns or number of movements expected below 3,000ft due to the airspace change proposal?

9.5.3 HRA Findings:

The HRA concluded that the proposed wind farm development will have no significant impact on either military or GA traffic. This finding is based on the following.

9.5.4 Military Aerodromes

The development falls outside the engagement distances for military instrument flight procedures (IFPs). Therefore, military aerodrome patterns and procedures are not affected.

9.5.5 Civil Airports

The development area is also outside the engagement zone for civil airport IFPs. Additionally, engagement with the CAA confirmed that no civil airport patterns and procedures would be impacted.

9.5.6 General Aviation

Studies conducted in the area show minimal GA activity. While non-transponder equipped aircraft might operate in the vicinity, the presence of the existing Seagreen TMZ would likely lead to a reroute, causing minimal impact on air traffic control workload.

9.5.7 Conclusion

Based on the HRA's findings, which align with CAP 1616i [Ref 014] guidelines, a full HRA is not required for this airspace change proposal. A copy of the detailed Berwick Bank HRA [Ref 015] can be found on the ACP Portal.

10 Summary

The Berwick Bank Wind Farm project represents a significant investment in renewable energy generation, directly contributing to the UK's Net Zero ambitions. This proposal outlines the necessary airspace changes to ensure safe and efficient co-existence of the wind farm with existing aviation activities.

A comprehensive environmental impact assessment has been conducted, addressing noise, greenhouse gas emissions, local air quality, and any potential effects on tranquillity. The proposed TMZ adheres to relevant regulations and policies, including SARG policies for TMZs and Special Use Airspace. The Change Sponsor is committed to maintaining equitable access to airspace for all users through its use of pre-implementation engagement, transparency surrounding published procedures, and continuous monitoring after implementation.

The final design option ensures no interaction with existing en-route routes, TMAs, and CTAs. Draft LOAs will be prepared with relevant stakeholders by Q3 2026 to further solidify coordinated implementation and management.

In Summary:

- The Berwick Bank Wind Farm airspace change proposal enables safe and efficient wind farm operation while minimising disruption to existing aviation activities.
- A comprehensive environmental impact assessment has been conducted, addressing noise, greenhouse gas emissions, local air quality, and potential effects on tranquillity.
- The proposed TMZ adheres to relevant regulations and policies, prioritising safety, and equitable access for all airspace users.
- The design ensures seamless integration with existing airspace structures and incorporates measures to mitigate potential impacts.
- The Change Sponsor is committed to ongoing collaboration with stakeholders through continued engagement and draft LOAs.

The Berwick Bank Wind Farm airspace change proposal offers a balanced approach, prioritising safety, efficiency, and environmental responsibility. We are confident that this proposal aligns with the CAA's objectives and look forward to a positive consideration.

11 References

Ref	Title	Origin
001	Habitats Regulations Assessment (5th Edition – Jan 2024)	CAA
002	CAP 1616h: Guidance on Airspace Change Process for Level 3 (1st Edition – Nov 23)	CAA
003	DAP 1916 (Version 1 – Dec 22)	Osprey
004	DAP 1916 (Version 2 – Sept 23)	Osprey
005	Berwick Bank Environmental Impact Assessment	RPS
006	CAP 1711 - Airspace Modernisation Strategy (2nd Edition – Republished Feb 24)	CAA
007	Berwick Bank Aviation Study Data (v2 – 15 Mar 24)	Osprey
008	Stage 1B Design Principles: Stakeholder Engagement (v1 – 26 Sep 23)	Osprey
009	Stage 2 Stakeholder Engagement Document (v1 – 15 Dec 23)	Osprey
010	SARG Policy 123: Policy for Radio Mandatory Zones and Transponder Mandatory Zones (13th Jan 22)	CAA
011	SARG Policy for the Establishment and Operation Special Use Airspace (12 February 2024)	CAA
012	CAP 760 - Guidance on the Conduct of Hazard Identification, Risk Assessment, and the Production of Safety Cases (1st Edition – 10 Dec 10)	CAA
013	Berwick Bank Transition Document (v2 – 15 Mar 24)	Osprey
014	CAP 1616i Environmental Assessment Requirements and Guidance for Airspace Change Proposals (1st Edition – Nov 23)	CAA
015	Habitats Regulations Assessment (v2 – 15 Mar 24)	Osprey

