Awel y Môr Offshore Wind Farm

Category 6: Environmental Statement

Volume 2, Chapter 13: Military and Civil Aviation

Date: April 2022

Revision: B

Application Reference: 6.2.13

Pursuant to: APFP Regulation 5(2)(a)

REVISION	DATE	STATUS/ REASON FOR ISSUE	AUTHOR:	CHECKED BY:	APPROVED BY:
A	August 2021	PEIR	Osprey CSL	RWE	RWE
B	March 2022	ES	Osprey CSL	RWE	RWE

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Glossary of terms

TERM	DEFINITION
Controlled Airspace	Airspace in which Air Traffic Control exercises authority. In the UK, Class A, C, D and E airspace is controlled.
Flight Level	A standard nominal altitude of an aircraft, in hundreds of feet, based upon a standardized air pressure at sea-level.
Instrument Flight Rules	The rules governing procedures for flights conducted with the crew making reference to aircraft cockpit instruments for situation awareness and navigation.
Instrument Meteorological Conditions	Weather conditions which would preclude flight by the Visual Flight Rules, i.e., conditions where the aircraft is in or close to cloud or flying in visibility less than a specified minimum.
Uncontrolled Airspace	Airspace in which Air Traffic Control does not exercise any executive authority but may provide basic information services to aircraft in radio contact. In the UK, Class G airspace is uncontrolled.
Visual Flight Rules	The rules governing flight conducted visually i.e., with the crew maintaining separation from obstacles, terrain and other aircraft visually.
Visual Metrological Conditions	A flight category which allows flight to be conducted under Visual Flight Rules (VFR) defined by in flight visibility and clearance from cloud.

Abbreviations and acronyms

TERM	DEFINITION
ACC	Area Control Centre
agl	above ground level
AIP	Aeronautical Information Publication
amsl	above mean sea level
ANO	The Air Navigation Order 2021
ATC	Air Traffic Control
ATS	Air Traffic Service
AyM	Awel y Môr
BAE	British Aerospace
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CAS	Controlled Airspace
CCS	Carbon Capture and Storage
CEA	Cumulative Effects Assessment
CNS	Communications, Navigation, Surveillance
CTA	Control Area
DECC	Department for Energy and Climate Control
DGC	Defence Geographic Centre
ECC	Export Cable Corridor
ECR	Export Cable Route
EIA	Environmental Impact Assessment

TERM	DEFINITION
ERCoP	Emergency Response Co-operation Plan
ES	Environmental Statement
FIR	Flight Information Region
FL	Flight Level
GAAC	General Aviation Awareness Council
HAT	Highest Astronomical Tide
IAIP	Integrated Aeronautical Information Package
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
IoM	Isle of Man
LARS	Lower Airspace Radar Service
LoS	Line of Sight
MAG	Manchester Airports Group
MCA	Maritime Coastguard Agency
MDS	Maximum Design Scenario
MGN	Maritime Guidance Note
Mil	Military
MoD	Ministry of Defence
MRCC	Maritime Rescue Coordination Centre
MSA	Minimum Safe Altitude
NERL	NATS En Route Limited

TERM	DEFINITION
NPS	National Policy Statement
NPAS	National Police Air Service
NSIP	Nationally Significant Infrastructure Project
OGA	Oil and Gas Authority
OREI	Offshore Renewable Energy Installations
OWF	Offshore Wind Farm
PEIR	Preliminary Environmental Information Report
PEXA	Practice and Exercise Area
PINS	Planning Inspectorate
PSR	Primary Surveillance Radar
RAF	Royal Air Force
RCS	Radar Cross Section
RDDS	Radar Data Display Screen
RDP	Radar Data Processor
SAR	Search and Rescue
SSR	Secondary Surveillance Radar
UKCS	UK Continental Shelf
UKLFS	UK Low Flying System
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions

Units

UNIT	DEFINITION
ft	feet
km	kilometre
m	metre
NM	Nautical Mile

13 Military and Civil Aviation

13.1 Introduction

1 This chapter of the Environmental Statement (ES) considers the potential impacts of the proposed Awel y Môr Offshore Wind Farm (hereafter referred to as AyM) on Military and Civil Aviation. The chapter provides an overview of the existing environment for the proposed offshore development area, followed by an assessment of the potential impacts and associated mitigation for the construction, operation, and decommissioning phases of the project.

2 This chapter has been written by Osprey Consulting Services Ltd (Osprey), with the assessment undertaken with specific reference to the relevant legislation and guidance. Details of these and the methodology used for the Environmental Impact Assessment (EIA) and Cumulative Effects Assessment (CEA) are presented in Sections 13.2 and 13.4.

13.2 Statutory and policy context

3 A variety of aviation publications contain information and guidance relating to the potential effects of an offshore wind development on aviation stakeholders. The following documents informed the desk-based study of potential impacts of AyM. Legislation and guidelines applicable to the assessment of military and civil aviation includes the following key sources of aviation and radar data:

- Civil Aviation Authority (CAA) Civil Aviation Publication (CAP) 168 Licensing of Aerodromes (CAA, Licensing of Aerodromes , 2019) sets out the standards required at UK licensed aerodromes relating to its management systems, operational procedures, physical characteristics, assessment and treatment of obstacles, and visual aids.

- CAA CAP 393 The Air Navigation Order (ANO) 2016 (CAA, 2021) sets out the provisions of the ANO as amended together with regulations made under the Order. It is prepared for those concerned with day-to-day matters relating to air navigation that require an up-to-date reference document of the air navigation regulations and is edited by the Legal Advisers Department of the CAA. CAP 393 also includes the use of aviation obstruction lighting to wind turbines in UK territorial waters.
- CAA CAP 764 CAA Policy and Guidelines on Wind Turbines (CAA, 2016): Aids aviation stakeholders in understanding and addressing wind energy related issues thereby ensuring greater consistency in the consideration of the potential effect of proposed wind farm developments.
- CAA CAP 437 Standards for Offshore Helicopter Landing Areas (CAA, 2021a): Provides the criteria applied by the CAA in assessing helicopter landing areas for worldwide use by helicopters registered in the UK. It includes design of winching area arrangements located on wind turbine platforms to represent current best practice.
- CAA CAP 670 Air Traffic Services Safety Requirements (CAA, 2019a): Sets out the safety regulatory framework and requirements associated with the provision of an Air Traffic Service (ATS).
- CAA CAP 032 UK Integrated Aeronautical Information Package (IAIP) (CAA, 2021b): The main resource for information and flight procedures at all licensed UK airports as well as airspace, en-route procedures, charts and other air navigation information.
- Ministry of Defence (MoD) Aeronautical Information Publication (AIP), (MoD, 2021): The main resource for information and flight procedures at all military aerodromes as well as airspace, en-route procedures, charts and other air navigation information.
- Maritime and Coastguard Agency (MCA) Maritime Guidance Note (MGN) 654 Safety of Navigation Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021): Contains information for operators and developers in formulating their emergency response plans and site safety management.
- CAA Visual Flight Rules Chart (CAA, 2021): Provides topographical air chart information on aerodrome, airspace and areas of air traffic control responsibilities.

- International Civil Aviation Authority (ICAO), Document 8168 Ops/611 Procedures for Air Navigation Services Aircraft Operations (ICAO, 2018): Describes operational procedures recommended for the guidance of flight operations personnel. It illustrates the need for operational personnel including flight crew to adhere strictly to published procedures to achieve and maintain an acceptable level of safety in operations.

4 Planning policy for offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to aviation and radar, is contained in the overarching National Policy Statement (NPS) for Energy (EN-1) (DECC, 2011) and NPS for Renewable Energy Infrastructure EN-3 (DECC, 2011a). NPS EN-1 and EN-3 include guidance on what matters are to be considered in the assessment, a review of the draft NPS has also been undertaken, applicable provisions of the NPS documents are summarised in Table 1.

Table 1: Legislation and policy context[i].

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
EN-1 paragraph 5.4.10.	If the proposed development could have an effect on civil and military aviation (and/ or other defence assets) an assessment of potential effects should be set out in the ES.	Construction, operation and decommissioning phases of AyM have been assessed within the impact assessment at section 13.10 et seq.
EN-1 paragraph 5.4.11.	- Consultation with the MoD, the CAA and NATS and any aerodrome, licensed or otherwise, likely to be affected by the proposed development should be completed.	Table 2 provides the results of consultation activity. A full record of consultation is also provided in the Consultation Report (application ref: 5.1).

[i] Future Wales nor Planning Policy Wales have no specific policies relating to aviation or radar impacts from offshore wind development.

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
EN-1 paragraph 5.4.12. 5.4.18 and 5.4.21	Any assessment of aviation or other defence interests should include potential impacts of the project upon the operation of Communication, Navigation or Surveillance (CNS) infrastructure, flight patterns (both civil and military), other defence assets and aerodrome operational procedures. It should also assess the cumulative effects of the project with other relevant projects in relation to aviation and defence.	The assessment of civil and military aviation flight patterns and infrastructure is provided in section 13.10 et seq. Cumulative are discussed within section 13.13.
Draft EN-1 paragraph 5.5.11	The applicant should consult the MoD, the CAA, NATS and any aerodrome – licensed or otherwise – likely to be affected by the proposed development in preparing an assessment of the proposal on aviation or other defence Interests.	Table 2 provides the results of consultation activity.
Draft EN-1 paragraph 5.5.13	If any relevant changes are made to proposals during the pre-application and determination period, it is the responsibility of the applicant to ensure that the relevant aviation and defence consultees are	All changes made during the pre-application period have been communicated to the relevant consultees as captured in Table 2.

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	informed as soon as reasonably possible.	
EN-3 paragraph 2.6.107.	Aviation and navigation lighting should be minimised to avoid attracting birds, taking into account impacts on safety.	Lighting requirements are provided in section 13.9.
EN-3 paragraph 2.6.187.	Detailed discussions between the applicant for the offshore wind farm and the relevant consultees should have progressed as far as reasonably possible prior to the submission of an application to the decision maker. As such, appropriate mitigation should be included in any application to the decision maker, and ideally agreed between relevant parties.	Consultation on mitigation principles are provided in Table 2, section 13.9 and paragraph77.
Draft EN-3 paragraph 2.22.28	The applicant will need to assess impacts on civil and military radar and other aviation and defence interests.	The assessment of civil and military aviation radar is provided in paragraph 13.7.3. Other aviation and defence interests are discussed in paragraph 13.7.
Draft EN-3 paragraph 2.29.5	Review of up-to-date research should be undertaken and all potential mitigation options presented.	Consultation on mitigation options are presented within paragraph 77 and Table 2. Aviation lighting is

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	Aviation and navigation lighting should be minimised and/or on demand (as encouraged in EN-1 Section 5.5) to avoid attracting birds, taking into account impacts on safety.	considered as embedded mitigation and is discussed in Section 13.9.

13.3 Consultation and scoping

5 Consultation is a key part of the application process. Consultation regarding military and civil aviation has been conducted through the EIA scoping process, statutory consultation on the Preliminary Environmental Information Report (PEIR), as well as through non-statutory means with interested parties to the date of compilation of this document.

6 A summary of the key issues raised during consultation specific to military and civil aviation is outlined below in Table 2 together with how these issues raised have been considered in the production of this ES Chapter.

Table 2: Summary of consultation relating to military and civil aviation.

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
20 November 2019 Meeting with NATS.	NATS predicted that the St. Annes and Great Dun Fell Primary Surveillance Radar (PSR) systems will be impacted by the operation of AyM. The potential for the Clee Hill PSR to provide a mitigation solution (blanking of affected radar and infill from Clee Hill) may be possible.	Effects to NATS radar systems are considered in section 13.7.3.
6 December 2019 Email from the MoD.	The MoD provided a pre-application response on the 29 January 2020 in which the MoD stated that they may have concerns to effects created to the Royal Air Force (RAF) Valley and British Aerospace (BAE) Warton[ii] PSR systems.	Effects to aviation radar systems is included in section 13.7.3.
14 January 2020 Email from MAG.	The Manchester Airport Group (MAG) stated that AyM is outside of MAG safeguarded area of operations however, MAG would like to be informed of the progress of the development. Further details were provided to MAG by email on the 26 March 2021, with no further response received.	N/A

[ii] The MoD are responsible for the safeguarding of the BAE Warton PSR due to the military function of the Warton operation.

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
14 January 2020 Email from Liverpool Airport.	Liverpool Airport were provided details of the development and responded stating that information provided would be circulated to helicopter operators who would respond directly to the Applicant – no further response was received. Further details were provided to Liverpool Airport by email on the 26 March 2021, no further response was received.	
July 2020 PINS Scoping Opinion.	The Planning Inspectorate (PINS) agrees that impacts to military Practice and Exercise Areas (PEXA) can be scoped out of the assessment as significant effects are unlikely to occur.	Impacts scoped out of this assessment are detailed in paragraph 47.
July 2020 PINS Scoping Opinion.	PINS agree that as the offshore Export Cable Route (ECR) will be below the water surface it will not result in significant effects to military and civil aviation during AyM's construction, operation, and decommissioning.	Impacts scoped out of this assessment are detailed in paragraph 47.
July 2020 PINS Scoping Opinion.	PINS agree that as the wind turbines will be stationary during construction, they will not impact radar and therefore impact to aviation radar is scoped out during the construction phase.	Impacts scoped out of this assessment are detailed in paragraph 4747.

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
July 2020 PINS Scoping Opinion.	PINS agree that impacts to Secondary Surveillance Radar (SSR) may be scoped out as effect to SSR systems are only likely to occur when wind turbines are located within 10 kilometers (km) of the SSR source. There are no SSR systems located within the defined range of the offshore array.	Impacts scoped out of this assessment are detailed in paragraph47.
July 2020 PINS Scoping Opinion.	PINS state that impacts to Chester Airport should be included in the assessment of effects.	Details of the consultation response received on the 1 December 2020 from Chester Airport is provided in this table.
July 2020 PINS Scoping Opinion.	PINS state that impacts to the NATS operated Clee Hill PSR system should be included in the assessment of effects.	Confirmation that the Clee Hill PSR would not be impacted by AyM was provided by NATS and as detailed in this table.
July 2020 PINS Scoping Opinion.	PINS state that impacts to the Aberporth Airfield PSR and to radar used by the Meteorological Office may be scoped out	Impacts scoped out of this assessment are detailed in paragraph 47.

