Partners in UK offshore wind

MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

Environmental Statement

Volume 2, Chapter 11: Aviation and radar

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11.1	Aviation and radar technical report, including: • Appendix A, Helicopter Access Report (HAR) (Anatec, 2023) • Appendix B, Instrument Flight Procedures (IFP) assessment (Osprey, 2024).

Glossary

Term	Meaning
Air Traffic Control Surveillance Minimum Altitude Chart (ATCSMAC)	The purpose of an ATCSMAC is to provide minimum safe altitudes in the vicinity of an aerodrome. The ATCSMAC is based laterally as per the dimensions defined in regulatory guidance and vertically to safely clear all obstacles as per the requirement for vectoring Instrument Flight Rules (IFR) flights with Primary and/or Secondary Surveillance radar equipment,
Controlled airspace	Airspace in which Air Traffic Control exercises authority. In the UK, Class A, C, D and E airspace is controlled. Within controlled airspace flights are subject to air traffic control service with standard separation maintained between aircraft.
Flight Level	A standard nominal altitude of an aircraft, in hundreds of feet, based upon a standardised air pressure at sea-level.
Helicopter Main Route Indicator (HMRI)	Routes which are established to facilitate safe helicopter flights in Instrument Flight Rules (IFR) conditions (i.e. when flight cannot be completed in visual conditions).
Instrument Approach	A procedure used by helicopters for low-visibility offshore approaches to offshore platforms which relies upon an aircraft's on-board weather radar for guidance and as a means of detecting obstacles in the approach path.
Instrument Flight Rules (IFR)	The rules governing procedures for flights conducted on instruments.
Instrument Meteorological Conditions (IMC)	Weather conditions which would preclude flight by the Visual Flight Rules (VFR) (i.e. conditions where the aircraft is in or close to cloud or flying in visibility less than a specified minimum).
Minimum Sector Altitude (MSA)	Under aviation flight rules, the altitude below which it is unsafe to fly in IMC owing to presence of terrain or obstacles within a specified area.
MultiLATeration (MLAT)	MLAT calculates the position of an aircraft using the time difference of the received signals from the Secondary Surveillance Radar (SSR) sensor and transponders on board the aircraft. The position of the aircraft is then determined by triangulation of information received from several MLAT sensors.
Radar shadow	A region shielded from radar illumination by an intervening object (e.g. a wind turbine).
Surveillance Minimum Altitude Area	The Surveillance Minimum Altitude Areas are promulgated in order to relieve controllers of the responsibility for determining the heights where the sequencing and separation of arriving IFR flights with Primary and/or Secondary Surveillance radar is taking place.
Uncontrolled airspace (Class G)	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. Aircraft operating in uncontrolled airspace may be in receipt of an ATS; however, within this classification of airspace, pilots are ultimately responsible for their own terrain and obstacle clearance.
Visual Flight Rules (VFR)	The rules governing flight conducted in Visual Meteorological Conditions (VMC) utilising outside visual reference; maintaining separation from obstacles and other aircraft visually. Clouds, heavy precipitation, low visibility, and otherwise adverse weather conditions should be avoided under VFR.

Term	Meaning
Visual Meteorological Conditions	A flight category which allows flight to be conducted under Visual Flight Rules (VFR) in flight conditions where pilots have sufficient visibility to fly and maintain separation from the terrain and other aircraft (as opposed to exclusive reliance on flight instruments).

Acronyms

Acronym	Description
ACC	Area Control Centre
AIP	Aeronautical Information Publication
AIS	Aeronautical Information Service
AMSL	Above Mean Sea Level
ANO	Air Navigation Order
ARA	Airborne Radar Approach
ATC	Air Traffic Control
ATCSMAC	Air Traffic Control Surveillance Minimum Altitude Chart
ATDI	Advanced Topographic Development and Imaging
ATS	Air Traffic Service
BAES	British Aerospace Systems
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CAS	Controlled Airspace
CAT	Civil Air Transport
CEA	Cumulative Effects Assessment
CNS	Communication Navigation and Surveillance
DCO	Development Consent Order
DESNZ	Department for Energy Security and Net Zero
DGC	Defence Geographic Centre
DME	Distance Measuring Equipment
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
FIR	Flight Information Region
HAR	Helicopter Access Report
HMRI	Helicopter Main Route Indicators
IAIP	Integrated Aeronautical Information Package
ICAO	International Civil Aviation Organisation
IFP	Instrument Flight Procedures

Acronym	Description
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IoM	Isle of Man
IR	Infra-Red
LAT	Lowest Astronomical Tide
LoS	Line of Sight
MCA	Maritime and Coastguard Agency
MDS	Maximum Design Scenario
MGN	Marine Guidance Note
MilAIP	Military Aeronautical Information Publication
MLAT	MultiLATeration
MOD	Ministry of Defence
MSA	Minimum Sector Altitude
NERL	NATS En-Route Limited
NHV	Noordzee Helikopters Vlaanderen
NOTAM	Notice to Aviators
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
NSTA	North Sea Transition Authority
NSWWS	National Severe Weather Warning Service
NUI	Normally Unmanned Installation
OGA	Oil and Gas Authority
OLS	Obstacle Limitation Surface
OREI	Offshore Renewable Energy Installation
OSP	Offshore Substation Platform
PDE	Project Design Envelope
PEIR	Preliminary Environmental Information Report
PEXA	Practice and Exercise Areas
PMO	Prime Minister’s Office
PSR	Primary Surveillance Radar
RAF	Royal Air Force
RCS	Radar Cross Section
RDDS	Radar Data Display Screen
RDP	Radar Data Processor

Acronym	Description
SAR	Search and Rescue
SMAA	Surveillance Minimum Altitude Area
SoCG	Statement of Common Ground
SSR	Secondary Surveillance Radar
TMZ	Transponder Mandatory Zone
UKHO	United Kingdom Hydrographic Office
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions

Units

Unit	Description
cd	Candela
ft	Feet
km	Kilometre
m	Metre
nm	Nautical mile

11 Aviation and radar

11.1 Introduction

11.1.1 Overview

11.1.1.1 This chapter of the Environmental Statement presents the assessment of the potential impact of the Morgan Offshore Wind Project: Generation Assets (hereafter referred to as the Morgan Generation Assets) on aviation and radar. Specifically, this chapter considers the potential impacts of the Morgan Generation Assets on aviation and radar receptors within the aviation and radar study area (see section 11.4.2) during the construction, operations and maintenance, and decommissioning phases.

11.1.1.2 This chapter has been written by Osprey Consulting Services Ltd (Osprey), with the assessment undertaken with specific reference to the relevant legislation and guidance and draws upon information contained within Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement, which contains:

- Appendix A, Helicopter Access Report (HAR) (Anatec, 2023) which details access to current Irish Sea (Liverpool Bay) oil and gas installations (platforms) near the Morgan Generation Assets
- Appendix B, Instrument Flight Procedures (IFP) assessment (Osprey, 2024) detailing published flight procedures of Irish Sea littoral aerodromes.

11.2 Legislative and policy context

11.2.1 Legislation

11.2.1.1 The Civil Aviation Authority (CAA) Civil Aviation Publication (CAP) 393: The Air Navigation Order (ANO) (CAA, 2022) sets out the provisions of the ANO as amended together with the legislation 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 version of the air navigation regulations and is edited by the legal advisers' department of the CAA. CAP 393 also includes application of aviation obstruction lighting to wind turbines in UK territorial waters. Additional relevant guidance is provided in section 11.4.1.

11.2.2 Planning policy context

11.2.2.1 The Morgan Generation Assets will be located wholly within English offshore waters (beyond 12 nautical miles (nm) from the English and Welsh coasts). As set out in Volume 1, Chapter 1: Introduction of the Environmental Statement, the Morgan Generation Assets are an offshore generating station with a capacity of greater than 100 MW located in English waters and therefore is a Nationally Significant Infrastructure Project (NSIP) as defined by Section 15(3) of the Planning Act 2008 (as amended) (the 2008 Act). As such, there is a requirement to submit an application for a Development Consent Order (DCO) to The Planning Inspectorate to be decided by the Secretary of State for the Department for Energy Security and Net Zero (DESNZ).

11.2.3 National Policy Statements

11.2.3.1 There are currently six energy National Policy Statements (NPSs), two of which contain policy relevant to offshore wind development and the Morgan Generation Assets, specifically:

- Overarching NPS for Energy (NPS EN-1) which sets out the UK Government's policy for the delivery of major energy infrastructure (Department for Energy Security and Net Zero (DESNZ), 2023a)
- NPS for Renewable Energy Infrastructure (NPS EN-3) (DESNZ, 2023b).

11.2.3.2 NPS EN-1 and NPS EN-3 include guidance on what matters are to be considered in the assessment. These are summarised in Table 11.1. NPS EN-1 also highlights a number of factors relating to the determination of an application and in relation to mitigation. These are summarised in Table 11.2.

Table 11.1: Summary of the NPS EN-1 and NPS EN-3 provisions relevant to aviation and radar.

Summary of NPS EN-1 and EN-3 provision	How and where considered in the Environmental Statement
NPS EN-1	
Aerodromes that are officially safeguarded will have officially produced plans that show the Obstacle Limitation Surfaces (OLS). Care must be taken to ensure that new developments do not infringe these protected OLS except where an aerodrome operator has considered the development and either determined there to be no adverse impact or agreed an acceptable mitigation can be put in place, as these encompass the critical airspace within which key air traffic associated with the aerodrome operates. Paragraph 5.5.11	The potential impacts of the Morgan Generation Assets on aerodromes and airport safeguarded surfaces are considered in section 11.9.2 and in Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement (Appendix B, IFP assessment).
New energy infrastructure may cause obstructions in MOD low flying areas. A balance must be struck between defence and energy needs in these areas. Paragraph 5.5.19	The potential impacts of the Morgan Generation Assets on military low flying activities are considered in section 11.9.2.
The joint industry and government Air Defence and Offshore Wind Mitigation Task Force was set up to enable the co-existence of UK Air Defence and offshore wind. The Strategy and Implementation Plan sets the direction for that collaboration. The recommendations generated from this Task Force should be referred to by both defence and energy stakeholders. Paragraph 5.5.36	The potential impacts of the Morgan Generation Assets on aviation radar are considered in section 11.9.3.
Where the proposed development may affect the performance of civil or military aviation Communication, Navigation and Surveillance (CNS), meteorological radars and/or other defence assets an assessment of potential effects should be set out in the Environmental Statement. Paragraph 5.5.37	The potential impacts of the Morgan Generation Assets on civil and military aviation CNS, meteorological radar and/or other defence assets are considered in section 11.1 and assessed, where relevant, in section 11.9.