12 Acronyms

Acronym	Definition
ACP	Airspace Change Proposal
AD	Air Defence
ADS-B	Automatic Dependent Surveillance - Broadcast
AIP	Aeronautical Information Publication
AMS	Airspace Modernisation Strategy
ANSP	Air Navigation Service Provider
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CDR	Conditional Route
CO_2	Carbon Dioxide
CTA	Control Areas
DAATM	Defence Airspace and Air Traffic Management
DOC	Designated Operational Coverage
DP	Design Principle
DPE	Design Principal Evaluation
EIA	Environmental Impact Assessment
FT	Feet
FL	Flight Level
GA	General Aviation
GHG	Green House Gas
GW	Gigawatt
HAZID	Hazard Identification
HIAL	Highlands and Islands Airports Ltd
HRA	Habitats Regulations Assessment
ICAO	International Civil Aviation Organisation
IFP	Instrument Flight Procedures
IFR	Instrument Flight Rules

Acronym	Definition
LOA	Letters of Agreement
MCA	Maritime and Coastguard Agency
MDA	Military Danger Area
NATS	National Air Traffic Services
NERL	National Air Traffic Services En-Route Limited
NM	Nautical Mile
NOTAM	Notice to Aviation
PSR	Primary Surveillance Radar
R/T	Radio Telephony
RAG	Range Azimuth Gating
RMZ	Radio Mandatory Zone
RNAV	Area Navigation
RRH	Remote Radar Head
SBN	Satellite Based Navigation
SET	Small Emitters Tool
SFC	Surface
SMS	Safety Management System
SON	Statement of Need
SSR	Secondary Surveillance System
TMA	Terminal Control Area
TMZ	Transponder Mandatory Zone
UK	United Kingdom
VFR	Visual Flight Rules
WTG	Wind Turbine Generator

13 Glossary

Term	Meaning
Airspace Change Proposal	An ACP is a formal request submitted to the CAA to modify a designated airspace area. It outlines the proposed changes, justification, and potential impact on stakeholders. The CAA then assesses the ACP, considering safety, efficiency, and community feedback before making a decision.
Air Defence	In terms of radar, is all about using radar technology to detect, track, and identify potential threats in the airspace.
Area Navigation	A method of aircraft navigation that permits pilots to fly any desired course within the coverage of ground-based or space-based navigation aids or using the capabilities of self-contained onboard systems.
Automatic Dependent Surveillance - Broadcast	Technology in aviation that improves air traffic control and situational awareness.
Aeronautical Information Publication	A crucial document published by a country's civil aviation authority that provides essential information for safe and efficient air navigation within that country's airspace.
Airspace Modernisation Strategy	A long-term plan developed by aviation authorities to improve the efficiency, safety, and environmental impact of air traffic management within a specific airspace.
Air Navigation Service Provider	A public or private legal entity responsible for managing air traffic on behalf of a company, region, or country.
Air Traffic Control (Officer)	A service provided by ground-based air traffic controllers who ensure the safe, orderly, and efficient flow of air traffic in controlled airspace. The “Officer” is a highly trained professional responsible for the safe, orderly, and efficient flow of air traffic in controlled airspace.
Civil Aviation Authority	The public corporation responsible for overseeing and regulating all aspects of civil aviation in the United Kingdom.
Civil Aviation Publication	A document published by a national civil aviation authority that outlines regulations, procedures, and guidance for various aspects of civil aviation.
Conditional Route	A non-permanent route or portion of a route within controlled airspace that can only be used under specific conditions.
Carbon Dioxide	One of the most important molecules on Earth, playing a critical role in both the environment and biological processes.