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
	as AyM will be located outside of the safeguarding areas for these radar systems.	
July 2020 MCA Scoping Opinion.	The MCA stated that the wind turbine layout design will require MCA approval to minimise the risk to Search and Rescue (SAR) aircraft operating within the array and that any additional navigation safety and/ or SAR requirements, as per MGN 654 Annex 5, will be agreed at the approval stage (see response from MCA dated 19 April 2021 below).	Effects to airborne SAR operations are discussed in Table 8.
July 2020 MoD Scoping Opinion.	The MoD stated that effects to the RAF Valley, BAE Warton and the NATS Great Dun Fell PSRs are required to be assessed with the ES. Updated information of the development was provided by email to the MoD on the 26 March 2021 with no further response received.	Effects to aviation radar systems is included in section 13.7.3.
July 2020 IoM Scoping Opinion.	The Isle of Man (IoM) Government stated that the Ronaldsway Airport PSR should be considered within the ES. Ronaldsway Airport were provided details of the development by email on the 6 April 2021.	See further response from the IOM Government dated 11 October 2021 and included in this table.

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
July 2020 NATS Scoping Opinion.	NATS predict that effects will only be created to the St Anne's and Great Dun Fell PSR.	NATS radar systems are considered in section 13.7.3.
11 November 2020 Email from Chester Airport.	Chester Airport were provided with details of AyM; their response provided on the 1 December 2020 stated that as AyM is outside of their 30 km safeguarded area that Chester Airport have no objection to AyM.	Impacts scoped out of this assessment are detailed in paragraph 47.
12 November 2020 Email to Warton Airfield.	Warton Airfield was provided with details of AyM together with a request for an opinion on whether AyM would affect operations conducted at Warton; no response was received. Further consultation requests were made during March, May and December 2021 with no response received.	The MoD have stated that no effect will be created to military operations conducted at Warton. We have no response from consultation requests to the airfield directly and therefore Warton is scoped out from assessment.
1 March 2021	ENI who are operators of the adjacent oil and gas platforms within 9 NM which operate a helideck were consulted in order	Awaiting further feedback from ENI.

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
Online meeting with ENI.	to establish if an interaction between helicopters operating to the platforms and the development would exist. ENI noted that subject to further confirmation by ENI, it is predicted that no effect to helicopter operations to platforms and aviation radio communications would exist. ENI responded by email on the 5 May 2021 and stated that Gwynt y Môr (GyM) does create some restriction to their aviation operation. AyM may present similar restrictions which ENI will discuss with their helicopter provider NHV.	
25 March 2021 Email to helicopter operators potentially affected.	The following helicopter operators who support the offshore renewable industry and provide helicopter operations in the SAR role were provided details of AyM: • NHV • CHC Helicopters • The Bristow Group (SAR) • Babcock At the time of the compilation of the ES Babcock, The Bristow Group and NHV are the three helicopter operators to have	Consultation will continue with NHV and their offshore client ENI to establish the effect that may be created to their operation in the vicinity of AyM. Effects to helicopter operations are discussed in section 13.11.3.

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
	responded. Babcock stated that AyM was outside of their area of operation and had no further comment. The Bristow Group envisage no major issues created by the development and copied their response to the MCA. NHV responded by email on the 18 May 2021 stating that due to the proximity of AyM to their operation to offshore helicopter platforms, mitigation may be required due to the potential of new obstacles created by above-sea infrastructure associated with AyM.	
25 March 2021 Email from NATS.	NATS were provided with details of the reduced array area together with the conclusion that both the Great Dun Fell and St Anne's PSR systems are predicted to be impacted by the detection of the operational wind turbines. NATS responded by email stating that mitigation is possible to the effect created to NATS radar systems consisting of radar blanking and infill data from the NATS Clee Hill PSR which will not detect the wind turbines; furthermore, NATS requested specific commercial details in order that a draft mitigation solution contract may be provided.	NATS radar systems are considered in section 13.7.3.

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
19 April 2021 Email from the MCA.	The MCA stated that it will continue engagement with the Applicant to address SAR specific issues if they arise.	Effects to airborne SAR operations are discussed in Table 8.
25 May 2021 Online Meeting with the MoD.	The MoD were provided with a project update which included details of the reduction in size of the array area and the options for the offshore and onshore cable routes. Details of the conclusions of a radar line of sight analysis to the reduced array area were also provided to the MoD during the call (see Section 13.7.3). The MoD responded stating that the previous MoD analysis for the development considered the previous larger (scoping) boundary of the array and that the MoD had not rerun their operational assessment to the reduced array area. The MoD were provided with updated grid references for array vertices and wind turbine dimensions in order to facilitate a rerun of their operational analysis to the refined array area. During the meeting the MoD confirmed that based on the previous analysis to the larger array area no impact is expected to occur to MoD operations conducted at BAE	Effects to aviation radar systems is included in section 13.7.3.

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
	Warton or the use of data provided by the NATS operated Great Dun Fell PSR.	
13 July 2021 Online Meeting with NHV Helicopters.	NHV were provided with a project update including details of the reduced array area and key maximum design parameters. Details of previous consultation activity with ENI and response received was highlighted in which ENI stated that they would liaise with NHV internally to discuss any potential impact to helicopter operations to and from ENI platforms which are adjacent to AyM. NHV stated that AyM will have an impact on days when Airborne Radar Approach (ARA) is required but may only apply to the Douglas and Conwy platforms. Currently, ARA is not possible south of Douglas (in the sector 120° to 240°) because of GyM, resulting in a number of lost flying days. Under single engine procedures, take-off is also affected by reduced rate of climb when flying to the south. There will be a small negative effect on NHV operations presented as an additional complication to GyM, and the restrictions on operations under certain conditions in place would likely need	Awaiting further information from ENI.

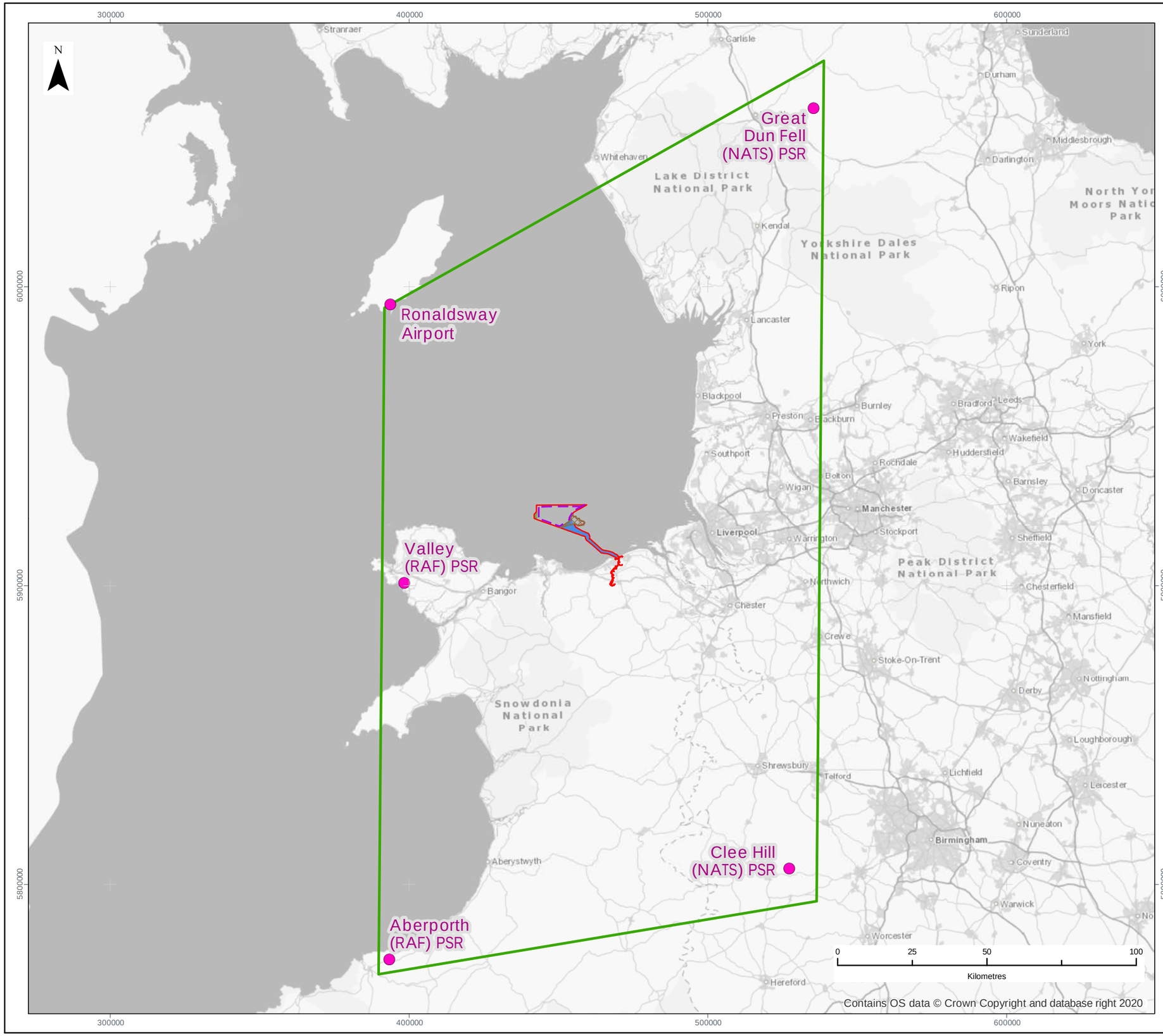
DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
	to be expanded to account for AyM to continue the safe operation. NHV added that it would now be up to ENI to determine the acceptability of any safety restrictions, and whether further study on the frequency of lost flying days was warranted.	
21 July 2021 Email from MoD.	The MoD were contacted to establish if the results of the rerun operational analysis were available – the MoD stated that the analysis was not yet completed.	N/A
21 September 2021 MoD Section 42 consultation.	The MoD confirmed that they had no concerns about the proposed development however, the MoD did request that the turbines be fitted with MOD accredited visible or infrared aviation safety lighting in accordance with the Air Navigation Order 2016.	Aviation lighting is considered in Section 13.9.
11 October 2021 IoM Section 42 consultation.	The Territorial Sea Committee of the Isle of Man Government responded on behalf of Ronaldsway Airport. The airport confirmed that no effect to operational activities is expected from the proposed development (including the airport aviation radar).	Ronaldsway Airport is not considered further in the ES.

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
15 October 2021 Section 42 consultation.	NATS identified an unacceptable impact to the Great Dun fell and St Anne's PSRs, no impact is predicted to the Clee Hill PSR.	Effects to NATS radar systems are considered in section 13.7.3.
29 October 2021; and 7 March 2022	ENI were contacted following the statutory consultation period, noting that they did not provide a Section 42 response to the consultation. ENI were made aware that the online exhibition for AyM was still online and that feedback could be provided on the PEIR. ENI were contacted again prior to application, informing them that they could make representations as an interested party if the application was accepted for examination by PINS.	Impacts to offshore helicopter operations in the O&M phase of AyM are consider in Section 13.11.3.
29 November 2021 Online Meeting with NATS.	A commercial discussion was held to agree terms of the mitigation agreement which will remove effects created to the St Anne's and Great Dun Fell PSRs.	Effects to NATS radar systems are considered in section 13.7.3.

13.4 Scope and methodology

7 The military and civil aviation study area is shown in Figure 1. This military and civil aviation study area includes the AyM array area, offshore Export Cable Corridor (ECC), the onshore ECC and airspace between the AyM array area, and the UK mainland from Aberporth to the south-west, RAF Valley to the west, the Ronaldsway Isle of Man Airport to the north-west, the Great Dun Fell PSR to the north-east and the Clee Hill PSR to the south-east. The AyM aviation and radar study area for undertaking the assessment of cumulative effects is the same, except for the assessment of radar cumulative effects which includes other offshore wind farms in the northern Irish Sea that could have potential cumulative effects on identified radar receptors. Specifically, the AyM military and civil aviation study area covers:

- Aviation radar systems that potentially detect 336 metre (m) above means sea level (amsl) high (blade tip) wind turbines within the array area.
- Offshore helicopter operations that are located within the proximity of the study area.
- Offshore oil and gas platforms with helidecks that are located within a nine nautical mile (NM) CAA recommended 'consultation buffer' that surrounds the AyM array area.
- Airborne SAR flight operations.
- Military low flying activity over the sea and adjacent to the AyM array.
- Aviation activities and aviation safeguarded areas that are adjacent to the onshore cable route.



LEGEND

- Order Limits
- Array Area
- Offshore Export Cable Corridor
- Other Wind Farm Infrastructure Zone
- GyM Interlink Zone
- Military and Aviation Study Area
- Radar Locations

Data Source:

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

AyM military and aviation study area

VER	DATE	REMARKS	Drawn	Checked
1	27/04/2021	For Issue For PEIR	BPHB	RM
2	28/03/2022	For Issue For ES	BPHB	RM

FIGURE NUMBER:

Figure 1

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:1,300,000	A3	WGS84	UTM30N

Fferm Wynt Alltraeth
AWEL Y MÔR Offshore Wind Farm

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13.4.1 Radar Line of Sight

8 Radar detectable wind turbines can be a significant cause of radar false plots, or unwanted returns (clutter), as the rotating blades can trigger the Doppler threshold (e.g. minimum shift in signal frequency) of the Radar Data Processor (RDP) and therefore might be interpreted as aircraft targets. Additionally, the rotation of the wind turbine blades provides an indication to the radar system that the target acquired is moving and thus defeating Doppler processing techniques. This issue can be further compounded by a large number of wind turbines located together (wind farm) which leads to a cumulative effect over a greater volume of airspace with higher densities of radar clutter produced.