Summary of NPS EN-1 and EN-3 provision	How and where considered in the Environmental Statement
The Applicant should consult the Ministry of Defence (MOD), the Met Office, 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, meteorological or other defence interests. Paragraph 5.5.39	A summary of the consultation carried out specific to aviation and radar is provided in Table 11.4. A full record of consultation is provided in the Consultation report (Document reference E3).
Any assessment of effects on aviation, meteorological or other defence interests should include potential impacts of the project upon the operation of CNS infrastructure, flight patterns (both civil and military), generation of weather warnings and forecasts, other defence assets (including radar) and aerodrome operational procedures. It should also assess the demonstratable cumulative effects of the project with other relevant projects in relation to aviation, meteorological and defence. Paragraph 5.5.40	The potential impacts of the Morgan Generation Assets during the construction, operations and maintenance, and decommissioning phases are considered in section 11.1 and assessed, where relevant, in section 11.9. The assessment of aviation flight patterns is provided in Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement (Appendix B, IFP assessment). Cumulative impacts are assessed within section 11.10.
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, meteorological and defence consultees are informed as soon as reasonably possible. Paragraph 5.5.42	All changes made during the pre-application period have been communicated to the relevant consultees as captured in Table 11.4. On 19 September 2023, an announcement was made regarding refinements to the Morgan Generation Assets, including a reduction in the Morgan Array Area from the boundary presented in the Preliminary Environmental Information Report (PEIR), an increase in the minimum spacing between the wind turbines, and maximum blade tip height. An electronic newsletter was distributed to the Morgan Generation Assets prescribed consultees (section 42) via email, signposting to the websites for further information. The information was sent to the relevant aviation, meteorological and defence consultees a day in advance of the public announcement.
The applicant should include appropriate mitigation measures as an integral part of the proposed development. Paragraph 5.5.43	Measures adopted as part of the Morgan Generation Assets are included in section 11.9.3.9.
Lighting must also be designed in such a way as to ensure that there is no glare or dazzle to pilots and/or Air Traffic Control (ATC), aerodrome ground lighting is not obscured and that any lighting does not diminish the effectiveness of aeronautical ground lighting and cannot be confused with aeronautical lighting. Lighting may also need to be compatible with night vision devices for military low flying purposes. Paragraph 5.5.55	The consideration of the fitment of aeronautical lighting is provided in Table 11.15.
NPS EN-3	

Summary of NPS EN-1 and EN-3 provision	How and where considered in the Environmental Statement
The applicant will need to assess impacts on civil and military radar and other aviation and defence interests. Paragraph 2.8.50	The potential impacts of the Morgan Generation Assets during the construction, operations and maintenance, and decommissioning phases on civil and military radar and other aviation and defence interests are considered in section 11.1 and assessed, where relevant, in section 11.9. The assessment of civil and military aviation radar is provided in Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement.
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. Subject to other constraints, wind turbines should be laid out within a site, in a way that minimises collision risk. Paragraph 2.8.240	Detailed discussions have progressed with relevant aviation consultees; aviation and navigation lighting is discussed in Table 11.15. A full record of consultation is provided in the Consultation report (Document reference E3).
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. As such, appropriate mitigation should be included in any application, and ideally agreed between relevant parties. Paragraph 2.8.261	Consultation on mitigation principles is provided in Table 11.4. Where relevant, further mitigation is discussed within the assessment presented in section 11.9.

Table 11.2: Summary of NPS EN-1 policy on decision making relevant to aviation and radar.

Summary of NPS EN-1 policy	How and where considered in the Environmental Statement
The Secretary of State should be satisfied that the effects on meteorological radars, civil and military aerodromes, aviation technical sites and other defence assets or operations have been addressed by the applicant and that any necessary assessment of the proposal on aviation, National Severe Weather Warning Service (NSWWS) or defence interests has been carried out. Paragraph 5.5.49	The potential impacts of the Morgan Generation Assets during the construction, operations and maintenance, and decommissioning phases on aviation and radar receptors are considered in section 11.1 and assessed, where relevant, in section 11.9. The assessment of civil and military aviation radar is provided in Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement.
The Secretary of State should be satisfied that the proposal has been designed, where possible, to minimise adverse impacts on the operation and safety of aerodromes and that realistically achievable mitigation is carried out on existing surveillance systems such as radar/tracking technologies. Paragraph 5.5.50	The potential impacts of the Morgan Generation Assets during the construction, operations and maintenance, and decommissioning phases are considered in section 11.1 and assessed, where relevant, in section 11.9. The assessment of aviation flight patterns is provided in Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement (Appendix B, IFP assessment).

Summary of NPS EN-1 policy	How and where considered in the Environmental Statement
When assessing the necessity, acceptability, and reasonableness of operational changes to aerodromes, the Secretary of State should be satisfied that they have the necessary information regarding the operational procedures along with any demonstrable risks or harm of such changes, taking into account the cases put forward by all parties. When making such a judgement in the case of military aerodromes, the Secretary of State should have regard to interests of defence and national security. Paragraph 5.5.51	The potential impacts of the Morgan Generation Assets during the construction, operations and maintenance, and decommissioning phases on aerodromes are considered in section 11.1 and assessed, where relevant, in section 11.9. The assessment of aviation flight patterns is provided in Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement (Appendix B, IFP assessment).
In the case of meteorological radars, the Secretary of State should consider the extent to which the provision of weather and flood warnings is compromised. Paragraph 5.5.52	Meteorological radar is considered within Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement. Impacts to meteorological radar are scoped out as discussed in Table 11.6.
If there are conflicts between the government's energy and transport policies and military interests in relation to the application, the Secretary of State should expect the relevant parties to have made appropriate efforts to work together to identify realistic and pragmatic solutions to the conflicts. In so doing, the parties should seek to protect the aims and interests of the other parties as far as possible, recognising simultaneously the evolving landscape in terms of the UK's energy security and the need to tackle climate change, which necessitates the installation of wind turbines and the need to maintain air safety and national defence and the national weather warning service. Paragraph 5.5.53	The consultation process with relevant civil and military authorities is provided in Table 11.4.
There are statutory requirements concerning lighting to tall structures. Where lighting is requested on structures that goes beyond statutory requirements by any of the relevant aviation and defence consultees, the Secretary of State should be satisfied of the necessity of such lighting taking into account the case put forward by the consultees. The effect of such lighting on the landscape and ecology may be a relevant consideration. Paragraph 5.5.54	The consideration of the fitment of aeronautical lighting is provided in Table 11.15.
Where new technologies to mitigate the adverse effects of wind farms on surveillance systems, such as radar, are concerned, the Secretary of State should have regard to any Civil Aviation Authority guidelines and/or government guidance which emerges from existing and future including the joint government/Industry Aviation Management Board and the Joint Air Defence and Offshore Wind Task Force. Paragraph 5.5.56	Consultation on mitigation principles is provided in Table 11.4.

Summary of NPS EN-1 policy	How and where considered in the Environmental Statement
Where a proposed energy infrastructure development would significantly impede or compromise the safe and effective use of civil or military aviation, meteorological radars, defence assets and/or significantly limit military training, the Secretary of State may consider the use of 'Grampian conditions', or other forms of requirement which relate to the use of current or future technological solutions, to mitigate impacts on legacy CNS equipment. Paragraph 5.5.58	The potential impacts of the Morgan Generation Assets during the construction, operations and maintenance, and decommissioning phases are considered in section 11.1 and assessed, where relevant, in section 11.9. The project will not signiifcantly impede or compromise safe and effective aviation activity.

11.2.4 North West Inshore and North West Offshore Marine Plans

11.2.4.1 The aviation and radar impact assessment has also been made with consideration to the specific policies set out in the North West Inshore and North West Offshore Marine Plans (The Marine Management Organisation (MMO), 2021). Key provisions are set out in Table 11.3 along with details as to how these have been addressed within the assessment.

Table 11.3: North West Inshore and North West Offshore Marine Plan policies of relevant to aviation and radar.

Policy	Key provisions	How and where considered in the Environmental Statement
NW-DEF-1	Proposals in or affecting Ministry of Defence areas should only be authorised with agreement from the Ministry of Defence.	The Morgan Generation Assets do not overlap with any MOD defence areas (see section 11.5). Consultation with the MOD is summarised in Table 11.4.

11.3 Consultation

11.3.1.1 A summary of the key matters raised during consultation activities undertaken to date specific to aviation and radar is presented in Table 11.4 below, together with how these comments have been considered in the production of this chapter. Further detail is presented within Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement.

Table 11.4: Summary of key matters raised during consultation activities undertaken for the Morgan Generation Assets relevant to aviation and radar.

Date	Consultee and type of response	Comment	Response to comment raised and/or where considered in this chapter
01 January 2022	NATS Technical and Operational Assessment	NATS informed that there will be a predicted impact to NATS St Anne's and Lowther Hill Primary Surveillance Radar (PSR) systems created by the radar detection of the operational wind turbines and the creation of unwanted radar returns.	The potential impact to NATS infrastructure is considered in section 11.9.3.10.
04 May 2022	Noordzee Helikopters Vlaanderen (NHV)	NHV provide helicopter support to both Spirit Energy (including Harbour Energy) and Eni. Raised that impacts of varying degrees may be experienced by helicopter operations completed in poor weather conditions to the offshore hydrocarbon platforms due to the creation of obstacles.	The potential impact on helicopter access to Harbour Energy offshore platforms is considered in section 11.9.2 and supported by Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement (Appendix A: HAR).
06 May 2022	Liverpool Airport Response to scoping	Radar LoS analysis predicts that the Morgan Array Area will not be detectable by the Liverpool Airport PSR. In the response to engagement, the airport did not raise concerns regarding the potential for radar effect. The airport requested the completion of an IFP assessment in order to establish the IFP safeguarded areas will not be impacted by the Morgan Generation Assets	An IFP assessment has concluded that the airport IFP will not be impacted (see Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement).
14 July 2022	Ministry of Defence Response to Scoping	The MOD requested the fitment of aviation lighting in accordance with CAA requirements. The MOD stated that the Warton and Royal Air Force Valley PSRs have the potential to be affected and require mitigation.	The impact to MOD low flying operations is considered in section 11.9.2 and supported by Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement. The MOD in response to PEIR stated that they do not envisage an impact to

Date	Consultee and type of response	Comment	Response to comment raised and/or where considered in this chapter
			Warton or RAF Valley PSRs (see response 23 June 2023) therefore potential impact to the Warton or RAF Valley PSRs is not considered further.
22 July 2022	The Planning Inspectorate Scoping Opinion	Agreed that scoping out a number of potential impacts from the aviation and radar assessment was acceptable, including: • Impacts to meteorological radar • Impacts to Helicopter Main Route Indicators (HMRIs) • Impacts to Secondary Surveillance Radar (SSR) • Transboundary impacts.	Potential impacts scoped out of the assessment are presented Table 11.6.
20 January 2023	Ronaldsway Isle of Man (IoM) Airport Online Meeting	Ronaldsway ATC asked for clarification of their stakeholder status to better understand their degree of involvement in the engagement process. The Applicant presented the approach to assessing effects and preliminary impact assessment results highlighting the need to engage further on potential mitigation options once the airport has reviewed the PEIR. Ronaldsway Airport agreed to further engagement post-PEIR and initiation of the Statement of Common Ground (SoCG) process. It was noted that the airport will soon be finalising a five year IFP update, review of procedures and Instrument Landing System (ILS) is also approaching completion, and Distance Measuring Equipment (DME) infrastructure will be	Stakeholder status as a non-prescribed consultation body was provisionally addressed in the meeting and followed up with a guidance note. The Applicant will continue to be engaged with the airport with a view to developing a SoCG.