Term	Meaning
Control Areas	A designated piece of airspace extending upwards from a specified limit above the earth's surface.
Design Principle (Evaluation)	A guiding principle used to assess and develop modifications to controlled airspace. The evaluation is a crucial step in the ACP overseen by the CAA.
Environmental Impact Assessment	A process used to identify, predict, evaluate, and mitigate the potential environmental impacts of a proposed project, plan, or program.
Flight Level	The level of an aircraft using the International Standard Atmosphere of 1013.25 hector Pascals (hPa) or 29.92 inches of mercury (inHg) at sea level. (E.g., 5,000ft ≈ FL50)
Green House Gas	These gases act like a blanket around our planet, trapping some of the sun's heat and preventing it from escaping back into space.
Gigawatt	A unit of power equal to one billion watts.
Hazard Identification	A proactive safety analysis technique used during the initial stages of an aviation project.
Habitats Regulations Assessment	An assessment used to evaluate the potential impact of proposed airspace changes on protected habitats and species within the UK.
International Civil Aviation Organisation	A specialised agency of the United Nations (UN) responsible for coordinating and regulating international air travel.
Instrument Flight Procedures	A critical set of instructions pilots rely on to safely navigate an aircraft when they cannot rely solely on visual cues.
Instrument Flight Rules	Regulations that govern aircraft operation when relying solely on instruments for navigation, rather than visual cues outside the cockpit.
Letters of Agreement	A formal documents outlining collaborative arrangements between different entities.
Maritime and Coastguard Agency	An executive agency of the United Kingdom that is responsible for implementing British and international maritime law and safety policy.
Military Danger Area	A designated airspace where hazardous activities for aircraft might be taking place.
Notice to Aviation	A critical message issued by aviation authorities to inform pilots and other aviation personnel about important information concerning flight operations.

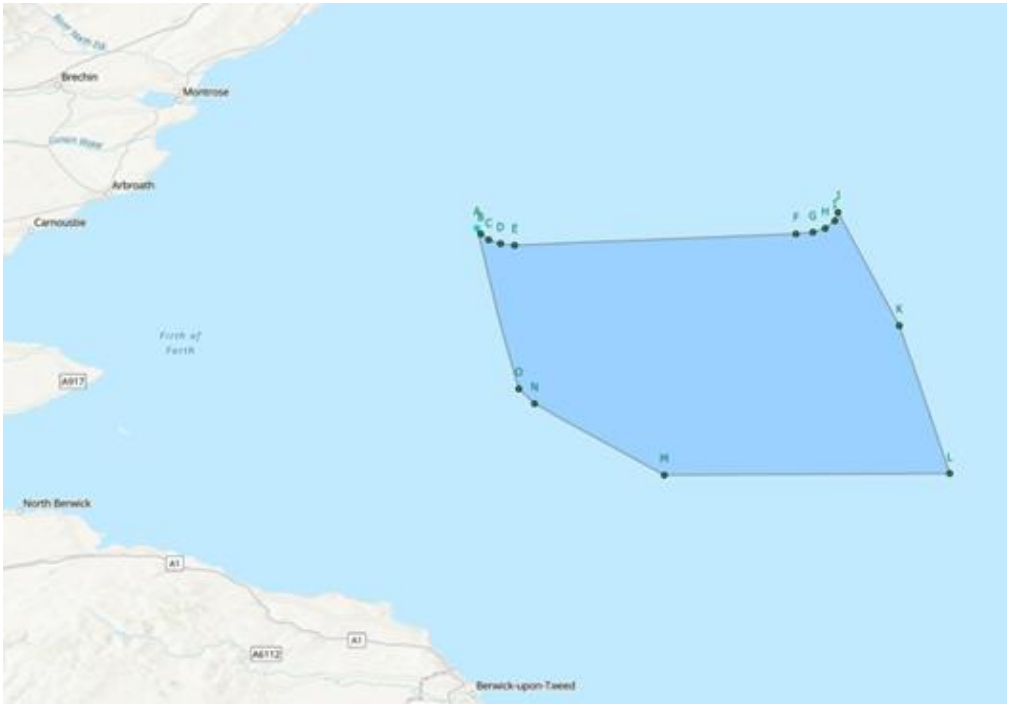
Term	Meaning
Primary Surveillance Radar	A fundamental tool used in air traffic control (ATC) for detecting and tracking aircraft.
Radio Telephony	The use of two-way radio communication between aircraft and air traffic control (ATC), as well as between aircraft themselves.
Range Azimuth Gating	A technique used to improve target detection and reduce clutter, particularly at short ranges.
Radio Mandatory Zone	Designated airspace where aircraft are required to carry and operate functional radio equipment.
Remote Radar Head	An outpost sensor for a central air defence network.
Satellite Based Navigation	A method of pinpointing your location anywhere on Earth (or near it) by using signals transmitted from orbiting satellites.
Small Emitters Tool	A tool to help aircraft operators classified as small emitters estimate their fuel burn and associated CO_2 emissions for their entire flight.
Safety Management System	A structured, organisation-wide approach to managing safety risks.
Statement of Need	A document outlining the rationale and justification for proposed changes to airspace regulations or procedures within the UK.
Secondary Surveillance System	A radar system that works in conjunction with transponders onboard aircraft to provide air traffic control (ATC) with essential information about the aircraft's position and identification.
Terminal Control Area	A designated airspace surrounding a major airport with high traffic volume.
Transponder Mandatory Zone	A designated airspace where all aircraft operating within the zone are required to carry and operate functional transponders.
Visual Flight Rules	Regulations governing the flight of aircraft in visual meteorological conditions (VMC).
Wind Turbine Generator	A machine that uses wind energy to generate electricity.