9 Generally, the larger the wind turbine rotor diameter is, the larger its Radar Cross Section (RCS) will be to the radar, thus resulting in more energy being reflected and an increased chance of it creating clutter. This clutter will be processed by the radar and presented to an air traffic controller on the Radar Data Display Screens (RDDS). False plots, clutter and reduced radar sensitivity may reduce the effectiveness of radar to an unacceptable level and compromise the provision of a safe radar service to participating aircraft and detection of aircraft targets. In general this may lead to:

- Twinkling appearance/blade flash effect can distract the air traffic controller from their primary task.
- Masking of real aircraft targets caused by increased clutter being displayed on the RDDS.
- Increase in unwanted targets or false aircraft tracks.
- Receiver saturation.
- Target desensitisation causing loss of valid aircraft targets that are of a small RCS.
- Shadowing behind the wind turbines caused by physical obstruction (blocking of radar transmitted signal).
- Degradation of target processing capability and processing overload.
- Degradation of tracking capabilities including track seduction (Real aircraft returns are relocated from their true return location as the radar attempts to update an aircraft track using the false return).

10 Without specific wind turbine mitigation processing capabilities, radar cannot distinguish between returns from wind turbines (false returns, or clutter) and those from aircraft. Air traffic controllers are required to assume that actual aircraft targets could be lost over the location of a wind farm; furthermore, identification of aircraft under control could be lost or interrupted. It is mainly for the above reasons that aviation radar system operators object to wind farm developments that are within radar Line of Sight (LoS) to radar systems.

11 A desk-top study was undertaken to obtain information on potential aviation and radar receptors. The documents listed in Table 1 and the consultation responses provided in Table 2 informed the desk-top study.

12 Osprey utilised the ATDI ICS LT (Version 22.4.7 x64) tool to model the terrain elevation profile between the identified PSR systems and the array. Otherwise known as a point-to-point radar LoS analysis, the result is a graphical representation of the intervening terrain and the direct signal LoS (taking into account earth curvature and radar signal properties). This is a limited and theoretical desk-based radar modelling study which is frequently used in order to establish the potential for individual wind farm developments to create an effect to aviation radar.

13 There are unpredictable levels of atmospheric signal diffraction and attenuation within a given radar environment that can influence the probability of a wind turbine being detected. The analysis is designed to give an indication of the theoretical likelihood of a wind turbine being detected by the assessed radar system. The qualitative definitions utilised in the radar LoS assessment are defined in Table 3.

Table 3: Qualitative definition of radar LoS.

RESULT	DEFINITION
Yes	the wind turbine is highly likely to be detected by the radar: direct LoS exists between the radar and the wind turbine
Likely	▲ the wind turbine is likely to be detected by the radar at least intermittently

RESULT	DEFINITION
Unlikely	the wind turbine is unlikely to be detected by the radar but cannot rule out occasional detection
No	the wind turbine is unlikely to be detected by the radar as significant intervening terrain exists

14 Other receptor specific operational factors will determine the nature and severity of the operational impact on the receptor e.g.:

- The consideration of airspace structure and classification, stakeholder operations conducted in the airspace and whether effects can be managed operationally in the wind turbine vicinity.
- The operational significance of the airspace to the operator.
- The range of the development from the radar source.
- Aircraft traffic patterns and procedures.
- The type of radar service provided to air traffic using the airspace.

13.5 Assessment criteria and assignment of significance

15 Determining the significance of effects is a two-stage process that involves defining the magnitude of the impacts and the sensitivity of the receptors. The criteria for defining magnitude in this chapter are outlined in Table 4. The criteria for defining sensitivity is outlined in in Table 5.

16 In basic terms, the potential significance of an effect is a function of the sensitivity of the receptor and the magnitude of the impact.

Table 4: Impact magnitude definitions.

MAGNITUDE	DEFINITION
High	Total loss of ability to carry on activities and/ or impact is of extended physical extent and/ or long-term duration (i.e. total life of project) and/ or frequency of repetition is continuous and/ or effect is not reversible for the project.
Medium	Loss or alteration to significant portions of key components of current activity and/ or physical extent of

MAGNITUDE	DEFINITION
	impact is moderate and/ or medium-term duration (i.e. operational period) and/ or frequency of repetition is medium to continuous and/ or effect is not reversible for the project phase.
Low	Minor shift away from baseline, leading to a reduction in level of activity that may be undertaken and/ or physical extent of impact is low and/ or short to medium term duration (i.e. construction period) and/ or frequency of repetition is low to continuous and/ or effect is not reversible for the project phase.
Negligible	Very slight change from baseline condition and/ or physical extent of impact is negligible and/ or short- term duration (i.e. less than two years) and/ or frequency of repetition is negligible to continuous and/ or effect is reversible.

Table 5: Sensitivity/importance of the environment/receptor.

RECEPTOR SENSITIVITY/ IMPORTANCE	DESCRIPTION/ REASON
High	Receptor provides a service which is of high value to the local, regional or national economy, and/ or the receptor is generally vulnerable to impacts that may arise from the project, and/ or recoverability is slow and/ or costly.
Medium	Receptor provides a service which is of moderate value to the local, regional or national economy, and/ or the receptor is somewhat vulnerable to impacts that may arise from the project, and/ or has moderate to high levels of recoverability.
Low	Receptor provides a service which is of low value to the local, regional or national economy, and/ or the

RECEPTOR SENSITIVITY/ IMPORTANCE	DESCRIPTION/ REASON
	receptor is not generally vulnerable to impacts that may arise from the project, and/ or has high recoverability.
Negligible	Receptor provides a service which is of negligible value to the local, regional or national economy, and/ or the receptor is not vulnerable to impacts that may arise from the project, and/ or has high recoverability.

17 The determination of significance is the output of the impact significance matrix of potential effects is over a certain threshold described in Table 6. Effects of 'moderate' significance or greater are defined as significant with regard to the EIA Regulations. The 'EIA Regulations' in this case are collectively The Marine Works (Environmental Impact Assessment) Regulations 2007 and the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

Table 6: Matrix to determine effect significance.

		SENSITIVITY			
		HIGH	MEDIUM	LOW	NEGLIGIBLE
ADVERSE MAGNITUDE	HIGH	Major	Major	Moderate	Minor
	MEDIUM	Major	Moderate	Minor	Negligible
	LOW	Moderate	Minor	Minor	Negligible
	NEGLIGIBLE	Minor	Minor	Negligible	Negligible
BENEFICIAL MAGNITUDE	NEGLIGIBLE	Minor	Minor	Negligible	Negligible
	LOW	Moderate	Minor	Minor	Negligible
	MEDIUM	Major	Moderate	Minor	Negligible
	HIGH	Major	Major	Moderate	Minor

Note: Effects of 'moderate' significance or greater are defined as significant with regard to the EIA Regulations.

13.6 Uncertainty and technical difficulties encountered

18 Paragraph 14 provides the limitations of the radar LOS analysis. No other technical limitations or difficulties were encountered in compiling the information required for the completion of the military and civil aviation baseline study and confidence in the establishment of the baseline is high.

13.7 Existing environment

13.7.1 Airspace Designations

19 The airspace within, above and surrounding the array area is used by both military and civil registered aircraft which observe the airspace rules dependent on the classification of airspace they are operating in as follows:

- Class G uncontrolled airspace: any aircraft can operate in an area of uncontrolled airspace without any mandatory requirement to be in communication with Air Traffic Control (ATC). Pilots of aircraft operating under Visual Flight Rules[3] (VFR) in Class G airspace are ultimately responsible for seeing and avoiding other aircraft, terrain and obstructions; and
- Class C CAS: all aircraft operating in this airspace must be in receipt of an ATS.

20 Above and surrounding the AyM array within Class G uncontrolled airspace, a radar based ATS may be provided on request (subject to suitable radar and radio coverage) by the following agencies:

- RAF Valley, a flying station on Anglesey, provides a Lower Airspace Radar Service[4] (LARS) to participating aircraft up to FL 100 within uncontrolled airspace to a radius of 40 NM from the radar position (Valley), as well as a radar based ATS to aircraft inbound and outbound from the airfield.

[3] Visual Flight Rules - A set of regulations under which a pilot operates an aircraft in weather conditions clear enough to allow the pilot to see where the aircraft is going; the pilot must be able to operate the aircraft with visual reference to the ground, and by visually avoiding obstructions and other flying machines.

[4] LARS – is available to all aircraft flying outside of controlled airspace up to FL 100 within the limits of radio and radar cover. The provision of LARS is at the discretion of the controllers concerned because they may be fully engaged in their primary tasks. Therefore, occasionally, the service may not be available.

- BAE Warton also provides a LARS to aircraft on request up to FL 100 within uncontrolled airspace operating within 40 NM radius of the radar position (Warton). Furthermore, Warton also provides a radar based ATS to aircraft participating in test and experimental flying within specific airspace and to aircraft operating to and from the airfield.
- Military air traffic controllers located at the Swanwick Area Control Centre (ACC) utilise NATS radar for the provision of ATS to aircraft flying outside of and crossing CAS above FL 100 within radar and radio coverage.

21 In aviation and airspace terms, the world is divided into Flight Information Regions (FIRs) for the allocation of responsibility for the provision of ATS to aircraft. Within CAS, NATS En-route Limited (NERL) (which is a subsidiary of NATS) are the main ATS provider utilising several long-range PSR and SSR[5] systems positioned to provide maximum coverage of UK airspace. Additionally, NATS has a licence obligation to provide radar data to other remote aviation stakeholders (such as the MoD) to a high quality and performance standard for the benefit of UK aviation as a whole. Any effect that AyM might have on NERL radar systems must be considered both in terms of effect on the civilian en-route services and in the context of its remote users such as the MoD and airports. There are no SSR systems located within the CAA suggested radius where impact is expected; therefore, SSR is scoped out from further analysis.

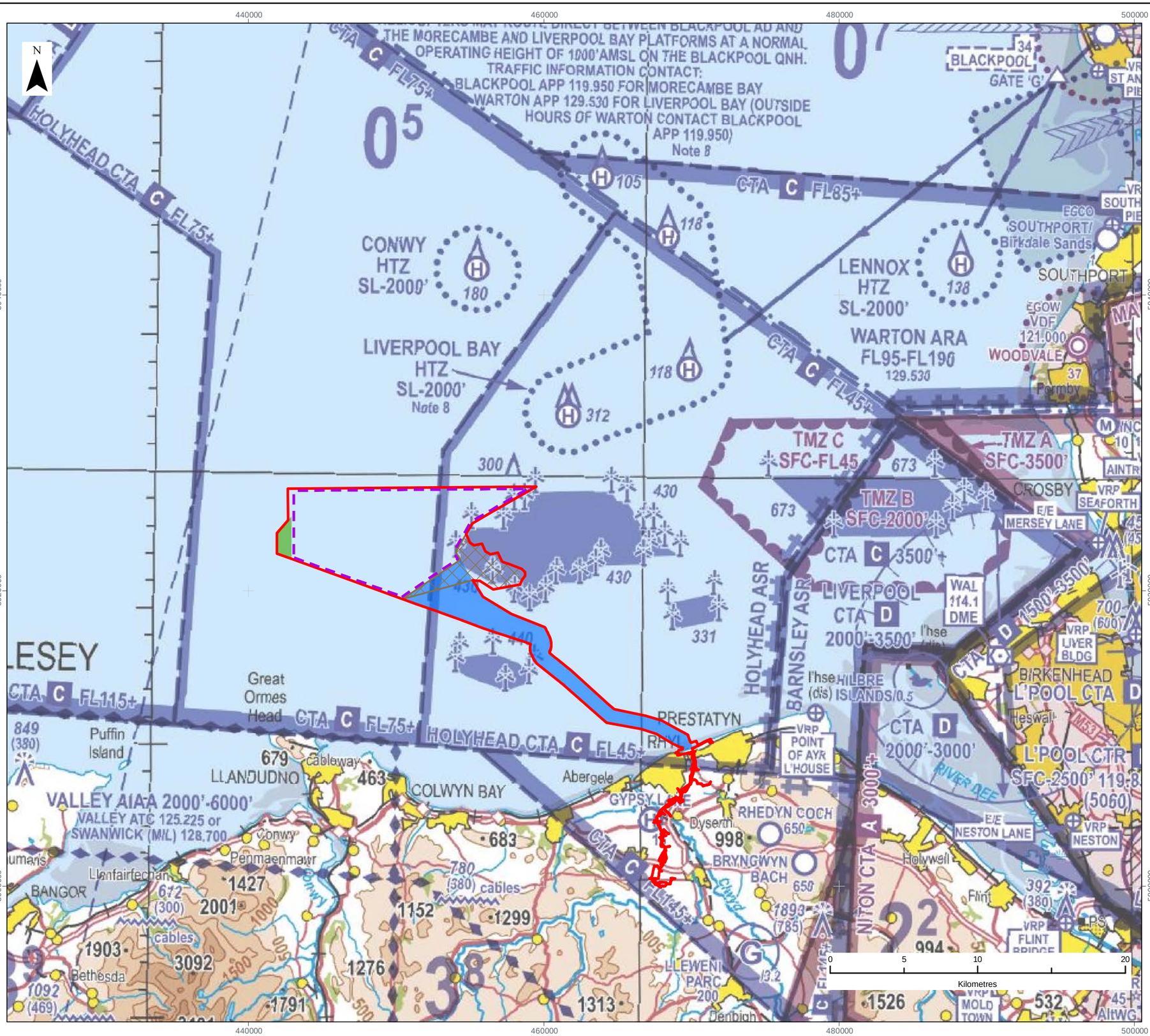
13.7.2 The Array

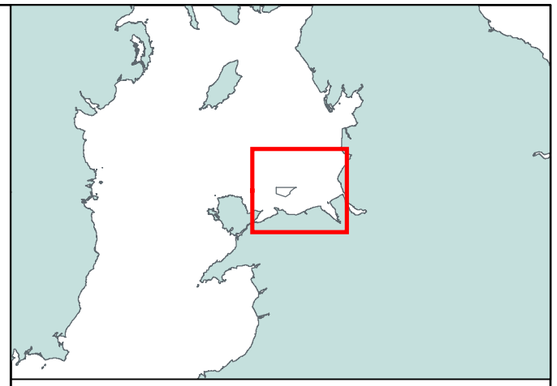
22 A characterisation of the aviation baseline for the area of the array was detailed within the EIA Scoping Report (Innogy, 2020). A review of the key findings from that study has been incorporated into the description of the existing environment.