Date	Consultee and type of response	Comment	Response to comment raised and/or where considered in this chapter
		changing, so this is a good opportunity to work together.	
29 March 2023	Walney Aerodrome Online Meeting	Results of assessment analysis concerning Walney Aerodrome was provided. Based on project parameters at the time, a potential impact was predicted to the Minimum Sector Altitude (MSA) at Walney Aerodrome.	The potential impact to Walney Aerodrome is considered within section 11.9.2 and supported by Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement (Appendix B: IFP assessment).
24 April 2023	Liverpool Airport Response to section 42 consultation	Confirmed no objection to the Morgan Offshore Wind Project. However, requested that a flight trial is carried out post-construction to establish if there is any effect to the Liverpool Airport PSR.	A radar line of sight assessment has concluded that the Liverpool Airport PSR system will not theoretically detect the maximum blade tip height wind turbines placed within the Morgan Array Area. An IFP assessment has concluded that the airport IFP will not be impacted (see Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement). As such, no further monitoring or flight trials is proposed by the Applicant.
02 June 2023	Chrysaor Resources (Irish Sea) Ltd (Harbour Energy) Response to section 42 consultation	Provided information on decommissioning for the Millom West normally unmanned platform (NUI) and Millom East subsea structures and outlined the need for continued access via vessel and helicopter (from 2024 to approximately 2030 at Millom West and from 2027 to approximately 2032 at Millom East). Harbour Energy set out their helicopter access requirements to support future decommissioning activities (a radius of 3.3 nm around the Millom East WHPSs and a 2 nm wide corridor extending from the Millom East WHPSs to 7 nm).	The potential impact on helicopter access to Harbour Energy offshore assets is considered in section 11.9.2 and supported by Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement (Appendix A: HAR).

Date	Consultee and type of response	Comment	Response to comment raised and/or where considered in this chapter
		Recognised the need for co-existence and noted commitment for continued engagement with the Applicant to share information.	
02 June 2023	Barrow Offshore Wind Limited, Burbo Extension Ltd, Ørsted Burbo (UK) Limited, Morecambe Wind Limited, Walney (UK) Offshore Windfarms Limited, Walney Extension Limited Response to section 42 consultation	Potential impact of helicopter usage during the construction and operation of the Morgan Generation Assets. The PEIR highlights that there may be two helicopter supports completing 365 return trips during installation works. No heliport site(s) or transit route(s) have been identified within the PEIR documentation. Requested further information to enable Ørsted to understand and respond to the potential impacts and mitigations being proposed.	Helicopter operations will be conducted in Class G (uncontrolled airspace) in Visual Meteorological Conditions (VMC) under normal Rules of the Air and the 'See and Avoid' principle. Daily construction, operations and maintenance helicopter movements, conducted below 5,000 ft Above Mean Sea Level (AMSL) are likely insignificant compared to current Irish Sea Class G aviation activity. Heliport site(s) yet to be confirmed; further information can be provided in regard to helicopter support operations when the mode of operation has been decided.
02 June 2023	Isle of Man Department of Infrastructure (Ronaldsway Airport) Response to PEIR	To ensure the safety of aircraft operating in the vicinity of offshore wind farms, it is essential that appropriate measures are put in place to ensure that any potential impacts on aviation safety are identified and addressed. Welcomed any opportunity for further engagement.	Potential impacts on Ronaldsway Airport Instrument Flight Procedures and radar are considered in section 11.9. The Applicant is continuing to engage with Ronaldsway Airport on potential mitigation.
02 June 2023	Blackpool Airport Response to section 42 consultation	Potential impact on the MSA currently used by Blackpool Airport and current and planned IFP to Blackpool Airport. The airport seeks reassurance that the development of the offshore project will not impact the MSAs and/or current or planned IFPs.	The potential impact on Blackpool Airport is considered within Appendix B of Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement. Analysis conclusions indicate that there will be no impact to currently published Blackpool Airport IFP/MSA.

Date	Consultee and type of response	Comment	Response to comment raised and/or where considered in this chapter
05 June 2023	Ørsted Isle of Man (UK) Limited Response to PEIR	Potential impact of helicopter usage during the construction and operation of the Morgan Generation Assets. The PEIR highlights that there may be two helicopter supports completing 365 return trips during installation works. No heliport site(s) or transit route(s) have been identified within the PEIR documentation. Requested further information to enable Ørsted to understand and respond to the potential impacts and mitigations being proposed.	Helicopter operations will be conducted in Class G (uncontrolled airspace) in Visual Meteorological Conditions (VMC) under normal Rules of the Air and the 'See and Avoid' principle. Daily construction, operations and maintenance helicopter movements, conducted below 5,000 ft Above Mean Sea Level (AMSL) are likely insignificant compared to current Irish Sea Class G aviation activity. Heliport site(s) yet to be confirmed; further information can be provided in regard to helicopter support operations when the mode of operation has been decided.
23 June 2023	Ministry of Defence Response to PEIR	The MOD updated their position in response to PEIR stating that they do not anticipate impact to the RAF Valley or Warton Airfield PSRs.	The MOD in response to PEIR stated that they do not envisage an impact to Warton or RAF Valley PSRs, therefore potential impact to the Warton or RAF Valley PSRs is not considered further.
01 August 2023	Ronaldsway (IoM) Airport Online Meeting	The Applicant acknowledged the potential impact on Ronaldsway Airport radar and flight procedures. The Applicant is continuing to engage with the airport to provide an agreed SoCG for mitigation of the potential impact.	The potential impact to the Ronaldsway (IoM) Airport PSR is considered in section 11.9.3.13.
07 August 2023	Harbour Energy Online meeting	Raised potential for impact on helicopter access resulting from placement of wind turbines within 3.3 nm of their assets. The Applicant provided results from the helicopter access assessment that finds proposed distances will have minimal impact.	The potential impact on helicopter access to Harbour Energy offshore assets is considered in section 11.9.2 and supported by Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement (Appendix A: HAR).

Date	Consultee and type of response	Comment	Response to comment raised and/or where considered in this chapter
10 August 2023	NATS Online Meeting	The Applicant acknowledged the potential impact on NATS radar systems and the desire for an appropriate regional mitigation. The Applicant is continuing to engage with NATS to progress an agreed SoCG for mitigation of the potential impact.	The potential impact on NATS radar systems is considered in section 11.9.3.10.
25 August 2023	Blackpool Airport Online Meeting	Blackpool Airport predict a potential impact on the airport MSA and future IFP designs. The Applicant is continuing to engage with the airport to provide an agreed route to mitigation of the potential impact.	The potential impact on Blackpool Airport is considered within section 11.9.2 and supported by Appendix B of Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement. Analysis conclusions indicate that there will be no impact to currently published Blackpool Airport IFP/MSA.
05 September 2023	Ronaldsway (IoM) Airport Online Meeting	A preferred route to mitigation of potential impact to the airport PSR was discussed.	Potential mitigation is described in section 11.9.3.13 *et seq*.
26 September 2023	Walney Aerodrome Online Meeting	Based on project parameters there is potential for impact to the MSA at the aerodrome.	The potential impact on Walney Aerodrome is considered within section 11.9.2 and supported by Appendix B of Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement.
04 October 2023	Harbour Energy Online meeting	Follow up meeting to that held on 07 August 2023. Harbour Energy presented the high level approach and findings of their helicopter access assessment. The Applicant agreed to do the same in a following meeting in the interests of full understanding of both parties' assessments to aid further discussion.	The potential impact on helicopter access to Harbour Energy offshore platforms is considered in section 11.9.2 and supported by Appendix A of Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement.

Date	Consultee and type of response	Comment	Response to comment raised and/or where considered in this chapter
08 November 2023	Liverpool Airport Online Meeting	Based on project parameters there is potential for impact on radar systems. Further discussions will take place following NATS mitigation report.	Radar Line of Sight (LoS) analysis concluded that the Liverpool Airport radar system will not theoretically detect the Morgan Generation Assets operational wind turbines (see Table 11.6 and Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement).
01 December 2023	Eni meeting	Project update and discussion of potential for interaction between Eni and Morgan Generation Assets. It was agreed that the Morgan Offshore Wind Project were not a concern for Eni.	No further specific consideration required
04 December 2023	Harbour Energy Online meeting	Meeting to provide early overview of the Applicant's helicopter access report findings. Harbour Energy will keep working with the Applicant to establish areas of common ground.	The potential impact on helicopter access to Harbour Energy offshore platforms is considered in section 11.9.2 and supported by Appendix A of Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement.
08 December 2023	NATS Online Meeting	NATS have not completed required internal discussions to establish a preferred mitigation solution. Work is continuing at NATS to establish the mitigation solution which could consist of radar blanking and infill.	The potential impact on NATS radar systems is considered in section 11.9.3.10.
19 December 2023	Blackpool Airport Online meeting	Meeting with Blackpool Airport (and Flotation Energy) to discuss the Morgan Generation Assets, Mona Offshore Wind Project and Morecambe Offshore Windfarm: Generation Assets assessments, to support CAA analysis.	The potential impact on Blackpool Airport is considered within Appendix B of Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement. Analysis conclusions indicate that there will be no impact to currently published Blackpool Airport IFP/MSA.

Date	Consultee and type of response	Comment	Response to comment raised and/or where considered in this chapter
22 December 2023	MOD Response to engagement newsletter	The MOD confirmed their position as provided at PEIR.	The MOD in response to engagement on increased maximum blade tip height stated that they do not envisage an impact to MOD PSR systems, which are as such not considered further.
15 January 2024	NATS Online Meeting	No update on the NATS preferred mitigation solution was available, work is continuing internally within NATS. It was agreed to meet again in February 2024, where it is possible that NATS will have completed their internal discussions to provide a preferred mitigation solution.	The potential impact on NATS radar systems is considered in section 11.9.3.10.
22 February 2024	NATS Email correspondence	Confirmed radar mitigation solution for the Morgan Generation Assets as Large Blanking and Transponder Mandatory Zone (TMZ).	The potential impact on NATS radar systems, including further mitigation, is considered in section 11.9.3.10.