A1 Airspace Definition

A1.1 Coordinates of the Proposed TMZ Perimeter

These coordinates are WGS84 presented in degrees, minutes, seconds (DMS). Below is a figure showing the location of the proposed TMZ.

Point A starts at North-Westly point then in clockwise order.



Point	Degrees ° Minutes' Seconds . Decimal Seconds"	
	Latitude (DMS)	Longitude (DMS)
A	56° 30' 26.42" N	001° 59' 55.88" W
B	56° 29' 53.27" N	001° 59' 35.36" W
C	56° 29' 19.9" N	001° 58' 49.3" W
D	56° 28' 56.71" N	001° 57' 42.34" W
E	56° 28' 48.32" N	001° 56' 21.64" W
F	56° 29' 53.25" N	001° 29' 38.62" W
G	56° 30' 1.55" N	001° 28' 4.53" W
H	56° 30' 24.93" N	001° 26' 53.95" W
I	56° 31' 7.56" N	001° 25' 58.88" W

J	56° 31' 55.59" N	001° 25' 41.78" W
K	56° 21' 11.23" N	001° 19' 52.9" W
L	56° 07' 4.29" N	001° 15' 6.16" W
M	56° 06' 56.63" N	001° 42' 7.2" W
N	56° 13' 42.78" N	001° 54' 28.99" W
O	56° 15' 6.25" N	001° 55' 59.33" W
P	56° 30' 26.42" N	001° 59' 55.88" W

A1.2 Draft AIP Entry

AIP Section GEN 1.5 5.3.2.2 Notified 'Transponder Mandatory Zone' Airspace

Add the following to the list:

- The vertical and lateral boundaries of the Berwick Bank TMZ as detailed in ENR 2.2 Paragraph 4.

AIP Section ENR 2.2

4 EN-ROUTE TRANSPONDER MANDATORY ZONES

Designation and Lateral Limits	Vertical Limits and Classification	Controlling Authority
Berwick Bank TMZ – the area bounded by: 56° 30' 26.42" N 001° 59' 55.88" W – 56° 29' 53.27" N 001° 59' 35.36" W – 56° 29' 19.9" N 001° 58' 49.3" W – 56° 28' 56.71" N 001° 57' 42.34" W – 56° 28' 48.32" N 001° 56' 21.64" W – 56° 29' 53.25" N 001° 29' 38.62" W – 56° 30' 1.55" N 001° 28' 4.53" W – 56° 30' 24.93" N 001° 26' 53.95" W – 56° 31' 7.56" N 001° 25' 58.88" W – 56° 31' 55.59" N 001° 25' 41.78" W – 56° 21' 11.23" N 001° 19' 52.9" W – 56° 07' 4.29" N 001° 15' 6.16" W – 56° 06' 56.63" N 001° 42' 7.2" W – 56° 13' 42.78" N 001° 54' 28.99" W – 56° 15' 6.25" N 001° 55' 59.33" W – 56° 30' 26.42" N 001° 59' 55.88" W	FL 100 SFC (Class G)	TMZ Active - H24 Controlling Authority: Leuchars Zone (126.505 MHz) 0900–1700(Local). Mon–Fri. Timings subject to change by NOTAM. *Outside of these hours, TMZ remains active, non-transponding aircraft should attempt contact with Leuchars on the published frequency.*
Note: For aircraft equipped with and operating secondary surveillance radar equipment, as defined in GEN 1-5 paragraph 5.3, access to the Berwick Bank TMZ is not subject to ATC approval. Access to the Berwick Bank TMZ without serviceable transponder equipment, as defined in GEN 1-5 paragraph 5.3, is subject to specific approval of the Controlling Authority.		