[5] SSR differs from PSR systems in that it transmits an interrogation requesting a dedicated response. CAA guidance (CAP 764, 2016) states that SSR systems are typically affected when wind turbines are located less than 10 km from the radar position.

23 The AyM array will be located in an area of Class G uncontrolled airspace, which is established above the array area from the surface of the Earth (water) up to varying Flight Levels (FL)[6], the lowest being FL 45 (approximately 4,500 feet (ft)). Above this Class G airspace, Class C Controlled Airspace (CAS) forms the Holyhead Control Area (CTA) which is established from various levels up to FL 195 (19,500 ft), further CAS is established above FL 195. Figure 2 below provides an illustration of the airspace structure above the array area.

[6]A Fight Level (FL) is a surface of constant atmospheric pressure related to a specific pressure datum, 1013.2hPa, and is separated from other such surfaces by specific pressure intervals. Altitude above the sea-level is measured in 100 feet units according to the standard atmosphere. In lay terms the FL corresponds approximately to the nearest 100 ft of altitude at which the airspace begins.





LEGEND

- Order Limits
- Array Area
- Offshore Export Cable Corridor
- Other Wind Farm Infrastructure Zone
- GyM Interlink Zone

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

Airspace structure above the AyM Array

VER	DATE	REMARKS	Drawn	Checked
1	27/04/2021	For Issue For PEIR	BPHB	RM
2	28/03/2022	For Issue For ES	BPHB	RM

FIGURE NUMBER:

Figure 2

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:265,000	A3	WGS84	UTM30N

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

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13.7.3 Radar LoS conclusions

24 The following paragraphs provide the results of the radar LoS conclusions. In order to inform the baseline, radar LoS analysis has been completed by Osprey to potentially affected aviation radar systems at a 'worst case' scenario blade tip height of 336 m amsl.

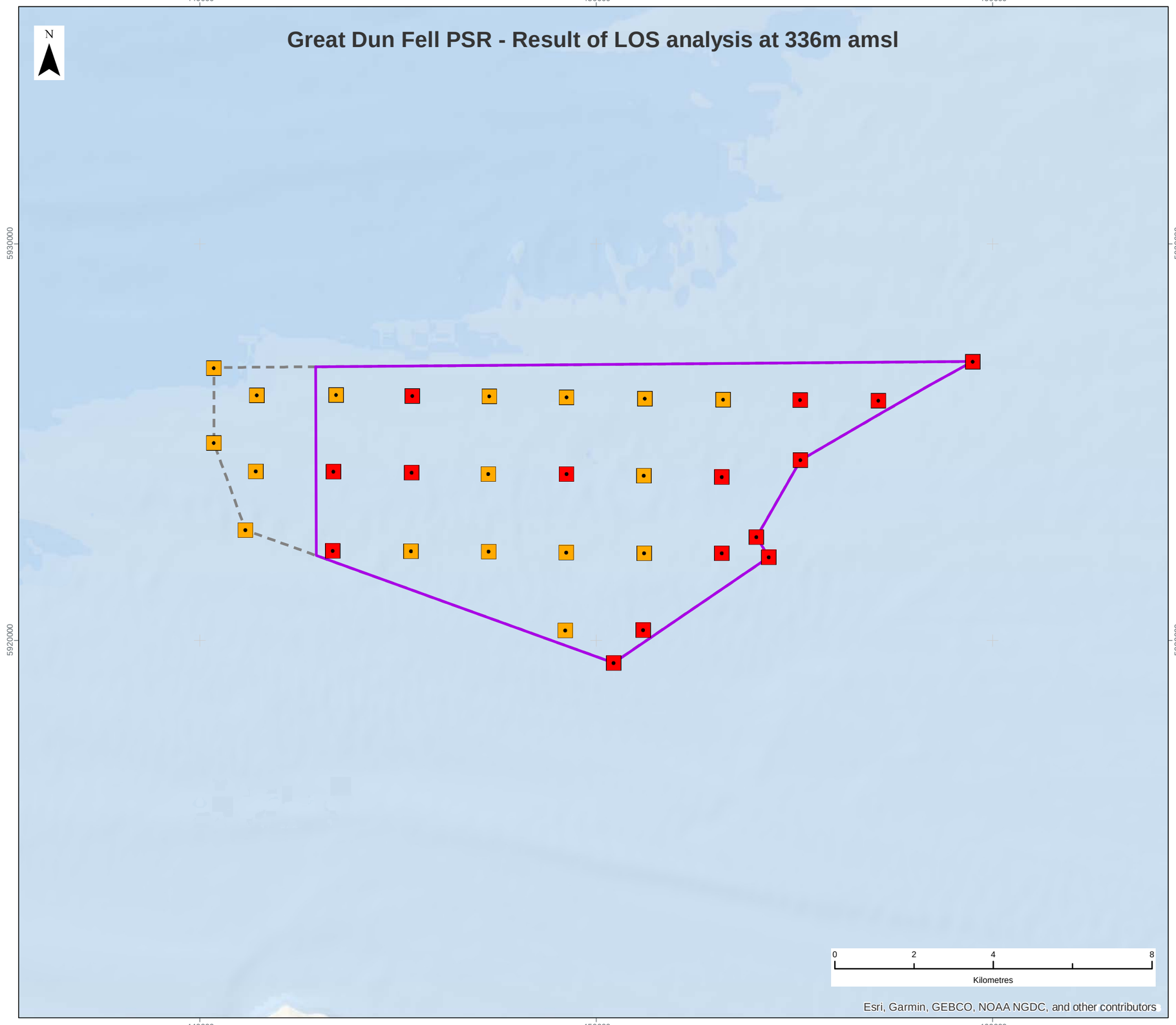
NATS radar systems

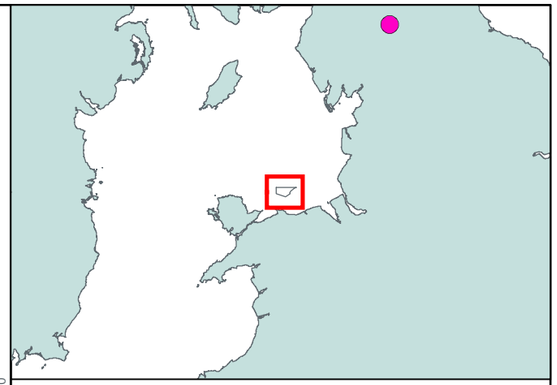
25 NATS operates three PSR systems which provide coverage over the array area in order to provide a radar-based air traffic service:

- The Great Dun Fell PSR which is located in the north Pennines, East Cumbria.
- St Anne's PSR located in Lytham St Annes.
- Clee Hill PSR located in the Shropshire Hills.

26 The aim of the LoS analysis is to determine which radar systems have the potential to theoretically detect operational wind turbines at the maximum blade tip height placed within the offshore array development area. No wind turbine site layout was available at the time of the completion of the analysis; however, layout of wind turbines does not have a material effect on establishing if theoretical radar LoS is possible. Therefore, to enable the analysis, points of reference in the form of a regular grid pattern were established across the AyM array with turbines on all array vertices at the worst-case blade tip height of 336 m amsl which is considered to be the Maximum Design Scenario (MDS) for aviation. The NATS Great Dun Fell and the St Anne's PSR systems are predicted to theoretically detect the development wind turbines. Figure 3 and Figure 4 below provides the results of the radar LoS analysis to the Great Dun Fell and St Anne's PSR.

Great Dun Fell PSR - Result of LOS analysis at 336m amsl





LEGEND

- Array Area (Application)
- Array Area (PEIR)
- Great Dun Fell PSR Location

Symbol	Result	Definition
	Yes	The WTG is highly likely to be detected by the radar: direct LOS exists between the radar and the wind turbine
	Likely	The WTG is likely to be detected by the radar at least intermittently
	Unlikely	The WTG is unlikely to be detected by the radar but cannot rule out occasional detection
	No	The WTG is unlikely to be detected by the radar as significant intervening terrain exists

Data Source:

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

Great Dun Fell PSR
Result of LOS analysis at 336m amsl

VER	DATE	REMARKS	Drawn	Checked
1	27/04/2021	For Issue For PEIR	BPHB	RM
2	19/01/2022	For Issue For ES	BPHB	RM

FIGURE NUMBER:

Figure 3

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:100,000	A3	WGS84	UTM30N

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AWEL Y MÔR
Offshore Wind Farm

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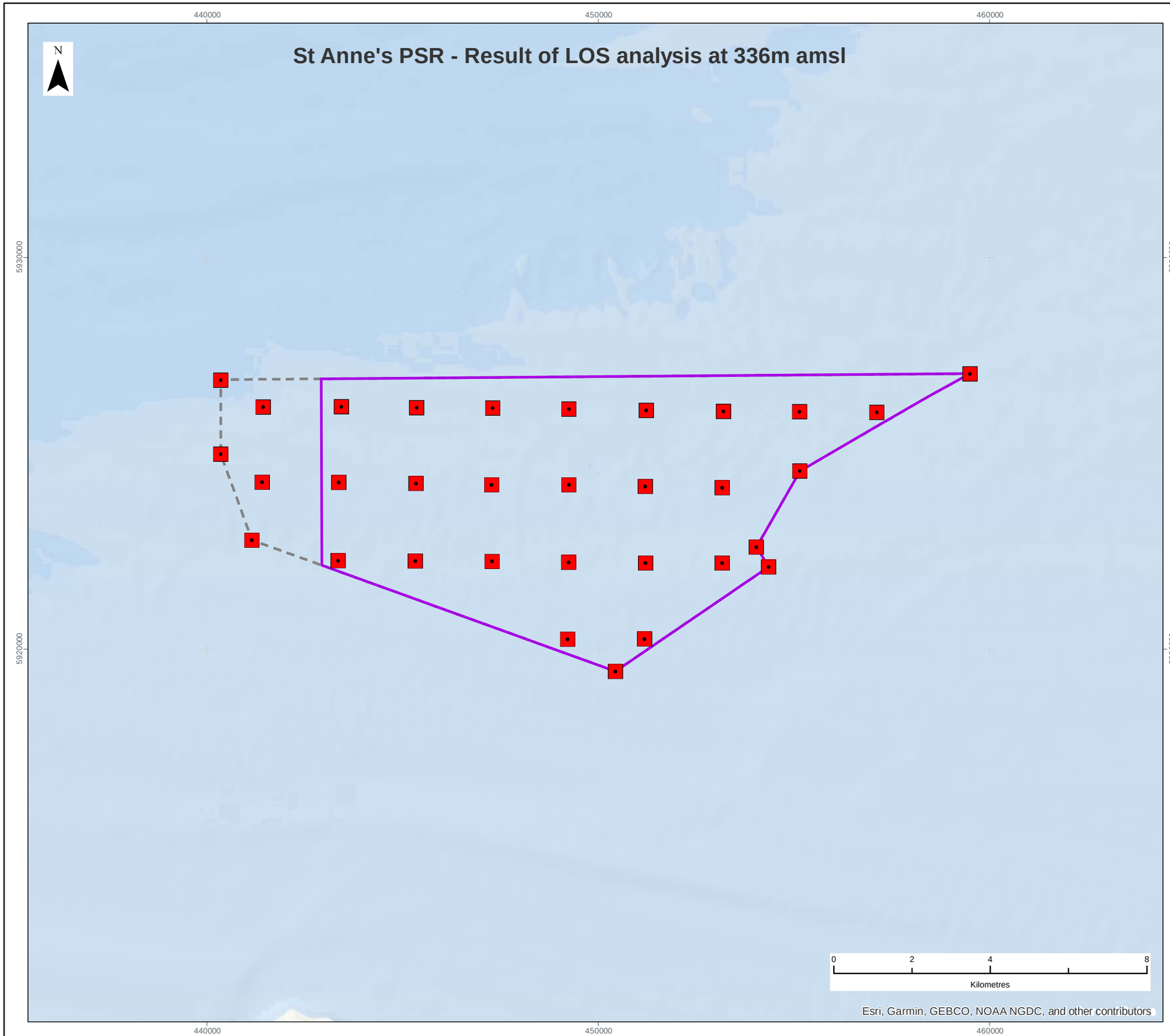
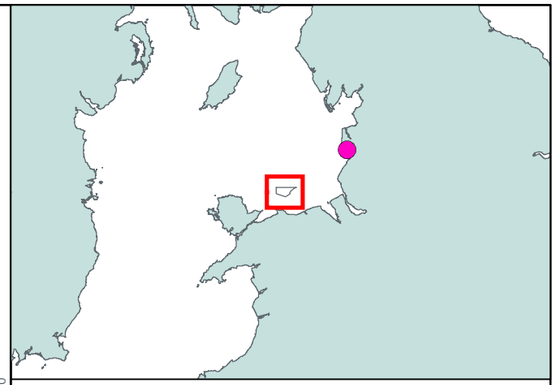
St Anne's PSR - Result of LOS analysis at 336m amsl





LEGEND

- Array Area (Application)
- Array Area (PEIR)
- St Anne's PSR Location

Symbol	Result	Definition
	Yes	The WTG is highly likely to be detected by the radar: direct LOS exists between the radar and the wind turbine
	Likely	The WTG is likely to be detected by the radar at least intermittently
	Unlikely	The WTG is unlikely to be detected by the radar but cannot rule out occasional detection
	No	The WTG is unlikely to be detected by the radar as significant intervening terrain exists