11.4 Baseline methodology

11.4.1 Relevant guidance

11.4.1.1 A variety of aviation publications contain information and guidance relating to the potential impacts of an offshore wind development on aviation stakeholders. The following documents informed the desk-based study of potential impacts from the Morgan Generation Assets:

- 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
- CAA CAP 032 UK Aeronautical Information Publication (CAA, 2023): 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
- CAA CAP 168 Licensing of Aerodromes (CAA, 2022): Sets out the standards required at UK national licensed aerodromes relating to management systems, operational procedures, physical characteristics, assessment and treatment of obstacles and visual aids
- CAA CAP 437 Standards for Offshore Helicopter Landing Areas (CAA, 2023): Provides the criteria applied by the CAA in assessing the standards of offshore 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, 2019): Provides an overview of the regulatory framework as well as requirements and guidance for Air Traffic Services, Communication, Navigation, Surveillance, Meteorological and Information and Alerting Systems, as well ATC unit staffing and duty hours
- CAA CAP 764 Policy and Guidelines on Wind Turbines (CAA, 2016): Provides assistance to aviation stakeholders to help understand and address wind energy related issues thereby ensuring greater consistency in the consideration of the potential impact of proposed wind farm developments
- Maritime and Coastguard Agency (MCA) Marine 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.

11.4.2 Scope of the assessment

11.4.2.1 The scope of this Environmental Statement has been developed in consultation with relevant statutory and non-statutory consultees as detailed in Table 11.4. The scope of the assessment includes all aviation stakeholders whose operations have the potential to be impacted by the Morgan Generation Assets.

11.4.2.2 Taking into account the scoping and consultation process, Table 11.5 summarises the potential impacts considered as part of this assessment.

Table 11.5: Potential impacts scoped into this assessment.

Activity	Potential impacts scoped into the assessment
Construction phase	
Presence of construction infrastructure and installation of wind turbines and OSP	Creation of a physical obstacle - potential physical obstruction to aviation low flying operations, helicopter operations and identified airport IFP/MSA due to height and number of above sea level infrastructure within the Morgan Array Area.
Operations and maintenance phase	
Presence and operation of wind turbines and OSP	Creation of a physical obstacle - potential physical obstruction to aviation low flying operations, helicopter operations and identified airport IFP/MSA due to height and number of above sea level infrastructure within the Morgan Array Area.
	Operational wind turbines causing interference on civil radar systems - ATC may be unable to provide an effective surveillance service due to interference on radar displays.
Decommissioning phase	
Presence of decommissioning infrastructure and decommissioning of wind turbines and OSP	Creation of a physical obstacle - potential physical obstruction to aviation low flying operations, helicopter operations and identified airport IFP/MSA due to height and number of above sea level infrastructure within the Morgan Array Area.

11.4.2.3 Effects which are not considered likely to be significant have been scoped out of the assessment. A summary of the effects scoped out, together with justification for scoping them out and whether the approach has been agreed with key stakeholders through either scoping or consultation, is presented in Table 11.6.

Table 11.6: Potential impacts scoped out of the assessment for aviation and radar.

Potential impact	Justification
Impact on civil and military radar systems during the construction and decommissioning phases	During construction there will be no impact on civil and military radar systems as wind turbines will not be rotating. During Scoping, The Planning Inspectorate on behalf of the Secretary of State agreed that this matter can be scoped out of the Environmental Impact Assessment (EIA).
Transboundary impacts	During Scoping, The Planning Inspectorate agreed that given the distance of the Morgan Array Area from international boundaries, transboundary effects are unlikely to be significant and this matter can be scoped out of the EIA.
Impact to aviation activity in Practice and Exercise Areas (PEXAs)	The MOD section 42 response has not highlighted impact to aviation related PEXA as a concern. It is the professional opinion of the author that impacts to airborne activity in PEXAs are scoped out as there are no PEXAs in the vicinity of the Morgan Array Area which may be impacted by the development of the Morgan Generation Assets.
Impacts to meteorological radar	During Scoping, The Planning Inspectorate agreed that given the distance of the Morgan Array Area from meteorological radar stations, this matter can be scoped out.

Potential impact	Justification
Impact to HMRIs	During Scoping, The Planning Inspectorate agreed that given the distance of the Morgan Array Area from HMRIs, this impact can be scoped out. In relation to Morgan Generation Assets helicopter usage, given the distance of the Morgan Array Area from HMRIs it is considered that the measures being adopted (see Table 11.15) are sufficient to scope out potential impacts arising from Morgan Generation Assets helicopter usage during the construction and operations and maintenance phases of the Morgan Generation Assets.
Impacts to SSR	The CAA have stated within CAP 764 (CAA, 2016) that impact may occur to aviation SSR systems located within 10 km of a wind farm. During Scoping, The Planning Inspectorate agreed that as there are no SSR systems located within the CAA suggested radius, potential impact on aviation SSR systems can be scoped out.
Impact to NATS Clee Hill, Manchester Airport, Liverpool Airport, RAF Valley, British Aerospace Systems (BAES) Warton and West Freugh PSR systems.	Radar Line of Sight (LoS) analysis concluded that these radar systems will not theoretically detect the operational wind turbines (see Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement). The MOD have confirmed in their section 42 response (see Table 11.4) that impacts to RAF Valley and BAES Warton PSRs are not expected and are therefore scoped out.

11.4.1 Methodology to inform the baseline

11.4.2 Study area

11.4.2.1 The aviation and radar study area (Figure 11.1) covers the aviation radar systems that provide radar coverage over the Morgan Array Area, and which may theoretically detect the highest wind turbine blade tip height of 364 meters (m) above Lowest Astronomical Tide (LAT). It has been defined on the basis of established guidance: the CAA CAP 764 Policy and Guidelines on Wind Turbines (CAA, 2016) consultation zones and criteria. Whilst not definitive, CAP 764 provides criteria for assessing whether any wind turbine development might have an impact on aviation related operations. Consideration of the potential for the Morgan Generation Assets wind turbines to impact on aviation receptors has been undertaken in accordance with the standard consultation distances stated in CAP 764. The aviation and radar study area is therefore defined in line with the CAP 764 consultation zones or criteria which considers the following:

- Within 30 kilometres (km) of an aerodrome with surveillance radar – although it is acknowledged that the distance quoted in CAP 764 (CAA, 2016) can be greater than 30 km dependent on a number of factors at individual aerodromes, including type and coverage of radar utilised. This has been considered in the assessment of radar effect:
  - Aerodrome radar to 75 km
  - NATS en-route radar to 200 km
- Offshore hydrocarbon platforms with helidecks that are located within 9 nm of the Morgan Array Area (the CAA recommended 'consultation buffer') as considered in Appendix A of Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement
- Airspace coincident with published IFPs to take into account an aerodrome's requirement to protect its IFPs, as considered in Appendix B of Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement

- Within 17 km of a non-radar equipped licensed aerodrome with a runway of 1,100 m or more. There are no such aerodromes within 17 km of the Morgan Array Area.

11.4.2.2 The aviation and radar study area is presented in Figure 11.1. The cumulative aviation and radar study area is the same, except for the assessment of radar cumulative effects which includes other offshore wind farms within a 100 km radius of the Morgan Array Area that could have potential cumulative effects on identified radar receptors through the radar detection of operational wind turbines.

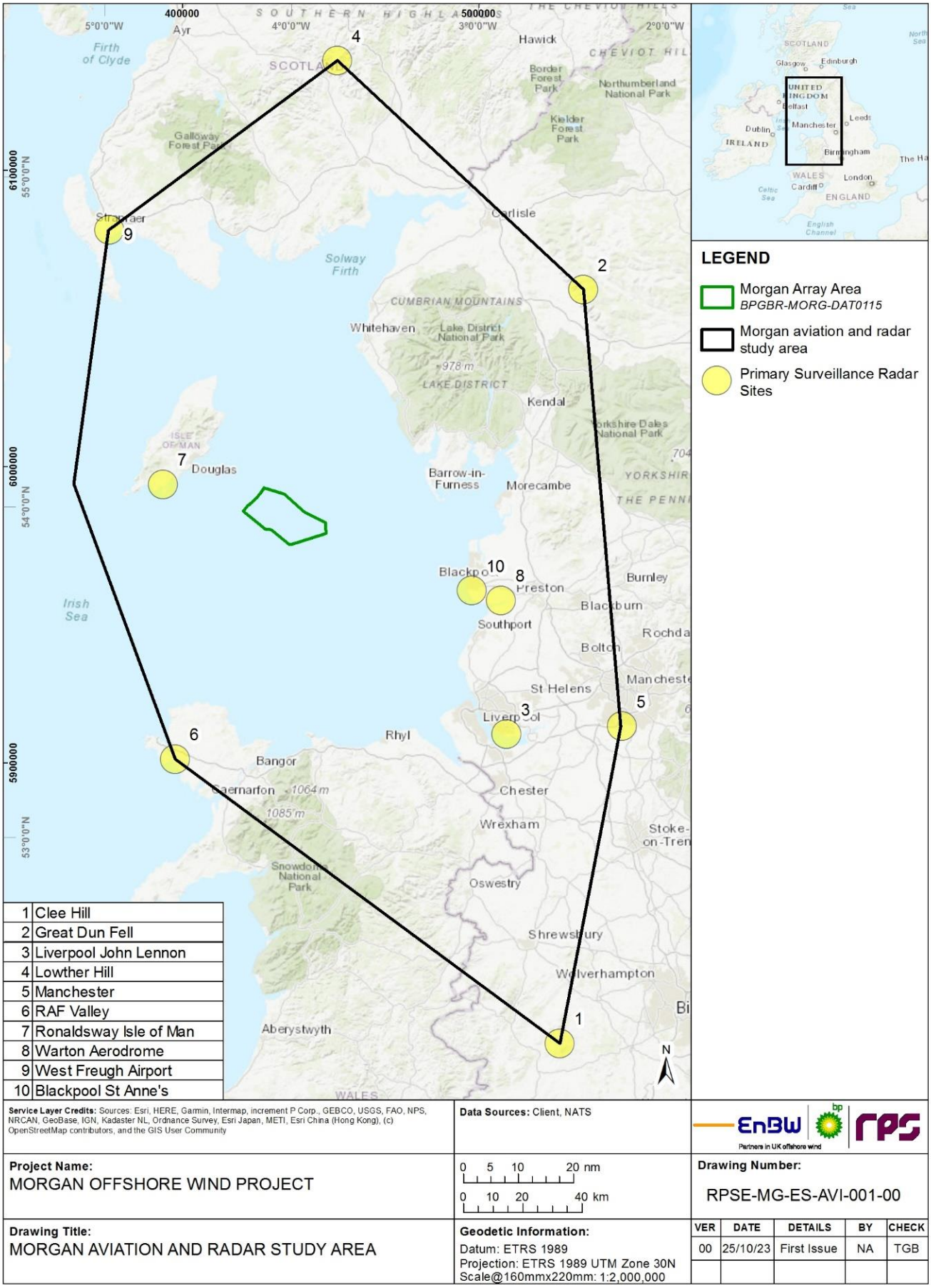


Figure 11.1: Aviation and radar study area.

11.4.3 Desktop study

11.4.3.1 Information on aviation and radar within the aviation and radar study area was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 11.7.

Table 11.7: Summary of key data sources and desktop reports.

Title	Source	Year	Author
CAA Visual Flight Rules (VFR) Charts	NATS	2023	CAA/Ordnance Survey/NATS
MOD Military Aeronautical Information Publication	MOD	2023	MOD
Radar Line of Sight (LoS) Analysis (Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement)	Osprey	2023	Osprey
HAR (Appendix A to Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement)	Anatec	2023	Anatec
IFP Assessment (Appendix B to Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement)	Osprey	2024	Osprey

11.4.3.2 NATS VFR Charts (CAA, 2023) are sectional aeronautical charts which are designed for visual navigation of slow to medium speed aircraft. The topographic information featured consists of a judicious selection of visual checkpoints used for flight under VFR.

11.4.3.3 The Military Aeronautical Information Publication (MilAIP) (MOD, 2023) contains information pertinent to aviation operations solely of a military nature. All military users must use the Civil AIP in conjunction with the MilAIP, to attain the full aeronautical information coverage of the UK.

11.4.3.4 The methodologies for the radar LoS, HAR and IFP desktop studies are discussed below.

Radar line of sight (LoS)

11.4.3.5 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 (such as a wind farm) which leads to a cumulative effect over a greater volume of airspace with higher densities of radar clutter produced.

11.4.3.6 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).

11.4.3.7 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 LoS to radar systems.

11.4.3.8 Osprey utilised the Advanced Topographic Development and Imaging (ATDI) ICS LT (Version 22.4.7 x64) tool to model the terrain elevation profile between the identified PSR systems and the Morgan Array Area. 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 to establish the potential for individual wind farm developments to create an effect on aviation radar. However, 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 11.8.

Table 11.8: 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.
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.

11.4.3.9 Radar detectability of wind turbines does not automatically provide justification for an objection from radar stakeholders. Other factors will determine the nature and severity of the operational impact on the receptor, including:

- The consideration of airspace structure and classification 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.

Helicopter access to offshore hydrocarbon platforms

11.4.3.10 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 hydrocarbon 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 farm 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.

11.4.3.11 Potential impact on helicopter access is addressed in section 11.9 and Appendix A of Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement.

Instrument Flight Procedures

11.4.3.12 An IFP is a published procedure used by aircraft flying in accordance with the instrument flight rules which is designed to achieve and maintain an acceptable level of safety in operations and includes an instrument approach procedure, a standard instrument departure, a planned departure route and a standard instrument arrival.

11.4.3.13 The CAA state within CAP 764 that ‘the CAA is responsible for being satisfied that a certificated or licensed aerodrome complies with the relevant requirements and is safe for use by civil aircraft, having regard in particular to the physical characteristics of the aerodrome and its surroundings. Aerodrome operators are required to have procedures for safeguarding, to monitor the changes in the obstacle environment, marking and lighting, and in human activities or land use on the aerodrome and in the areas around the aerodrome. In addition, a requirement is placed on the licensee to take all reasonable steps to ensure that the aerodrome and its surrounding airspace are safe at all times for use by aircraft’.

11.4.3.14 Large wind turbine developments, dependent on location and proximity to published airport IFP safeguarded areas, may impact the safe operation of these published procedures. Potential impact on IFP is described in Appendix B of Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement.

11.4.4 Site specific surveys

11.4.4.1 No site-specific surveys have been undertaken to inform the EIA for aviation and radar. This is because sufficient data exists in the public domain.

11.5 Baseline environment

11.5.1 Airspace and air traffic services

11.5.1.1 In aviation and airspace terms, the world is divided into Flight Information Regions (FIRs) for the allocation of responsibility for the provision of Air Traffic Service (ATS) to aircraft. The Morgan Array Area is located within the London FIR. The UK CAA is the airspace regulator for the London FIR.

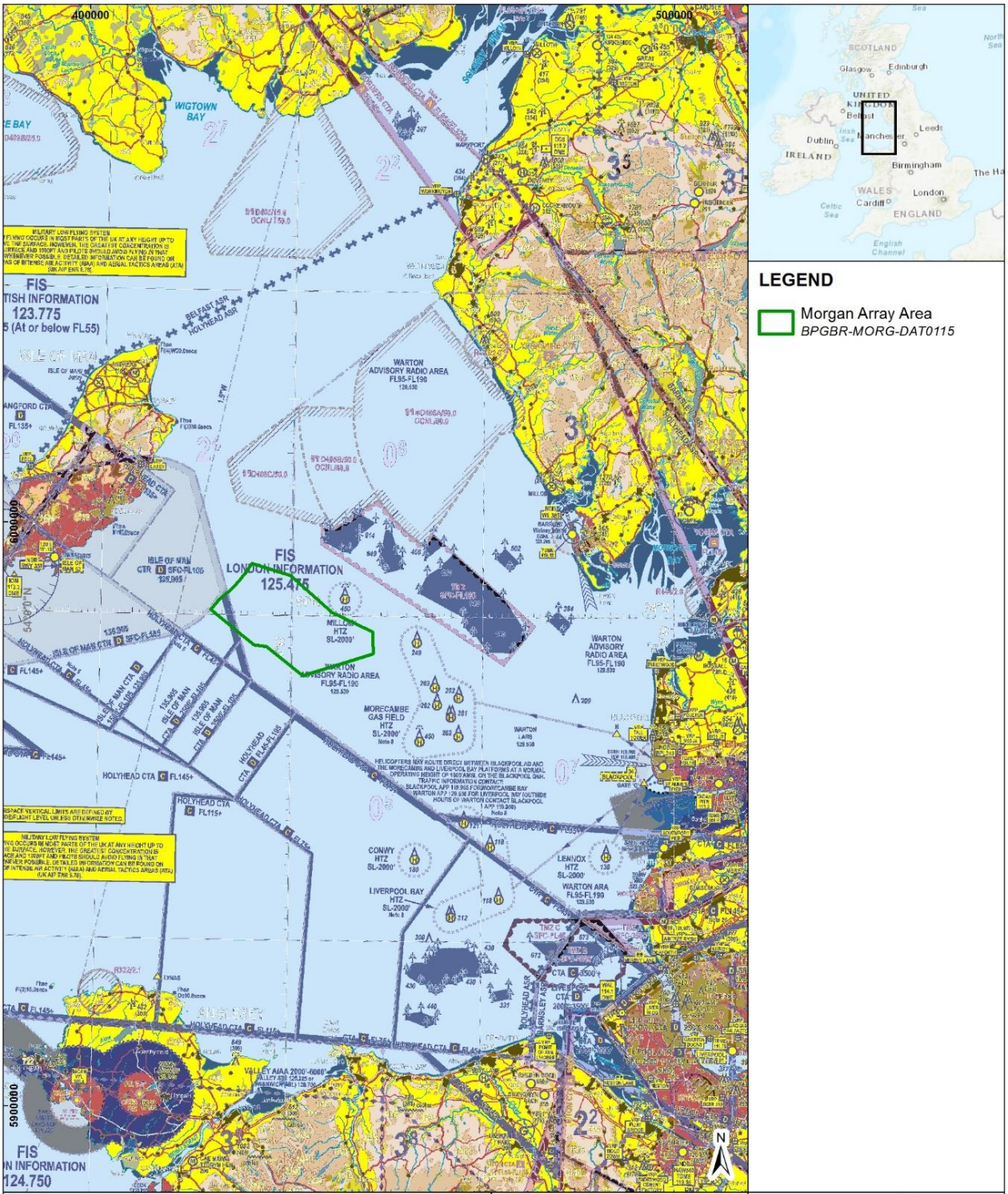
11.5.1.2 Within Controlled Airspace (CAS), NATS (En-route) plc (NERL – a subsidiary of NATS and hereafter referred to as NATS) is the regulated en-route ATS provider in the UK utilising several long-range PSR systems positioned to provide maximum coverage of UK airspace. Additionally, NATS has a licence 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 potential impact that the Morgan Generation Assets might have on NATS 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.

11.5.1.3 There are 10 PSR sites located within the aviation and radar study area which are listed in Table 11.9.

Table 11.9: PSR systems within the Morgan aviation and radar study area.

PSR site	Distance from Morgan Array Area (nm)	Distance from Morgan Array Area (km)
Ronaldsway Airport Isle of Man PSR	15.4	28.5
NATS St Anne's en-route PSR	28.6	52.9
BAES Warton Aerodrome PSR	34.2	63.3
RAF Valley PSR	44.3	82.1
Liverpool John Lennon Airport PSR	49.3	91.2
MOD West Freugh Air Weapons Range PSR	54.8	101.6
NATS Great Dun Fell en-route PSR	63.4	117.4
Manchester International Airport PSR	64.4	119.3
NATS Lowther Hill en-route PSR	79.0	146.2
NATS Clee Hill en-route PSR	102.2	189.3

11.5.1.4 The Morgan Array Area is located within a multi-layered area of Class G uncontrolled airspace, where the application of an ATS is not mandated, with Class C and Class D CAS established above that (see Figure 11.2). Within Class C CAS, an ATS is mandatory for pilots. A number of published procedures are established within the airspace surrounding the Morgan Array Area for the sequencing of arriving and departing aircraft. The division of airspace and rules applicable to uncontrolled airspace and CAS is provided within Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement. Above and surrounding the Morgan Array Area, airspace is used by both military and civil registered aircraft.



Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community	**Data Sources:** Client, VFR Chart-Northern England and Northern Ireland Ed.44 (2021) copyright NATS (Services)Ltd/ALL RIGHTS RESERVED	EnBW bp Partners in UK offshore wind / rps
Project Name: MORGAN OFFSHORE WIND PROJECT	0 5 10 nm 0 10 20 km	**Drawing Number:** RPSE-MG-ES-AVI-003-00
Drawing Title: AIRSPACE CONSTRUCTION IN THE VICINITY OF THE MORGAN ARRAY AREA	**Geodetic Information:** Datum: ETRS 1989 Projection: ETRS 1989 UTM Zone 30N Scale@160mmx220mm: 1:1,100,000	

VER	DATE	DETAILS	BY	CHECK
00	25/10/23	First Issue	NA	TGB

Figure 11.2: Aeronautical chart covering the Morgan Array Area.[1]

[1] Data included in this product reproduced under licence from NATS (Services) Ltd © Copyright 2022 NATS (Services) Ltd. All rights reserved.