Data Source:

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

St Anne's PSR
Result of LOS analysis at 336m amsl

VER	DATE	REMARKS	Drawn	Checked
1	27/04/2021	For Issue For PEIR	BPHB	RM
2	19/01/2022	For Issue For ES	BPHB	RM

FIGURE NUMBER:

Figure 4

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:100,000	A3	WGS84	UTM30N

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AWEL Y MÔR
Offshore Wind Farm

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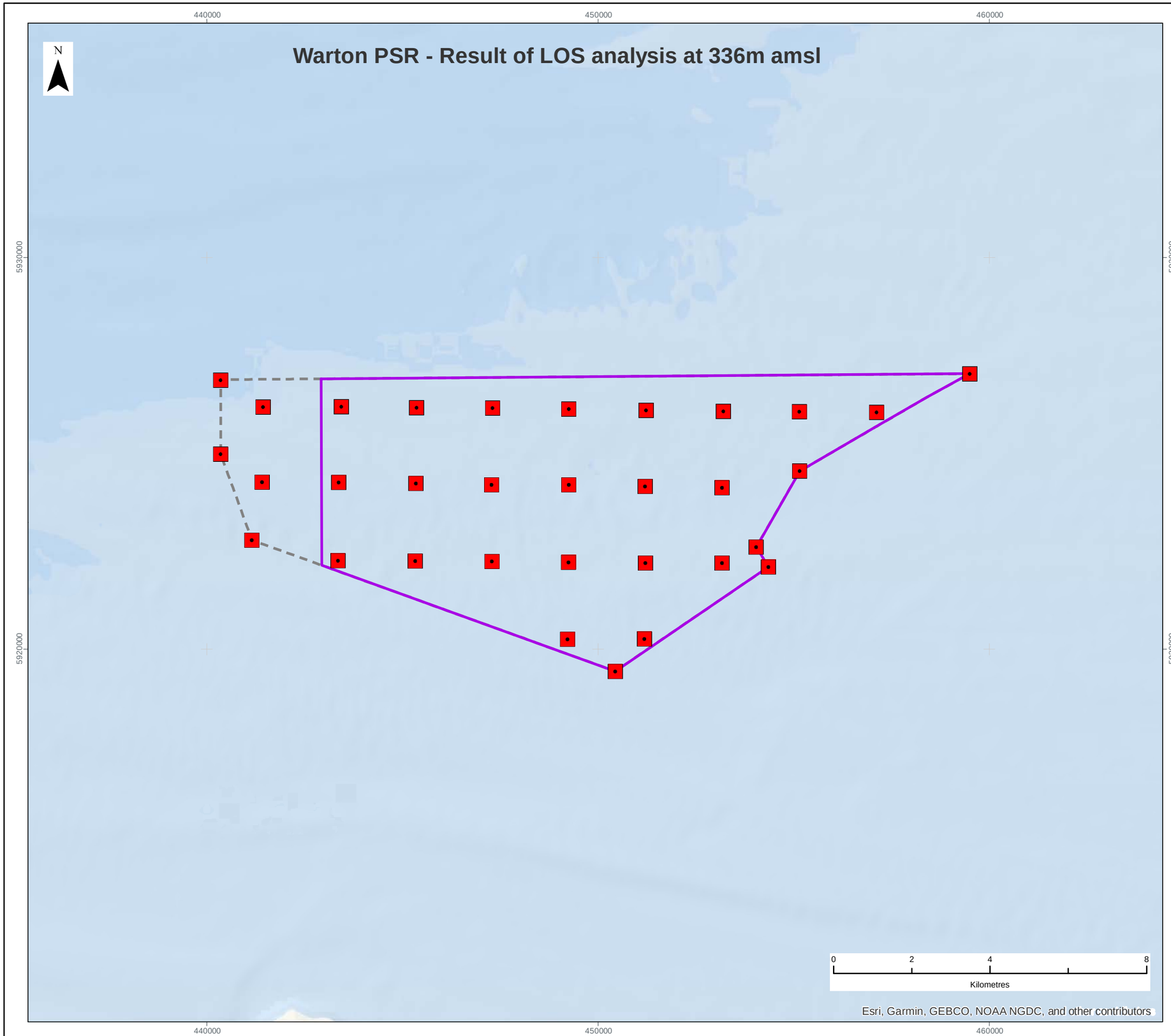
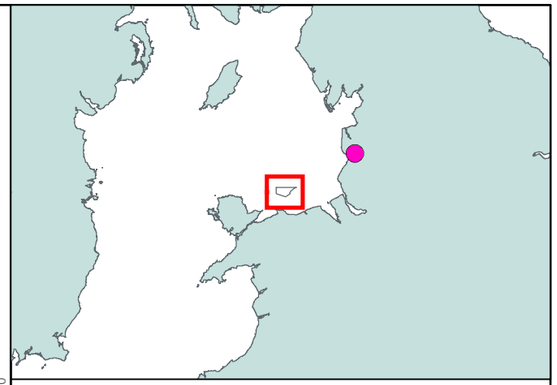
27 NATS analysis concludes that the Clee Hill PSR will not theoretically detect wind turbines at a maximum blade tip height of 336 m amsl and is therefore scoped out from further analysis.

BAE Warton

28 Figure 5 below provides the conclusions of the radar LoS analysis between the Warton PSR and the grid pattern of wind turbines across the AyM array. The Warton PSR will theoretically detect all wind turbines placed in the array area at a blade tip height of 336 m amsl.

Warton PSR - Result of LOS analysis at 336m amsl





LEGEND

- Array Area (Application)
- Array Area (PEIR)
- Warton PSR Location

Symbol	Result	Definition
	Yes	The WTG is highly likely to be detected by the radar: direct LOS exists between the radar and the wind turbine
	Likely	The WTG is likely to be detected by the radar at least intermittently
	Unlikely	The WTG is unlikely to be detected by the radar but cannot rule out occasional detection
	No	The WTG is unlikely to be detected by the radar as significant intervening terrain exists

Data Source:

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

Warton PSR

Result of LOS analysis at 336m amsl

VER	DATE	REMARKS	Drawn	Checked
1	27/04/2021	For Issue For PEIR	BPHB	RM
2	19/01/2022	For Issue For ES	BPHB	RM

FIGURE NUMBER:

Figure 5

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:100,000	A3	WGS84	UTM30N

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AWEL Y MÔR
Offshore Wind Farm

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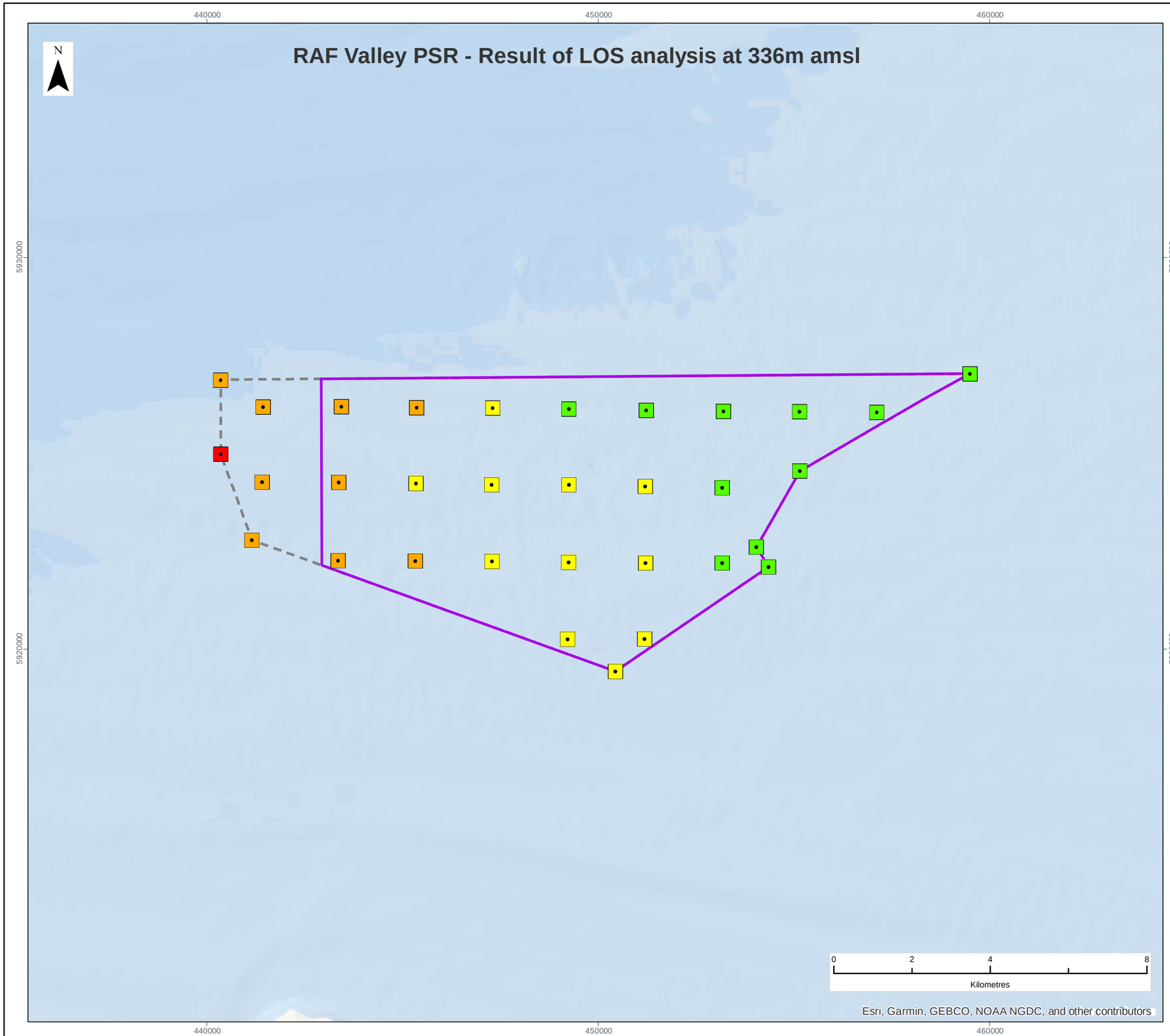
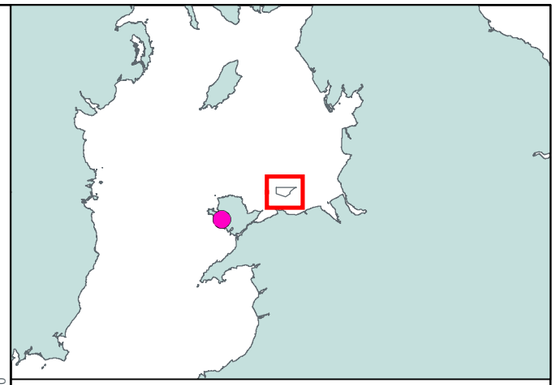
RAF Valley

29 Figure 6 below provides the conclusions of the radar LoS analysis between the RAF Valley PSR and the grid pattern of wind turbines across the AyM array. Conclusions of the radar LoS analysis between the RAF Valley PSR and the AyM wind turbines are mixed with a small portion on the most western edge of the array theoretically highly likely to be detectable. Intermittent detection of the AyM wind turbines at a maximum height of 336 m amsl cannot be ruled out in limited locations further east in the array area.

RAF Valley PSR - Result of LOS analysis at 336m amsl





LEGEND

- Array Area (Application)
- Array Area (PEIR)
- RAF Valley PSR Location

Symbol	Result	Definition
	Yes	The WTG is highly likely to be detected by the radar: direct LOS exists between the radar and the wind turbine
	Likely	The WTG is likely to be detected by the radar at least intermittently
	Unlikely	The WTG is unlikely to be detected by the radar but cannot rule out occasional detection
	No	The WTG is unlikely to be detected by the radar as significant intervening terrain exists

Data Source:

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

RAF Valley PSR
Result of LOS analysis at 336m amsl

VER	DATE	REMARKS	Drawn	Checked
1	27/04/2021	For Issue For PEIR	BPHB	RM
2	19/01/2022	For Issue For ES	BPHB	RM

FIGURE NUMBER:

Figure 6

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:100,000	A3	WGS84	UTM30N

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

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Other Aviation Stakeholders considered in the existing environment baseline

30 Radar LoS analysis was also completed to the Chester (Hawarden) Airport PSR which is located on a bearing of 122°/30 NM from the south-eastern edge of the array area. Theoretically the Chester (Hawarden) PSR will detect a limited number of wind turbines at the assessed blade tip height in the far eastern point of the array area. However, the consultation response from Chester (Hawarden) Airport states that as AyM is outside of their safeguarded area no effect will be apparent to their operations. Therefore, Chester (Hawarden) Airport is scoped out from further assessment.

31 At its closest point, Ronaldsway Isle of Man Airport is located 81 km north-west of the AyM array, the airport is equipped with an ATC PSR system. CAA CAP 764 states that impact to radar equipped airfield should be considered when a wind farm development is located within 30 km of an airfield, although it is acknowledged that impact to radar may occur outside of 30 km. It is considered to be the case that Ronaldsway radar operations will be limited in the area of the development array due to range, airspace classification and the ATS management of the airspace above AyM. This was confirmed by the IoM Government in their Section 42 consultation response dated 11 October 2021 and therefore impact to Ronaldsway Airport is scoped out.

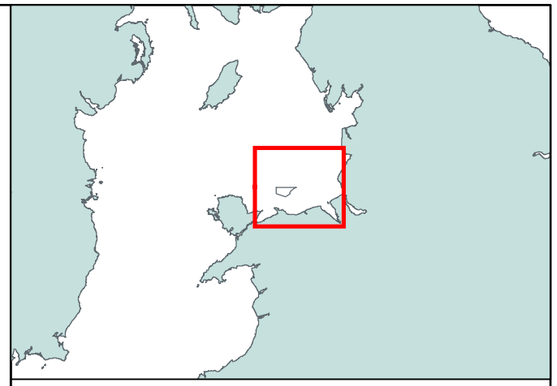
32 QINETIQ Aberporth operates a Watchman PSR which ATC generally operate within a 40 NM radius of the radar location. AyM array is located over 80 NM from the location of the radar system and therefore Aberporth radar is scoped out.