11.5.1.5 Aircraft operating in the vicinity of the Morgan Array Area observe the airspace rules dependent on the classification of airspace they are operating in and the type of ATS they are receiving, as follows:

- Civil air traffic controllers located at the Swanwick Area Control Centre (ACC) utilise NATS radar for the provision of ATS to aircraft flying within the CAS above and surrounding the Morgan Array Area. Outside of CAS and for the crossing of CAS, military controllers located at the ACC, may provide on request, an ATS within Class G airspace and for the crossing of CAS subject to suitable radar and radio coverage being available.
- Ronaldsway (IoM) Airport is the main airport located on the IoM. An ATS is provided by controllers at the airport utilising the IoM PSR for provision of radar based ATC services to aircraft inbound and outbound from the airport and to aircraft operating within IoM CAS. The airport also publishes a number of IFP which are required to be safeguarded by the airport authority to maintain safe flight operations.
- RAF Valley is a military operated aerodrome located on a bearing of approximately 206°/82.4 km. The airfield is the home of Number 4 Flying Training School, which provides basic and advanced fast jet training utilising Hawk and Texan aircraft. 202 Squadron based at the airfield provides maritime and mountain training for aircrews on the Jupiter helicopter. RAF Valley has a safeguarded Air Traffic Control Surveillance Minimum Altitude Chart (ATCSMAC).
- Walney Aerodrome (which is not equipped with PSR) offer a non-radar ATS to participating aircraft. ATC at this airfield is unlikely to be offering an ATS to aircraft flying within the immediate vicinity of the Morgan Array Area. The published individual aerodrome MSAs (the altitudes below which it is unsafe to fly in Instrument Meteorological Conditions (IMC) owing to presence of terrain or obstacles within a specified area) will be penetrated by the maximum blade tip height of wind turbines placed within the Morgan Array Area.
- Military low flying aircraft operate low level in the Class G airspace surrounding the Morgan Array Area, at or below an altitude of 2,000 ft above mean sea level (amsl). The creation of above sea level infrastructure could impede military low flying training.
- Helicopters operating in Class G airspace in support of the offshore hydrocarbon industry conduct specific sorties to helicopter platform equipped offshore facilities. The installations within 9 nm of the Morgan Array Area are shown in Table 11.10.

Table 11.10: Hydrocarbon infrastructure considered for helicopter access within 9 nm of the Morgan Array Area.

Installation Name	Type	Operator	Status	Distance from Morgan Array Area (nm)
Millom West	NUI Day Only	Harbour Energy	Active but ceased production. To be decommissioned	1.6
Millom East PLEM and WHPS	Wellhead	Harbour Energy	Active but ceased production. To be decommissioned	2.0
Q1-3 Wellheads	Wellhead	Chrysaor	Active	2.0
Dalton Well R1	Wellhead	Chrysaor	Active	3.3
Dalton Well R2	Wellhead	Chrysaor	Active	3.6
North Morecambe DPPA	NUI Day and Night	Spirit Energy	Active	4.1
Whitehaven Wellhead 113/27B-K	Wellhead	Spirit Energy	Active	5.8
South Morecambe DP8	NUI Day and Night	Spirit Energy	Active	6.6
Rhyl Wellheads	Wellhead	Spirit Energy	Active	7.1
South Morecambe DP6	NUI Day and Night	Spirit Energy	Active	7.6
South Morecambe DP4	NUI No HCA Certificate	Spirit Energy	Topside Removed June 2021	9.0

11.5.2 Future baseline scenario

11.5.2.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 requires that "an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge" is included within the Environmental Statement. In the event that the Morgan Generation Assets do not come forward, an assessment of the future baseline conditions has been carried out and is described within this section.

11.5.2.2 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, the Morgan Generation Assets. The North Sea Transition Authority (NSTA) (the new name of the Oil and Gas Authority[2] (OGA)) regulate the licensing of exploration and development of the UK's offshore and

[2] On 21 March 2022, the OGA became known by a new business name: NSTA to reflect its evolving role in the energy transition. The OGA remains the legal name of the company. References to the NSTA should be interpreted as the OGA.

onshore oil and gas resources, gas storage and unloading activities in accordance with the OGA Strategy[3] and the UK Government's target of net zero greenhouse gas emissions by 2050. The OGA Annual Report and Accounts 2022-2023 (NSTA, 2023) reported a predicted decline in gas production and usage. Operators continue to find it difficult to predict production accurately as older fields mature and their reliability reduces. The Prime Minister's Office (PMO) and DESNZ reported during July 2023 that the Prime Minister has committed to future oil and gas licensing rounds with two areas in the North Sea chosen as locations for carbon capture usage and storage clusters. The Independent Climate Change Committee has predicted around a quarter of the UK's energy demand will still be met by oil and gas when the UK reaches net zero in 2050, and the Government states that it is taking steps to slow the rapid decline in domestic production of oil and gas, which will secure UK domestic energy supply and reduce reliance on hostile states.

11.5.2.3 As fields are decommissioned, it is the opinion of the author that helicopter use to those hydrocarbon platforms will eventually decline; however, the NSTA is completing the latest oil and gas licensing round which may increase the use of helicopter support to the offshore hydrocarbon industry (oil and gas licensing is discussed further in Volume 2, Chapter 9: Other sea users of the Environmental Statement). As future offshore wind projects are consented and constructed, an overall increase is expected in offshore aviation activity as new offshore areas are developed to support net zero targets.

11.5.2.4 No change to the present airspace construct or usage above and around the Morgan Array Area is expected.

11.5.1 Data limitations

11.5.1.1 The data used in this chapter is the most up to date publicly available information which can be obtained from the data sources as cited. Data has also been provided through consultation as detailed in Table 11.4.

11.5.1.2 The results of the LoS analysis are considered to be conservative in the establishment of results and are provided in order to establish the worst-case possibility of impact to aviation stakeholders. Radar LoS results are theoretical in nature however, analysis is based on an industry standard for establishing the potential impact to aviation radar systems from operational wind turbines and it is considered this will not have an implication for the conclusions of the assessment.

[3] https://www.nstauthority.co.uk/regulatory-information/regulatory-framework/the-oga-strategy/#:~:text=The%20OGA%20Strategy%20places%20an,amends%20the%20MER%20UK%20Strategy.

11.6 Impact assessment methodology

11.6.1 Overview

11.6.1.1 The aviation and radar impact assessment has followed the methodology set out in Volume 1, Chapter 5: EIA methodology of the Environmental Statement. Specific to the aviation and radar impact assessment, the guidance documents listed at section 11.4.1 have also been considered.

11.6.1.2 In addition, the aviation and radar impact assessment has considered the legislative framework as provided in CAP 393.

11.6.2 Impact assessment criteria

11.6.2.1 The criteria for determining the significance of effects is a two-stage process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Volume 1, Chapter 5: EIA methodology of the Environmental Statement.

11.6.2.2 The criteria for defining magnitude in this chapter are outlined in Table 11.11.

Table 11.11: Definition of terms relating to the magnitude of an impact.

Magnitude of impact	Definition
High	Total loss of ability to carry on activities and/or impact is of extended spatial 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 project phase.
Medium	Loss or alteration to significant portions of key components of current activity and/or spatial extent of 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 project phase.
Low	Minor shift away from baseline, leading to a reduction in level of activity that may be undertaken and/or spatial 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 project phase.
Negligible	Very slight change from baseline condition and/or spatial 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.

11.6.2.3 The criteria for defining sensitivity in this chapter are outlined in Table 11.12.

Table 11.12: Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition
Very High	Receptor or the activities of the receptor, is of critical importance to the local, regional or national economy and/or the receptor or the activities of the receptor, is highly vulnerable to impacts that may arise from the project and/or recoverability is long term or not possible.
High	Receptor or the activities of the receptor, is of high value to the local, regional or national economy and/or the receptor or the activities of the receptor, is generally vulnerable to impacts that may arise from the project and/or recoverability is slow and/or costly.

Sensitivity	Definition
Medium	Receptor or the activities of the receptor, is of moderate value to the local, regional or national economy and/or the receptor or the activities of the receptor, is somewhat vulnerable to impacts that may arise from the project and/or has moderate to high levels of recoverability.
Low	Receptor or the activities of the receptor, is of low value to the local, regional or national economy and/or the receptor or the activities of the 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.

11.6.2.4 The significance of the effect upon aviation and radar is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 11.13. Where a range of significance of effect is presented in Table 11.13, the final assessment for each effect is based upon expert judgement.

11.6.2.5 For the purposes of this assessment, any effects with a significance level of minor or less have been concluded to be not significant in terms of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

Table 11.13: Matrix used for the assessment of the significance of the effect.

Sensitivity of Receptor	Magnitude of Impact			
	Negligible	**Low**	**Medium**	**High**
Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
High	Minor	Minor or Moderate	Moderate or Major	Major
Very High	Minor	Moderate or Major	Major	Major

11.7 Key parameters for assessment

11.7.1 Maximum design scenario

11.7.1.1 The Maximum Design Scenarios (MDSs) identified in Table 11.14 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the Project Design Envelope presented in Volume 1, Chapter 3: Project description of the Environmental Statement. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g. different infrastructure layout), to that assessed here be taken forward in the final design scheme.

11.7.1.2 The assessment of potential impacts on aviation and radar is based on the MDS as identified from a design envelope and is specific to the potential impacts identified in this chapter. The key parameters for the MDS include consideration of the maximum number of wind turbines across the largest area and the maximum blade tip height of 364 m above LAT.

11.7.1.3 The MDS for impacts on aviation and radar services assumes that the entirety of the Morgan Array Area will be populated with wind turbines (68) at the maximum blade tip height of 364 m above LAT, and one Offshore Substation Platform (OSP) with a maximum height of 95 m above LAT. 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 (i.e. the OSP) and less than the extent of the Morgan Array Area will not create an incremental effect on aviation interests.

11.7.1.4 Table 11.14 provides the MDS for impacts to aviation and radar.

Table 11.14: Maximum design scenario considered for the assessment of potential impacts on aviation and radar.

[a] C=construction, O=operations and maintenance, D=decommissioning

Potential impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
Creation of a physical obstacle to aircraft operations.	✓	✓	✓	**Construction phase** • Up to four years construction duration • Wind turbines: construction of 68 wind turbines with a maximum blade tip height of 364 m above LAT • OSPs: construction of one OSP with a maximum height, inclusive of antenna structure, of 95 m above LAT • During the construction phase the potential creation of physical obstacles to aircraft operations will be gradual as the presence of infrastructure increases. The MDS in terms of the presence of infrastructure would be on the completion of construction. **Operations and maintenance phase** • Operational lifetime of up to 35 years • Wind turbines: presence of 68 wind turbines with a maximum blade tip height of 364 m above LAT • OSPs: presence of one OSP with a maximum height, inclusive of antenna structure, of 95 m above LAT. **Decommissioning phase** • During the decommissioning phase creation of physical obstacles to aircraft operations would gradually decrease from the operational MDS as structures are removed.	Maximum physical obstruction from the largest wind turbine to aviation operations due to size (and number) of infrastructure above LAT within the Morgan Array Area.
Wind turbines causing interference on aviation PSR systems.	×	✓	×	**Operations and maintenance phase** • Operational lifetime of up to 35 years • Wind turbines: operation of 68 wind turbines with a maximum blade tip height of 364 m above LAT.	Maximum number of the highest wind turbines is the MDS as it provides the maximum potential interference to radar propagation in the area. ATC may be unable to provide an effective surveillance service due to interference on radar displays.

11.8 Measures adopted as part of the Morgan Generation Assets

11.8.1.1 For the purposes of the EIA process, the term 'measures adopted as part of the project' is used to include the following measures (adapted from IEMA, 2016):

- Measures included as part of the project design. These include modifications to the location or design of the Morgan Generation Assets which are integrated into the application for consent. These measures are secured through the consent itself through the description of the development and the parameters secured in the DCO and/or marine licences (referred to as primary mitigation in IEMA, 2016)
- Measures required to meet legislative requirements, or actions that are generally standard practice used to manage commonly occurring environmental effects and are secured through the DCO requirements and/or the conditions of the marine licences (referred to as tertiary mitigation in IEMA, 2016).

11.8.1.2 A number of measures (primary and tertiary) have been adopted as part of the Morgan Generation Assets to reduce the potential for impacts on aviation and radar. These are outlined in Table 11.15 below. As there is a commitment to implementing these measures, they are considered inherently part of the design of the Morgan Generation Assets and have therefore been considered in the assessment presented in section 11.9 below (i.e. the determination of magnitude and therefore significance assumes implementation of these measures).

Table 11.15: Measures adopted as part of the Morgan Generation Assets.

Measures adopted as part of the Morgan Generation Assets	Justification	How the measures will be secured
Primary measures: Measures included as part of the project design		
Development of, and adherence to, a Design Plan (DP) which will be prepared in accordance with the layout principles, and agreed with the Marine Management Organisation (MMO), in consultation with the Maritime and Coastguard Agency (MCA), the UK Hydrographic Office (UKHO) and Trinity House as appropriate.	A Design Plan, including a plan of the Morgan Array Area, will be prepared and submitted to the MMO in consultation with the MCA, the UKHO and Trinity House as appropriate post-consent but before construction commences. The Design Plan will include two lines of orientation for navigation and SAR access within the Morgan Array Area. The Morgan Generation Assets will consider MCA MGN 654 Safety of Navigation: Offshore Renewable Energy Installations (OREI) - Guidance on UK Navigational Practice and its annexes, Safety and Emergency Response, in addition to CAP 393 Air Navigation Order 2022, CAP 764 CAA Policy and Guidelines on Wind Turbines and CAP 437 Standards for Offshore Helicopter Landing Areas, where applicable.	The need for a Design Plan to be approved is secured within the deemed marine licences in the draft DCO (Document Reference C1). Two lines of orientation are secured through a requirement of the draft DCO and within the deemed marine licences within the draft DCO (Document Reference C1).
Tertiary measures: Measures required to meet legislative requirements, or adopted standard industry practice		

Lighting as required and/or determined necessary for aviation safety as agreed with the Defence Infrastructure Organisation Safeguarding and the Civil Aviation Authority for the operational life of the Morgan Generation Assets unless otherwise agreed with the Ministry of Defence. The Morgan Generation Assets lighting and marking will conform to the following: • Red medium intensity aviation warning lights (of variable brightness between a maximum of 2,000 candela (cd)) to a minimum of 10% of the maximum which would be 200 cd) will be located on either side of the nacelle of peripheral wind turbines. These lights will flash simultaneously with a Morse W flash pattern and will also include an infra-red component • All aviation warning lights will flash synchronously throughout the Morgan Array Area and be able to be switched on and off by means of twilight switches (which activate when ambient light falls below a pre-set level) • Aviation warning lights will allow for reduction in lighting intensity at and below the horizon when visibility from every wind turbine is more than 5 km (to a minimum of 10% of the maximum (i.e. 200 cd)) • SAR lighting of each of the non-periphery wind turbines will be combi infra-red (IR)/200 cd steady red aviation hazard lights, individually switchable from the control centre at the request of the MCA (i.e. when conducting SAR operations in or around the Morgan Array Area) • All wind turbines will be fitted with a low intensity light for the purpose of helicopter winching (green hoist lamp). All wind turbines will also be fitted with suitable illumination (minimum one 5 cd light) for identification signs The location of all infrastructure (including wind turbines, OSPs, and cables) will be communicated to the UK Hydrographic Office (UKHO) so that they can be incorporated into Aviation Charts and the Notice to Aviators (NOTAM).	The Morgan Generation Assets will be designed and constructed in accordance with relevant guidance from: • Trinity House Provision and Maintenance of Local Aids to Navigation Marking Offshore Renewable Energy Installations • MCA Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for Search and Rescue and Emergency Response. Appropriate marking, lighting and aids to navigation will be employed during the construction, operations and maintenance and decommissioning phases as appropriate to ensure the safety of all parties. Appropriate lighting will ensure the offshore structures are visible for search and rescue and emergency response procedures.	Aviation safety is secured through a requirement of the draft DCO (Document Reference C1).

Measures adopted as part of the Morgan Generation Assets	Justification	How the measures will be secured
Defence Geographic Centre Notification - information regarding construction should be passed to the Defence Geographic Centre (DGC) (at dvof@mod.gov.uk) at least 10 weeks in advance of the obstacle type(s) erection detailing position, height (tip of arc) and type of aviation lighting. Once reported, all will be included in the DGC Obstruction database and all that meet aviation chart inclusion criteria will be published for broader awareness.	In line with RenewableUK guidance.	In line with standard industry practice.
Defence Infrastructure Organisation Safeguarding (DIOS) Notification - notify DIOS of the following at least 14 days prior to the commencement of construction: a. the date of the commencement of construction b. the date any wind turbines are brought into use c. the maximum height of any construction equipment to be used d. the maximum heights of any wind turbine, meteorological mast and OSP to be constructed e. the latitude and longitude of each wind turbine, meteorological mast and OSP to be constructed The DIOS must be notified of any changes to the information supplied and of the completion of construction.	In line with standard industry practice.	Aviation safety is secured through a requirement of the draft DCO (Document Reference C1).
NATS Aeronautical Information Service Notification - Appropriate information about the site construction and any associated lighting (where applicable), for example the height and temporary location of construction cranes, should be provided to the NATS Aeronautical Information Service (AIS) (for promulgation in applicable aviation publications including the UK Integrated Aeronautical Information Package (IAIP)).	In line with standard industry practice and in compliance with Article 225A of the ANO.	In line with standard industry practice.

11.8.1.3 Where significant effects have been identified, further mitigation measures (referred to as secondary mitigation in IEMA, 2016) have been identified to reduce the significance of effect to acceptable levels following the initial assessment. These are measures that could further prevent, reduce and, where possible, offset any adverse

effects on the environment. These measures are set out, where relevant, in section 11.9 below.

11.9 Assessment of significant effects

11.9.1.1 The impacts of the construction, operations and maintenance, and decommissioning phases of the Morgan Generation Assets have been assessed on aviation and radar. The potential impacts arising from the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets are listed in Table 11.14 along with the MDS against which each impact has been assessed.

11.9.1.2 A description of the potential effect on aviation and radar receptors caused by each identified impact is given below.

11.9.2 Creation of physical obstacle to aircraft operations

11.9.2.1 The construction, operations and maintenance, and decommissioning of the Morgan Generation Assets wind turbines and OSP may lead to the creation of a physical obstacle to aircraft operations. The MDS is represented by 68 wind turbines and one OSP due to size, number and height above LAT within the Morgan Array Area and is summarised in Table 11.14.

Construction phase

Magnitude of impact

Military and other low flying operations

11.9.2.2 Wind turbine and OSP construction infrastructure above LAT could pose a physical obstruction to flight operations in the vicinity, and specifically to military and other low flying operations, including survey work. Construction infrastructure, OSPs 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 associated infrastructure may present a potential obstacle collision risk to aircraft flight operations.

11.9.2.3 A range of adopted measures, in the form of appropriate notification to aviation stakeholders, development of, and adherence to a Design Plan, and lighting and marking to minimise effects to aviation flight operations would apply to the development of the Morgan Generation Assets. These will comply with current guidelines where appropriate and be agreed with the appropriate stakeholders and are outlined in Table 11.15.

11.9.2.4 The impact is predicted to be of regional spatial extent, short term duration, intermittent and low reversibility for the construction phase. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **low**.

Helicopter operations

11.9.2.5 Wind turbine and OSP construction infrastructure above LAT could restrict access to helicopters operating in support of the offshore hydrocarbon industry. Hydrocarbon platform and helicopter operators have been consulted with regard to the potential for the Morgan Generation Assets to create an obstruction to aviation activities conducted in the vicinity of the wind turbines and OSPs.

11.9.2.6 Appendix A of Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement considers those offshore platforms which are located within 9 nm of the Morgan Array Area and assesses helicopter access to current Irish Sea (Liverpool and Morecambe Bay) oil and gas installations (platforms) near the Morgan Array Area. HAR analysis considered 11 installations within a 9 nm range of the Morgan Array Area, and identified a potential impact on three installations:

- Millom West platform, operated by Harbour Energy, located 1.6 nm from the Morgan Array Area
- Millom East (pipeline end manifold (PLEM) and three subsea wellheads protection structures (WHPS), operated by Harbour Energy, located 2.1 nm from the Morgan Array Area
- Q1-3 wellheads, operated by Chrysaor Resources (Irish Sea) Ltd. (Harbour Energy), located 2.1 nm from the Morgan Array Area.

11.9.2.7 The HAR concluded that the Morgan Generation Assets could restrict or prevent helicopter access to these three installations under certain meteorological and flight conditions. For the Millom West platform, the distance to the Morgan Array Area will prevent IMC approaches, resulting in a 4.3% average annual loss of access. Day VMC approaches will provide access for an average of 94.4% of daylight conditions. For the Millom East PLEM and WHPS and Q1-3 wellheads, day VMC access would be possible, and would provide average access of 94.4% of daylight conditions. Night access would not be possible under proposed CAA regulations (see Appendix A of Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement), however it is understood that flights to non-production installations (e.g. a jack-up vessel working over a wellhead or at an NUI) typically occur during daylight and predominately under VMC.

11.9.2.8 For Millom West, Millom East PLEM and WHPS and Q1-3 wellheads, it should be noted that emergency helicopter flights by HM Coastguard would still be possible to the platform or a drilling rig or vessel working over the wellhead. The SAR helicopters operated on behalf of the MCA are not constrained by Commercial Air Transport (CAT) meteorological limits, or operational limits. The Morgan Generation Assets will have a layout which will need to be compliant with MGN 654, and therefore SAR access to installations adjacent to the Morgan Generation Assets will still be available. Any reduction in CAT helicopter access will result in a logistical impact on the installation operator, rather than a safety impact as SAR helicopters will be tasked for major incidents, accidents and urgent medical evacuations, rather than CAT helicopters.