33 The closest Meteorological Office radar system is located at Hameldon Hill located approximately 2.5 NM southwest of Burnley, Lancashire. It is located a significant distance (more than 20 km where effect is likely) from the array and is highly unlikely to be affected and as such weather radar is scoped out.

34 The UK Low Flying system (UKLFS) used for military low flying activity covers the airspace over the entire UK land mass and surrounding sea (excluding restricted, PEXA and built-up areas) generally out to 2 NM from the coastline, from the surface to 2,000 ft above ground level (agl) or amsl, however military low flying activities can take place further from the coastline out to sea. AyM has the potential to impact low flying operations due to the construction of multiple obstacles above sea level.

35 The AyM array does not lie within, adjacent to or underneath any military training areas and therefore no assessment of military PEXA is required and this impact is scoped out.

36 In order to help achieve a safe operating environment, a CAA recommended consultation zone of 9 NM radius exists around offshore helicopter decks which are located on oil and gas platforms. This consultation zone is not considered a prohibition on wind farm development within a 9 NM radius of offshore helicopter operations but a trigger for consultation between the platform operators, the offshore helicopter operators, the operators of existing installations and wind developers to determine a solution that will maintain safe offshore helicopter operations in the presence of the wind farm. The basic requirement of the 9 NM consultation zone is to provide airspace for the safe operation of helicopter instrument approaches in poor weather conditions where a low visibility approach profile is needed. Figure 7 below provides an illustration of the AYM array area together with those 9 NM buffer areas which overlap the array area.



LEGEND

- Array Area
- Platform
- 9NM buffer from Platforms

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

Offshore Helicopter Platforms

VER	DATE	REMARKS	Drawn	Checked
1	27/04/2021	For Issue For PEIR	BPHB	RM
2	13/01/2022	For Issue For ES	BPHB	RM

FIGURE NUMBER:

Figure 7

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:250,000	A3	WGS84	UTM30N

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AWEL Y MÔR
Offshore Wind Farm

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37 There are three platforms in which the 9 NM 'consultation zones' potentially overlap the array area, Hamilton, Douglas and Conwy. During initial consultation with ENI (the platform operator, 1 March 2021 (Table 2)), ENI, predicted that no effect to helicopter operations to platforms and aviation radio communications would occur however, this is subject to further confirmation by ENI and continues to be scoped into the assessment.

38 The SAR force provides 24-hour aeronautical SAR cover in the UK which is provided from ten strategically located bases across the UK. The bases are positioned close to SAR hotspots so that aircraft can provide support as quickly and efficiently as possible. Bristow Helicopters were awarded the contract to provide SAR helicopter services for the UK in 2013 and operate SAR operations from Caernarfon Airport (the closest SAR aircraft base to AyM).

39 Consultation with Liverpool Airport has provided a limited response in which the airport indicated that they will inform the helicopter operators who operate from the airport to contact the Applicant directly, however no response has been received. Manchester Airport stated that AyM is outside of their safeguarded area but MAG would like to be kept informed of the progress of the application. Based on these consultation responses Liverpool and Manchester Airport are scoped out from the assessment; however, project details will be provided to Liverpool Airport and MAG throughout the application period.

13.7.4 The Offshore ECC

40 The offshore ECC will be below the water surface and will not affect aviation activity and is therefore scoped out from the assessment.

13.7.5 The onshore ECC and substation

41 The onshore ECC consists of the 100 m corridor within which the 40 m preferred cable route is located. North Wales Police has previously operated a helicopter from its Gypsy Lane, Rhuddlan helipad; however, the base closed during 2015 with operations moving to the National Police Air Service (NPAS) base located at Chester (Hawarden) Airport. No aviation activities are completed adjacent or within the onshore ECC are therefore the impacts of the onshore ECC are scoped out of the assessment.

Evolution of the baseline

42 It is difficult to define what the likely evolution of the aviation interests in the Irish Sea will be either with, or in the absence of AyM. The Chairman's foreword of the Oil and Gas Authority (OGA) Annual Report and Accounts (OGA, 2020-2021) reports that the OGA industry and government have worked together over the past year to protect value in the UK Continental Shelf (UKCS), while pushing on with the ambitious net zero agenda. The Chairman states that '*according to official government figures, oil and gas still make up around three quarters of the UK's energy consumption. They are forecast to be needed now and into the future; not just for heating, transport and power generation, but also as a feedstock for manufacturing other materials such as chemicals, medicines and more*'.

43 The OGA strategy came into force on 11 February 2021 and reaffirms the organisation's purpose and direction and reflects the ongoing energy transition. It features a range of net zero obligations on the oil and gas industry and calls on industry to work collaboratively with the supply chain by actively supporting Carbon Capture Storage (CCS) and hydrogen production projects. The OGA will monitor governance closely and ensure that carbon costs are considered in its regulatory decisions.

44 Operators continue to find it difficult to predict production accurately as older fields mature and their reliability reduces. The OGA are considering a collaborative approach to late life optimisation in the Liverpool Bay which will '*enable a smooth transition to energy integration by identifying the optimum time to switch from hydrocarbon production'*.

45 As old fields are decommissioned helicopter use to those oil and gas platforms will decline; however, as helicopter support to offshore wind increases it is expected that there may be an increased aviation activity as new offshore areas are developed to support net zero targets in the near future.

Potential Impacts

46 Aviation receptors were identified in accordance with CAP 764 (CAA, 2016). This assessment considers all radar systems within operational range of AyM, as well as military areas of operation. For each identified receptor, the physical obstruction and/ or radar impacts, and subsequently the operational impacts to aviation activities were considered along with any other potential impacts.

47 The operational range of a radar system is dependent on the type of radar used and its operational requirement. CAP 764 provides a guide of 30 km for assessment of radar impact; however, any impact is dependent on radar detectability of operational wind turbines, the radars operational range and the use of airspace in which the development sits. The operational impact considers the orientation of approach and departure flight paths, physical safeguarding of flight, airspace characteristics and flight procedures as published in the UK IAIP (CAA, 2021b) and the Mil AIP (MoD, 2021). This assessment has been informed by the results of baseline studies and consultation, with reference to the existing evidence base regarding the effects of offshore wind farm development.

48 In order to help achieve a safe operating environment, a CAA recommended consultation zone of 9 NM radius exists around offshore oil and gas platforms that are capable of operating helicopters from installations. This consultation zone is not considered a prohibition on wind turbine development within a 9 NM radius of offshore operations but a trigger for consultation between platform operators, the offshore helicopter operators, the operators of existing installations and wind developers to maintain a safe coexistence between wind turbines and offshore helicopter operations to platforms. The individual consultation zones of three oil and gas platform installations are located within 9 NM of the AyM array as illustrated in Figure 7.

49 Wind turbines are considered as physical obstructions and helicopters must be operated in accordance with applicable separation regulations when operating VMC or IMC. In IMC and in certain wind conditions, which dictate the area of approach to an installation, instrument approach procedures might be restricted due to the proximity of wind turbine structures to the flight approach path.

50 When flying in VMC a helicopter must maintain a 150 m (500 ft) separation distance from all obstacles. Access requirements in VMC are not considered to be affected at a distance of greater than one NM from wind turbines. At less than one NM access requirements in VMC are considered possible but may be affected when considering other factors such as wind conditions and turbulence.

51 When operating IMC, helicopters must operate to minimum separation distances. When conducting an instrument approach procedure, a helicopter must maintain a 1,000 ft vertical clearance from all obstacles as it lines up its final descent and a 1 NM lateral separation from all radar contacts (including wind turbines). On this basis, access requirements in IMC are potentially affected between 1 NM and a range from which the instrument approach is commenced (usually 6 - 8 NM) depending upon direction of approach.

Impacts Scoped Out

52 In accordance with the Scoping Opinion, the following impacts are scoped out of the ES assessment for military and civil aviation:

- Impacts to aviation radar during the construction phase due to the static (non-operational) nature of the wind turbines.
- Impacts to the NATS Clee Hill PSR: NATS radar LoS analysis confirms that the Clee Hill PSR will not detect the AyM wind turbines.
- Impacts to Chester (Hawarden) Airport: The airport authority has confirmed that AyM is outside of their safeguarded area.
- Impacts to the Aberporth PSR: AyM is outside of the range of the Aberporth PSR.
- Impacts to the Warton Airfield PSR: the MoD confirmed that (although theoretical radar LoS exists), no operational impact will be created by AyM.

- Impacts on Meteorological Office weather radar because AyM is located outside of the 20 km safeguarding area within which there may be an objection to development.
- Impact to PEXA: There are no PEXA within the surrounding area of the array.
- Impact to Liverpool and Manchester Airports.
- Impact to Ronaldsway Airport.
- Impact created by the offshore ECR as the cable will be below the sea surface.
- Impact created by the onshore ECC as no aviation infrastructure is along or in close proximity to the route.
- Impact to SSR as the AyM array is located over 10 km from a SSR source.
- The MoD have confirmed that there will be no effect to operations conducted at RAF Valley (including the ATC PSR).

53 Potential impacts on the following receptors are scoped into the assessment:

- NATS Great Dun Fell and St Anne's PSR systems.
- Offshore helicopter operations to helicopter deck equipped oil and gas platforms (specifically the Hamilton, Douglas and Conwy platforms).
- Impact to military low flying operations through the creation of an obstruction.
- Airborne SAR operations through the creation of an obstruction.

13.8 Key parameters for assessment

54 The assessment of potential impacts on military and civil aviation is based on the MDS and is specific to the potential impacts identified in this chapter. The key parameters for the MDS include the maximum number of wind turbines across the largest area and the maximum blade tip height of 336 m above amsl.

55 The MDS for impacts on military and civil aviation including radar assumes that the entirety of the AyM array area will be populated with wind turbines (34 in the case of the largest wind turbines) at the maximum blade tip height of 336 m amsl. This is because the largest area of the highest wind turbines will create the largest impact from a physical obstruction and radar interference perspective, leading to a greater effect on aviation services. Any aspects of the infrastructure that are lower in height than the wind turbines and less than the extent of the AyM array area will not create an incremental effect on aviation interests. Table 7 provides the MDS for impacts to military and civil aviation and radar.

Table 7: Maximum design scenario.

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
CONSTRUCTION		
Creation of an aviation obstacle.	Array 34 wind turbine positions at a maximum blade tip height of 336 m amsl.	Maximum physical obstruction to aviation operations due to size and number of above sea level infrastructure within the AyM array area.
OPERATION		
Creation of an aviation obstacle.	Array 34 wind turbine positions at a maximum blade tip height of 336 m amsl.	Maximum physical obstruction to aviation operations due to size and number of above sea level infrastructure within the AyM array area.

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
Wind turbines causing permanent interference on civil and military radar systems.	34 wind turbines with a maximum blade tip height of 336 m above amsl. Impact throughout the Operation phase of approximately 25 years. Impact duration present during operational period.	ATC may be unable to provide an effective surveillance service due to interference on radar displays. Impact duration present during operational period.
Wind turbines creating an impact to Instrument Flight Rules[7] (IFR) offshore helicopter operations to oil and gas platforms.	34 wind turbines with a maximum blade tip height of 336 m above amsl. Impact throughout the Operation phase of approximately 25 years. Impact duration present during operational period.	Wind turbines with a maximum blade tip height creating a physical obstruction to helicopter operations (conducted in poor weather conditions) to oil and gas platform helicopter landing areas due to the size and location of above sea level infrastructure.
DECOMMISSIONING		
Creation of an aviation obstacle.	34 wind turbine positions at a maximum blade tip height of 336 m amsl.	Maximum physical obstruction to aviation operations due to size and number of above sea level

[7] IFR - The rules governing procedures for flights conducted with the crew making reference to aircraft cockpit instruments for situation awareness and navigation.

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
		infrastructure within the AyM array area.
CUMULATIVE EFFECTS		
Construction Creation of an aviation obstacle.	MDS for AyM plus the cumulative full development of other offshore projects within 40 km[8] of AyM. Table 9 provides those operational and planned projects considered within the military and civil aviation cumulative effect assessment.	This includes the presence of other developments which will have the potential to create a cumulative aviation obstacle and affect available airspace for other low level flying users in the same region.
Operation Wind turbines causing permanent interference on civil and military radar systems.	MDS for AyM plus the cumulative full development of other offshore projects within 100[9] km of AyM.	MDS aviation and radar cumulative effect is calculated within a representative 100 km buffer of the AyM array.

[8] For the purposes of this ES Chapter, this additive impact has been assessed within 40 km from the AyM array, which is based on professional knowledge, the maximum range where the creation of an aviation obstacle to fixed wing and rotary aircraft operating offshore may occur although some impacts are likely to be localised to the AyM array area.

[9] For the purposes of this ES Chapter, this additive impact has been assessed within 100 km from the AyM array, which is based on professional knowledge, the maximum range where aviation radar cumulative effect may occur although some impacts are likely to be localised to the AyM array area.

13.9 Mitigation measures

56 Mitigation measures that were identified and adopted as part of the evolution of the project design (embedded into the project design) and that are relevant to military and civil aviation are listed in Table 8. The mitigation includes embedded measures such as design changes and applied mitigation which is subject to further study or approval of details; these includes avoidance measures that will be informed by pre-construction surveys, and necessary additional consents where relevant. The composite of embedded and applied mitigation measures apply to all parts of the AyM development works, including pre-construction, construction, O&M and decommissioning.

57 CAP 393 Article 223 (CAA, 2021) sets out the mandatory requirements for lighting of offshore wind turbines, these requirements will be considered by the Applicant in the development of the project lighting scheme in the development of the final design, post consent:

- Legislation requires the fitting of obstacle lighting on offshore wind turbines with a height of 60 m or more above the level of the sea at Highest Astronomical Tide (HAT).
- Where four or more wind turbines are located together in the same group, with the permission of the CAA, only those on the periphery of the group need to be fitted with at least one medium intensity steady red light positioned as close as reasonably practicable to the top of the fixed structure.
- The obstruction light or lights must be fitted to show when displayed in all directions without interruption. The requirements of the angle of the plane beam and peak intensity levels are defined within CAP 393 (CAA, 2021)."

58 It is good practice to notify aviation stakeholders of the location and dimension of any wind energy development and the associated construction activities. Information regarding construction will be passed to the Defence Geographic Centre (DGC) and the General Aviation Awareness Council (GAAC) at least ten weeks in advance of the erection of the first wind turbine and to follow up on the day with a confirmation that the activity has taken place. The data will include:

- Location height (of all structures over 150 ft, date of erection, date of removal and lighting type (none, infra-red or lighting brightness); and
- Local aerodromes identified during consultation should be notified, particularly any police helicopter or air ambulance unit.

59 Information will be circulated to relevant aviation stakeholders including NATS and the MoD. Information on potential aviation obstructions would be promulgated within the UK IAIP (CAA, 2021b) and notified to regulatory authorities including the CAA and the MoD for marking on aeronautical related charts and documentation. These commitments will be secured through the requirements of the Development Consent Order (DCO).

Table 8: Mitigation measures relating to military and civil aviation.

PARAMETER	MITIGATION MEASURES
GENERAL	
Compliance with MGN 654	An Emergency Response Co-operation Plan (ERCoP) secured by a requirement of the DCO will be in place for the construction, operation and decommissioning phases of the AyM. The ERCoP is completed initially in discussion between the developer and the MCA, SAR and Navigation Safety Branches. Detailed completion of the plan will then be in cooperation with the Maritime Rescue Coordination Centre (MRCC), responsible for maritime emergency response. The ERCoP must then be submitted to and approved by the MCA. The ERCoP would detail specific marking and lighting of the wind turbines provided by a lighting and marking plan to be agreed with the MCA. The SAR helicopter bases would be supplied with an accurate chart of the AyM wind turbine locations, helicopter access positions and spacing between wind turbines. Furthermore, the arrangements of liaison between the wind farm developer and HM Coastguard in the event of an emergency response would be detailed together with an explanation of procedures and processes carried out.

PARAMETER	MITIGATION MEASURES
CONSTRUCTION	
Notification to aviation stakeholders.	The DGC will be informed of the locations, heights and lighting status of the wind turbines, including estimated and actual dates of construction and the maximum height of any construction equipment to be used, prior to the start of construction, to allow inclusion on Aviation Charts.
OPERATION	
Fitment of aviation obstruction lighting.	The Applicant is committed to marking and lighting the project in accordance with relevant industry guidance and as advised by relevant stakeholders including the MCA, CAA and Trinity House. Marking and lighting of the wind turbines and infrastructure will be in line with current industry standards and regulations and will be secured in the DCO.
DECOMMISSIONING	
Notification to aviation stakeholders.	As per construction.

13.10 Environmental assessment: construction phase

60 The impacts of the offshore construction of AyM have been assessed on military and civil aviation. The impacts arising from the construction of AyM are listed in Table 7 along with the MDS against which each construction phase impact has been assessed. The subsequent assessment stage of the EIA for all phases is based on the 'mitigated' design.

13.10.1 Creation of an aviation obstacle.

Magnitude of impact

61 Wind turbine construction infrastructure above sea level could pose a physical obstruction to flight operations in the vicinity of the array specifically to military low flying, airborne SAR operations and to those helicopters operating in support of the oil and gas industry. Construction infrastructure and erected wind turbines can be difficult to see from the air, particularly in poor meteorological conditions leading to potential increased obstacle collision risk. Furthermore, during the construction phase, the presence and movement of construction infrastructure may present a potential obstacle collision risk to aircraft flight operations.

62 A range of mitigation measures, in the form of appropriate notification to aviation stakeholders, lighting and marking to minimise effects to aviation flight operations would apply to the development of AyM. These will comply with current guidelines and be agreed with the appropriate stakeholders and are outlined in Table 8. Pilots are obliged to plan their flying activities in advance and to be familiar with any en-route obstacles they may encounter; however, during flight, weather conditions or operational requirements may necessitate route adjustments. In Visual Meteorological Conditions[10] (VMC), pilots are ultimately responsible for seeing and avoiding obstructions such as wind turbines and will be aware through notification procedures of the proposed project. Furthermore, when flying in IMC[11] pilots will be utilising on board radar which detects obstructions, will be flying at or above the Minimum Safe Altitude[12] (MSA) and are likely to be under the control of ATC with an appropriate level of radar service. The impact is predicted to be of regional spatial extent, of short-term duration and intermittent. It is predicted that the impact will affect the receptor directly, the magnitude is considered to be **low adverse**.

[10] VMC - is an aviation flight category in which Visual Flight Rules (VFR) is permitted, specifically conditions in which pilots have sufficient visibility to fly the aircraft maintaining visual separation from terrain and other aircraft.

[11] IMC - Instrument Meteorological Conditions (IMC) is an aviation flight category that describes weather conditions that require pilots to fly primarily by reference to instruments, and therefore under Instrument Flight Rules (IFR), rather than by outside visual references under VFR.

[12] MSA - Minimum Safe Altitude is a generic expression, used in various cases to denote an altitude below which it is unsafe to fly owing to presence of terrain or obstacles.

Sensitivity of the receptor

63 Helicopter operators, the MoD and ATC service providers will be notified of construction activity and will continue to be consulted with regard to the potential for AyM to create an obstruction to aviation activities conducted in the vicinity of construction infrastructure. Pilots are obliged to plan their flying activities in advance and to be familiar with any en-route obstacles they may encounter on their route of flight. The development will be included within applicable military and civil aviation publications and charts; pilots will be aware of the presence of the development through notification procedures as provided within Table 8. Embedded mitigation and notification of construction, operation and decommissioning of the wind farm and the lighting and promulgation on aviation charts will reduce any physical obstruction effect to aviation activities in the region of the development. The ability of aviation receptors to continue using the airspace of the Irish Sea surrounding AyM construction activities is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **medium**.

Significance of the effect

64 Overall, the sensitivity of the receptor is considered to be medium, and the magnitude of the impact is deemed to be low. The effect will, therefore, be of ***minor adverse*** which is not significant in terms of the EIA Regulations.

13.11 Environmental assessment: operational phase

13.11.1 Creation of an aviation obstacle

Magnitude of impact

65 During the operational phase of AyM, wind turbines could pose a physical obstruction to the flight of aircraft operating in the vicinity of the array area, specifically to low flying aircraft. Helicopter operators, the MoD and ATC service providers will continue to be consulted with regard to the potential for AyM to create an obstruction to aviation activities conducted in the vicinity of the wind turbines.

66 A range of mitigation measures, in the form of appropriate notification to aviation stakeholders, lighting and marking and the inclusion of the development on appropriate aviation charts will minimise effects to aviation flight operations and would apply to the development of AyM, as included in the commitments set out under Table 8. These commitments will comply with current guidelines and be agreed with the appropriate stakeholders and secured as requirements of the DCO.

67 Pilots are obliged to plan their flying activities in advance and to be familiar with any en-route obstacles they may encounter; however, during flight, weather conditions or operational requirements may necessitate route adjustments. In VMC conditions, pilots are ultimately responsible for seeing and avoiding obstructions such as wind turbines and will be aware through notification procedures of AyM. When operating IMC pilots will be utilising on board radar which detects obstructions, will be at or above the MSA and will likely be under the control of ATC with an appropriate level of radar service. The impact is predicted to be of regional spatial extent and of permanent duration. It is predicted that the impact will affect the receptor directly however, the magnitude is considered to be **low adverse**.

Sensitivity of the receptor

68 Helicopter operators, the MoD and ATC service providers will be notified of the operational period of AyM and will continue to be consulted with regard to the potential for AyM to create an obstruction to aviation activities conducted in the airspace surrounding the operational wind turbines. Embedded mitigation and notification of construction and operation of the wind farm and the lighting and promulgation on aviation charts will reduce any physical obstruction effect to aviation activities in the region of the development. The ability of aviation receptors to continue using the portion of the Irish Sea airspace in which AyM will operate is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **medium**.

Significance of the effect

69 Overall, the sensitivity of the receptor is considered to be medium adverse, and the magnitude of the impact is deemed to be low adverse. The effect will, therefore, be of ***minor adverse*** which is not significant in terms of the EIA Regulations.

13.11.2 Wind turbines causing permanent interference on civil and military radar systems

70 The operational wind turbines of the AyM array would be theoretically detectable by the NATS Great Dun Fell and St Anne's PSRs. Wind turbines detectable by a PSR system might degrade the system by creating false targets, reduce system sensitivity, create radar shadowing behind the wind turbines and saturate the radar receiver leading to clutter potentially concealing real aircraft targets.

Magnitude of impact

71 The AyM array area will be theoretically detectable by and create unacceptable interference to the following PSR systems:

- NATS Great Dun Fell (located in east Cumbria); and
- NATS St Anne's (located at Lytham St Anne's).

72 Radar LoS analysis which assessed a blade tip height of 336 m amsl, concluded that all of the operational wind turbines of AyM placed within the array area will be highly likely to be theoretically detectable by the St Anne's PSR system; the Great Dun Fell PSR may theoretically detect the AyM wind turbines by varying degrees which may lead to a degradation of the system and the presentation of radar clutter.

73 The impact to radar systems is predicted to be of regional spatial extent and of permanent duration. It is predicted that the impact will affect the receptor directly, the magnitude is considered to be **medium adverse**.

Sensitivity of the receptor

74 NATS aim to ensure 'clutter free' radar to continue to deliver a safe and effective ATS. Radar stakeholders are considered to be of high vulnerability, low recoverability and high value. The sensitivity of NATS is therefore, considered to be **high**.

Significance of the effect

75 Overall, the sensitivity of NATS is considered to be high and the magnitude of the impact is deemed to be medium. The effect for NATS will, therefore, be of ***major adverse*** which is significant in terms of the EIA Regulations.

Further mitigation

Great Dun Fell and St Anne's PSRs

76 Suitable mitigation of the effects on the Great Dun Fell and St Anne's PSR has been identified by NATS during the consultation completed to date (see Table 2). The mitigation solution will be subject to commercial agreement between the Applicant and NATS and will be implemented by radar blanking of the affected areas of the Great Dun Fell and St Anne's PSRs which will remove all wind turbine radar returns; however, all other radar returns in the blanked area will also be removed. To resolve this, radar data from the NATS Clee Hill PSR (which does not detect the wind turbines) will 'infill' the 'blanked' areas ensuring 'clutter free' radar coverage above the array. With agreed mitigation in place impact will be negligible and with mitigation in place the residual effect to the Great Dun Fell and St Anne's PSRs will be ***not significant***.

13.11.3 Wind turbines creating an impact to Instrument Flight Rules offshore helicopter operations to oil and gas platforms.

Magnitude of Impact

77 The Applicant has commenced consultation with ENI who is the operator of potentially impacted offshore helideck platforms, together with those offshore helicopter operators that may operate the platforms in the affected area and this consultation will continue throughout the timeline of the application process. ENI who are operators of the adjacent oil and gas platforms which operate a helideck were consulted in order to establish if an interaction between helicopters operating to the platforms and the development would exist. It was noted that subject to confirmation by ENI, it is predicted by ENI that no effect to helicopter operations to platforms and aviation radio communications would exist. NHV who provide helicopter services to ENI under contract, have stated that due to the proximity of AyM to their operation to offshore helicopter platforms mitigation may be required due to the potential of a new obstacle environment created by above-sea infrastructure associated with AyM. Consultation with NHV and ENI will continue to reach agreement of mutual coexistence of both operations and development. The impact is predicted to be of regional spatial extent and of long-term duration. It is predicted that the impact will affect the receptor directly; at this stage the magnitude is **medium adverse** for all relevant platforms.

Sensitivity of the receptor

78 The sensitivity of the receptor is dependent on the frequency and ease of existing platform access by helicopter, which will be informed once consultation with ENI and NHV is complete. ENI who are the operator of the three oil and gas platforms that are located within 9 NM of the array have indicated that they do not expect an impact to the operation of helicopters to their platforms which will be confirmed after ENI internal conversations. NHV added that it would now be up to ENI to determine the acceptability of any safety restrictions, and whether further study on the frequency of lost flying days was warranted. Further consultation will be completed throughout the application phase; however, from the response provided from ENI, a **low** sensitivity has been applied.

Significance of the effect.

79 At this stage it is anticipated that overall, the sensitivity of the receptor will be deemed to be **low** and the magnitude of the impact is deemed to be **medium adverse**. Based on consultation response, assessment predicts an effect of ***minor adverse*** which is not significant in terms of the EIA Regulations.

13.12 Environmental assessment: decommissioning phase

13.12.1 Creation of an aviation obstacle

Magnitude of impact

80 During the decommissioning phase, the presence and movement of decommissioning infrastructure may present a potential collision risk to aircraft in the vicinity specifically to low flying aircraft. A range of mitigation measures (notification, lighting and marking and inclusion of AyM on aviation charts) to minimise environmental effects would apply to the decommissioning of the proposed project. These will comply with current guidelines and be agreed with the appropriate stakeholders and are outlined in Table 8. Pilots are obliged to plan their flying activities in advance and to be familiar with any en-route obstacles they may encounter; however, during flight, weather conditions or operational requirements may necessitate route adjustments. Pilots are ultimately responsible for seeing and avoiding obstructions such as wind turbines and decommissioning infrastructure and will be aware through previous notification procedures of the operational AyM. Mitigation implemented will remain in place until the last wind turbine has been removed. The impact is predicted to be of regional spatial extent and of short-term duration and intermittent. It is predicted that the impact will affect the receptor directly, the magnitude is therefore, considered to be **low adverse**.

Sensitivity of the receptor

81 Helicopter operators, the MoD and ATC service providers will be notified of the decommissioning phase of AyM and will continue to be consulted with regard to the potential for decommissioning infrastructure to create an obstruction to aviation activities conducted in the airspace surrounding the decommissioning infrastructure. Notification of the decommissioning of AyM, embedded mitigation of lighting and charting on aviation charts will reduce any physical obstruction effect. The ability of aviation stakeholders to continue using the portion of the Irish Sea airspace in which AyM will be operated and decommissioned is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **medium**.

Significance of the effect

82 Overall, the sensitivity of the receptor is considered to be medium, and the magnitude of the impact is deemed to be low. The effect will, therefore, be of ***minor adverse*** which is not significant in terms of the EIA Regulations.

13.13 Environmental assessment: cumulative effects

83 Cumulative effects are defined as the effects on a receptor that might arise when the development is considered together with other existing and/ or approved projects, plans and activities. A fundamental requirement of undertaking the Cumulative Effects Assessment (CEA) is to identify those projects, plans and activities with which AyM might interact to produce a cumulative effect. These interactions might arise within the construction and operation and maintenance phases of the project. Please note that due to the anticipated operating lifetime of the project (approximately 25 years) as outlined in Volume 1, Annex 3.1: Cumulative Effects Assessment, it is not possible to undertake a meaningful assessment of potential cumulative effects for the decommissioning phase at this time as the baseline aviation environment, airspace design, airspace users and radar mitigation technologies may change over such a long period of time.

84 The plans and projects selected as relevant to the CEA of impacts to military and civil aviation and radar are based on an initial screening exercise undertaken on a long list. The CEA methodology and long list are described in Volume 1, Annex 3.1: Cumulative Effects Assessment. A consideration of effect-receptor pathways, data confidence and temporal and spatial scales has been given to select projects for a topic-specific short-list. By virtue of its distance from centres of aviation activity (including airports and training activities), AyM produces fewer direct adverse effects on aviation operations than an equivalent onshore development.

85 The CEA presented in this chapter has been undertaken on the basis of information presented in the ES for the other projects, plans and activities. Given that this broadly represents an MDS, the level of cumulative impact on military and civil aviation would highly likely be reduced from those presented here.

86 The specific projects scoped into the CEA for aviation and radar, as well as the tiers into which they have been allocated are presented in Table 9 below.

Table 9: Projects considered within the military and civil aviation cumulative effect assessment.

DEVELOPMENT TYPE	PROJECT	STATUS	DATA CONFIDENCE ASSESSMENT	TIER
Offshore Wind Farm	Gwynt y Môr	Operational	High	Tier 1
Offshore Wind Farm	Rhyl Flats	Operational	High	Tier 1
Offshore Wind Farm	North Hoyle	Operational	High	Tier 1
Offshore Wind Farm	Burbo Bank	Operational	High	Tier 1

DEVELOPMENT TYPE	PROJECT	STATUS	DATA CONFIDENCE ASSESSMENT	TIER
Offshore Wind Farm	Burbo Bank Extension	Operational	High	Tier 1
Offshore Wind Farm	West of Duddon Sands	Operational	High	Tier 1
Offshore Wind Farm	Walney Extension 4	Operational	High	Tier 1
Offshore Wind Farm	Barrow	Operational	High	Tier 1
Offshore Wind Farm	Walney 1	Operational	High	Tier 1
Offshore Wind Farm	Walney 2	Operational	High	Tier 1
Offshore Wind Farm	Ormonde	Operational	High	Tier 1
Offshore Wind Farm	Walney Extension 3	Operational	High	Tier 1
Offshore Wind Farm	EnBW and BP 1 – Round 4	Concept/ early planning	Low	Tier 3
Offshore Wind Farm	Cobra and Flotation Energy – Round 4	Concept/ early planning	Low	Tier 3
Offshore Wind Farm	EnBW and BP 2 – Round 4	Concept/ early planning	Low	Tier 3

DEVELOPMENT TYPE	PROJECT	STATUS	DATA CONFIDENCE ASSESSMENT	TIER
Offshore Wind Farm	Isle of Man	Concept	Medium	Tier 3

87 Certain impacts assessed for AyM are not considered in the cumulative assessment due to:

- The highly localised nature of the impacts (i.e. they occur entirely within the AyM array boundary only).
- Management measures in place for AyM will also be in place on other projects reducing their risk of occurring.
- Where the potential significance of the impact from AyM alone has been assessed as negligible.

88 The impacts excluded from the CEA for the above reasons are:

- Wind turbines creating an impact to Instrument Flight Rules offshore helicopter operations to oil and gas platforms.

89 Therefore, the effects that are considered in the CEA are as follows:

- Creation of an aviation obstacle.
- Wind turbines causing permanent interference on civil and military radar systems.

90 The cumulative MDS is described in Table 10.

Table 10: Cumulative MDS.

POTENTIAL EFFECT	SCENARIO	JUSTIFICATION
Creation of an aviation obstacle.	MDS for AyM plus the cumulative full development of the following projects within 40 km of the AyM array. Tier 1: - Gwynt y Môr.	This includes the presence of other developments which will have the potential to create a cumulative aviation obstacle and affect the available airspace for

POTENTIAL EFFECT	SCENARIO	JUSTIFICATION
	▲ Rhyl Flats. ▲ North Hoyle. ▲ Burbo Bank. ▲ Burbo Bank Extension. Tier 2: No Tier 2 projects identified. Tier 3: ▲ Cobra & Flotation Energy - Round 4.	other users in the same region.
Wind turbines causing permanent interference on civil and military radar systems.	MDS for AyM plus the cumulative full development of the following projects within 100 km of the AyM array: Tier 1: ▲ Gwynt y Môr. ▲ Rhyl Flats. ▲ North Hoyle. ▲ Burbo Bank. ▲ Burbo Bank Extension. ▲ West of Duddon Sands. ▲ Walney Extension 4. ▲ Barrow. ▲ Walney 1. ▲ Walney 2. ▲ Ormonde. ▲ Walney Extension 3. Tier 2: No Tier 2 projects identified. Tier 3: ▲ EnBW and BP 1 - Round 4.	Maximum radar cumulative effect is calculated within a representative 100 km buffer of AyM.

POTENTIAL EFFECT	SCENARIO	JUSTIFICATION
	▲ Cobra & Flotation Energy - Round 4. ▲ EnBW and BP 2 - Round 4. ▲ Isle of Man Offshore Wind Farm	

91 A description of the significance of cumulative effects on military and civil aviation and radar arising from each identified impact is given below.

Creation of an aviation obstacle.

92 There is potential for cumulative aviation obstacle effect as a result of AyM through all development phases and other projects (Table 10). For the purposes of this ES and based on professional judgement, this additive impact has been assessed within 40 km from AyM, which is considered to be the maximum range where the creation of an aviation obstacle to fixed wing and rotary aircraft operating offshore may occur although some impacts are likely to be localised to the AyM array area.

93 The adjacent operational offshore wind farm projects are likely to be served by helicopters in support of operation and maintenance; furthermore, the oil and gas industry is served by helicopter flights from both Liverpool and Blackpool Airports. The cumulative increase in helicopter operations from the project alone together with those existing flights to the adjacent oil and gas platforms could be noticeable, particularly as flights may be concentrated in a regional obstruction area and may impact other users of the airspace including military low flying aircraft and airborne SAR flights.

94 The impact is predicted to be of regional spatial extent, long-term duration, continuous and not reversible for the operational lifetime of AyM. Paragraph 59 provides pilots responsibilities with regard to obstacles. It is considered that low flying operations in the fillet of airspace presently available between the obstructions created by the operational offshore wind farms and oil and gas infrastructure and the lower portion of CAS above would not be affected by the operation of the development. It is predicted that the impact will affect the aviation receptors operating in the airspace directly but without a change to present operating parameters and therefore the magnitude is considered to be **low adverse**.

95 The impact to aviation receptors operating offshore is deemed to be of low vulnerability, high recoverability and high value. Aviation operations in the UK are highly regulated. The AyM array area is located in airspace where the provision of an ATS is routine. The same rules of the air which maintain a safe operating environment in the current baseline will apply in the airspace surrounding the array during all phases of development and the provision of the ATS will not be affected. The sensitivity of the receptors is therefore, considered to be **medium**.

96 Overall, the sensitivity of the receptor is considered to be **medium,** and the magnitude of impact is deemed to be **low adverse**. The effect will, therefore, be of ***minor adverse*** which is not significant in terms of the EIA Regulations.

Wind turbines causing permanent interference on civil and military radar systems

97 There is potential for cumulative radar effect as a result of AyM through the operation and maintenance phases and other projects (Table 10). For the purposes of this ES and based on professional opinion, this additive impact to aviation radar has been assessed within 100 km from AyM, which is considered to be the maximum range where radar cumulative effects may occur although some impacts are likely to be localised to the AyM array area due to the unmitigated effect created by the detection of operational wind turbines.

98 Theoretical radar LoS analysis for the NATS Great Dun Fell and St Anne's PSR indicates that the operational AyM wind turbines with a tip height of 336 m amsl, would be considered to be detectable (by varying degrees) to the radar systems.

99 Other offshore wind farms that are considered likely to be detected by the radar systems are listed in Table 10. Unmitigated the potential cumulative effect will be to add to the radar clutter and possibly an increase in the individual signal processing demands of the predicted effected PSRs. The impact is predicted to be of regional spatial extent, long-term duration, intermittent and not reversible for the lifetime of AyM. It is predicted that the impact will affect the receptor directly. The magnitude is considered to be **medium adverse**.

100 NATS require 'clutter free' radar to continue to deliver a safe and effective ATS in the safety critical environment. Radar stakeholders are considered to be of high vulnerability, low recoverability and high value. The sensitivity of these receptor is therefore, considered to be **high**.

101 The sensitivity NATS is **high** and the worst-case magnitude of potential cumulative effects is deemed to be, without mitigation, **medium adverse**. The impact for all of the receptors considered would therefore, in the absence of mitigation, have ***major adverse*** cumulative impacts on radar receptors of data provided by the effected PSRs. However, as mitigation will have been required for those radar systems which are affected by operational and planned projects, no radar cumulative effect will be apparent. With agreed mitigation in place impact will be negligible and therefore the residual effect will be ***minor adverse*** which is not significant in terms of the EIA Regulations for all scenarios due to the requirement for a technical solution to mitigate radar effect.

13.14 Inter-relationships

102 The greatest potential for spatial and temporal interactions is likely to occur due to interaction or creation of an aviation obstacle. The individual standalone impacts were assigned significance of minor adverse. ATS provision and the rules of air, including the 'see and be seen principle', will mean reduced potential for inter and intra-related effects for helicopter operators and the MoD alike, operating at low level in the airspace surrounding the array. It is therefore anticipated the significance of these combined effects on airspace users will not be of any greater significance than the effects when assessed in isolation (i.e., minor adverse significance).

13.15 Transboundary effects

103 AyM is contained wholly in the UK FIR and UK waters and therefore there are no transboundary considerations for military and civil aviation. However, in line with The IoM Government response to Scoping, consultation with Ronaldsway (IoM) Airport has continued. The IoM Government confirmed by email (Table 2) that the development AyM will not affect operations conducted at the Airport.

13.16 Summary of effects

104 Table 11 presents a summary of the significant effects assessed within this ES, any mitigation required, and the residual effects are provided.

Table 11: Summary of effects.

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL EFFECT
CONSTRUCTION				
Creation of an aviation obstacle	Low adverse	Medium	None proposed beyond existing embedded mitigation and commitments.	Minor adverse (not significant)
OPERATION				
Creation of an aviation obstacle	Low adverse	Medium	None proposed beyond existing embedded mitigation and commitments	Minor adverse (not significant)
Wind turbines causing permanent interference on civil and military radar systems	Medium adverse	High	NATS – Radar blanking and infill. With agreed mitigation in place impact will be negligible	Minor adverse (not significant)

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL EFFECT
Wind turbines creating an impact to Instrument Flight Rules offshore helicopter operations to oil and gas platforms	Medium adverse	Low	None proposed beyond existing embedded mitigation and commitments	Minor adverse (not significant)
DECOMMISSIONING				
Creation of an aviation obstacle	Low adverse	Medium	None proposed beyond existing embedded mitigation and commitments	Minor adverse (not significant)
CUMULATIVE EFFECTS				
Creation of an aviation obstacle	Low adverse	Medium	None proposed beyond existing embedded mitigation and commitments	Minor adverse (not significant)
Wind turbines causing permanent	Medium adverse	High	NATS – Radar blanking and infill.	Minor adverse (not significant)

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL EFFECT
interference on civil and military radar systems			With agreed mitigation in place impact will be negligible	

13.17 References

DECC (2011) EN-1 Overarching NPS for Energy.

DECC (2011a) EN-3 National Policy Statement for Renewable Energy Infrastructure.

CAA (2016) CAP 764 Policy and Guidelines on Wind Turbines.

MCA (2021) Safety of Navigation: Offshore Renewable Energy Installations OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response.

CAA (2021a) CAP 437 Standards for Offshore Helicopter Landing Areas.

ICAO Doc.8168 Ops/611 Procedures for Air Navigation Services Aircraft Operations.

CAA (2019) CAP 168 Licensing of Aerodromes.

CAA (2021) CAP 393 The Air Navigation Order 2016 and Regulations.

CAA (2019a) CAP 670 Air Traffic Services Safety Requirements.

Osprey (2020) Aviation section of the Scoping Report.

CAA (2021) Visual Flight Rules Chart – Northern England.

NATS (2021b) CAP 032 United Kingdom Integrated Aeronautical Information Package.

MoD (2021) Military Aeronautical Information Publication.

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Fferm Wynt Alltraeth

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