11.9.2.9 As described in Table 11.4, decommissioning activities requiring helicopter access at the Millom West platform and Millom East subsea structures are planned to take place until approximately 2030 and 2032 respectively, and therefore there is potential for impact during the construction phase of the Morgan Generation Assets.

11.9.2.10 A range of adopted measures, in the form of appropriate notification to aviation stakeholders, development of, and adherence to a Design Plan, and lighting and marking to minimise effects to aviation flight operations would apply to the development of the Morgan Generation Assets. These will comply with current guidelines where appropriate and be agreed with the appropriate stakeholders and are outlined in Table 11.15.

11.9.2.11 The impact is predicted to be of local spatial extent, short term duration, intermittent and low reversibility for the construction phase. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **low**.

Instrument Flight Procedures

11.9.2.12 Wind turbine and OSP construction infrastructure above LAT could pose a physical obstruction to flight operations in the vicinity, specifically to flight procedures. Appendix B of Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement assesses those Irish Sea littoral aerodromes' flight procedures which are within 50 nm of the Morgan Array Area. The IFP assessment which was completed at a maximum blade tip height of 364 m LAT has concluded that the Morgan Array Area will breach the MSAs at Walney Aerodrome and the confines of the Surveillance Minimum Altitude Area (SMAA) at Ronaldsway (IoM) Airport. The RAF Valley Air Traffic Control Surveillance Minimum Altitude Chart (ATCSMAC) will also be impacted. These areas provide an altitude at which a minimum of 300 metres (m) above the highest obstacle is ensured for IFR flights.

11.9.2.13 The impact is predicted to be of regional spatial extent, short term duration, intermittent and low reversibility for the construction phase. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **medium**.

Sensitivity of the receptor

Military and other low flying operations

11.9.2.14 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 (VMC), pilots are ultimately responsible for seeing and avoiding obstructions such as wind turbines and will be aware through notification procedures of the Morgan Generation Assets. Furthermore, when flying in IMC pilots may be under the control of ATC with an appropriate level of radar service and flying at an altitude which provides the required separation from obstacles below them.

11.9.2.15 The MOD, ATC service providers and helicopter operators have been consulted with regard to the potential for the Morgan Generation Assets to create an obstruction to military and other low flying operations conducted in the vicinity of construction infrastructure. No concerns were raised on this issue.

11.9.2.16 The stakeholders' ability to continue to conduct military and other low flying operations in the Irish Sea airspace is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **medium**.

Helicopter operations

11.9.2.17 NHV provide helicopter support to Harbour Energy. Consultation with NHV during the Scoping phase indicated that impacts of varying degrees may be experienced by helicopter operations completed in poor weather conditions to their offshore hydrocarbon platforms due to the creation of obstacles. Following consultation on the PEIR, the Applicant has held several meetings with Harbour Energy to discuss the potential impact (Table 11.4).

11.9.2.18 It is understood that access to NUIs typically occurs in daylight and predominately under VMC. There is potential for decommissioning schedules to be affected if day VMC access is restricted, however the potential impact is logistical rather than safety related. The assets being decommissioned will no longer be productive.

11.9.2.19 The Applicant presented the findings of the HAR to Harbour Energy in December 2023, and discussions are ongoing between the parties.

11.9.2.20 The receptor is deemed to be of low vulnerability, high recoverability and medium value. The sensitivity of the receptor is therefore, considered to be **low**.

Instrument Flight Procedures

11.9.2.21 Walney Aerodrome, RAF Valley (via the MOD) and Ronaldsway (IoM) Airport have been consulted throughout the pre-application phase, as presented in Table 11.4. Walney Aerodrome are discussing internally the management of the requirement to increase the Walney Aerodrome MSA. The Applicant is continuing to engage with Walney Aerodrome, the MOD and Ronaldsway (IoM) Airport to provide an agreed route to mitigation.

11.9.2.22 The receptor is deemed to be of high vulnerability, low recoverability and high value. The sensitivity of the receptor is therefore, considered to be **high**.

Significance of the effect

Military and other low flying operations

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

Helicopter operations

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

Instrument Flight Procedures

11.9.2.25 Overall, the magnitude of the impact is deemed to be medium and the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms.

Further mitigation and residual effect

Instrument Flight Procedures

11.9.2.26 Consultation with regard to the potential breach of the SMAA, ATCSMAC and MSA with Ronaldsway (IoM) Airport, RAF Valley (via the MOD) and Walney Aerodrome is continuing with a view to reaching agreement on mitigation to maintain a safe altitude for aircraft flying IFR procedures in the sectors of the SMAA/ATCSMAC/MSA impacted by the Morgan Array Area.

11.9.2.27 Agreement with the impacted stakeholders is being sought to raise the impacted MSA/SMAA altitudes to a level that will provide the required minimum of 300 m separation between the highest obstacle (wind turbine) and IFR flight rules aircraft operating within the affected area.

11.9.2.28 The aerodrome licence holder or representative acting on the licence holder's behalf is responsible for the initial design, routine maintenance and periodic review of their aerodrome's ATCSMAC. Military aerodromes ATCSMACs and IFP are reviewed annually.

11.9.2.29 The aerodrome licence holder shall, if appropriate, independently re-issue the ATCSMAC as soon as possible if the changing obstacle environment or aerodrome

operational requirement dictates an amendment to the ATCSMAC, either laterally or vertically. During annual maintenance review an appointed and approved Procedure Designer will review the ATCSMAC, together with IFPs published for the given aerodrome, and assess their compliancy to ICAO criteria – as well as ensuring that the applicable obstacle clearance is achieved for all procedures considering the latest aerodrome and obstacle survey data available at the given date. As an output from the review, the Procedure Designer will provide a list of recommended changes to be actioned on the IFPs/ATCSMAC to ensure they remain compliant to criteria as well as provide the required clearance margin over terrain and obstacles surrounding the airport.

11.9.2.30 If a change to the ATCSMAC is required, consideration will be given to any new dominant vertical obstacle(s) that require a change to the level previously provided in a particular segment/area of the ATCSMAC. This new level will provide a minimum of 300 m obstacle clearance for IFR flights.

11.9.2.31 It is considered that the residual impact to the Ronaldsway (IoM) Airport SMAA, RAF Valley ATCSMAC and Walney Aerodrome MSA would be **minor adverse** with mitigation in place, which is not significant in EIA terms.

Operations and maintenance phase

Magnitude of impact

Military and other low flying operations

11.9.2.32 During the operations and maintenance phase of the Morgan Generation Assets, the presence and operation of wind turbines and the OSP could pose a physical obstruction to flight operations in the vicinity of the Morgan Array Area, specifically to military and other low flying operations. As discussed in paragraph 11.9.2.2, wind turbines and OSPs can be difficult to see from the air, leading to potential increased obstacle collision risk.

11.9.2.33 A range of adopted measures, in the form of appropriate notification to aviation stakeholders, development of, and adherence to a Design Plan, and lighting and marking to minimise effects to aviation flight operations would apply to the development of the Morgan Generation Assets. These will comply with current guidelines where appropriate and be agreed with the appropriate stakeholders and are outlined in Table 11.15.

11.9.2.34 The impact is predicted to be of regional spatial extent, long term duration, continuous and low reversibility for the operations and maintenance phase. It is predicted that the impact will affect the receptor directly. The magnitude is considered to be **low**.

Helicopter operations

11.9.2.35 The presence and operation of wind turbine and OSP infrastructure above LAT could restrict access to helicopters operating in support of the offshore hydrocarbon industry, as discussed in paragraph 11.9.2.5.

11.9.2.36 The HAR presented within Appendix A of Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement considered 11 installations within a 9 nm range of the Morgan Array Area, and identified a potential impact on three installations:

- Millom West platform, operated by Harbour Energy, located 1.6 nm from the Morgan Array Area

- Millom East PLEM and WHPS, operated by Harbour Energy, located 2.1 nm from the Morgan Array Area
- Q1-3 wellheads, operated by Chrysaor Resources Irish Sea Ltd. (Harbour Energy), located 2.1 nm from the Morgan Array Area.

11.9.2.37 The HAR concluded that the Morgan Generation Assets could restrict or prevent helicopter access to these three installations under certain meteorological and flight conditions, as described in paragraph 11.9.2.7. It is understood that flights to non-production installations (e.g. a jack-up vessel working over a wellhead or at an NUI) typically occur during daylight VMC.

11.9.2.38 For Millom West, Millom East PLEM and WHPS and Q1-3 wellheads, it should be noted that emergency helicopter flights by HM Coastguard would still be possible to the platform or a drilling rig or vessel working over the wellhead. The SAR helicopters operated on behalf of the MCA are not constrained by Commercial Air Transport (CAT) meteorological limits, or operational limits. The Morgan Generation Assets will have a layout which will need to be compliant with MGN 654, and therefore SAR access to installations adjacent to the Morgan Generation Assets will still be available. Any reduction in CAT helicopter access will result in a logistical impact on the installation operator, rather than a safety impact as SAR helicopters will be tasked for major incidents, accidents and urgent medical evacuations, rather than CAT helicopters.

11.9.2.39 As described in Table 11.4, the Millom West platform and Millom East subsea structures are planned to be decommissioned by approximately 2030 and 2032 respectively. The potential impact may therefore occur over an approximately one to three year period, as the Applicant intends for the Morgan Generation Assets to be fully operational by 2030 (see Volume 1, Chapter 3: Project description of the Environmental Statement). The duration of the potential impact will therefore depend on the duration of overlap between the operation of the installations and the Morgan Generation Assets operations and maintenance phase.

11.9.2.40 A range of adopted measures, in the form of appropriate notification to aviation stakeholders, development of, and adherence to a Design Plan, and lighting and marking to minimise effects to aviation flight operations would apply to the development of the Morgan Generation Assets. These will comply with current guidelines where appropriate and be agreed with the appropriate stakeholders and are outlined in Table 11.15.

11.9.2.41 The impact is predicted to be of local spatial extent, short term duration (the potential impact may occur over an approximately one to three year period), continuous and low reversibility for the operations and maintenance phase. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **low**.

Instrument Flight Procedures

11.9.2.42 The presence and operation of wind turbine and OSP infrastructure above LAT could pose a physical obstruction to flight operations in the vicinity, specifically to flight procedures. Appendix B of Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement assesses those Irish Sea littoral aerodromes' flight procedures which are within 50 nm of the Morgan Array Area. The IFP assessment which was completed at a maximum blade tip height of 364 m LAT has concluded that the Morgan Array Area will breach the MSAs at Walney Aerodrome, the RAF Valley ATCSMAC and the confines of the SMAA at Ronaldsway (IoM) Airport.

11.9.2.43 The impact is predicted to be of regional spatial extent, long term duration, continuous and low reversibility for the operations and maintenance phase. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **medium**.

Sensitivity of receptor

Military and other low flying operations

11.9.2.44 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, pilots are ultimately responsible for seeing and avoiding obstructions such as wind turbines and will be aware through notification procedures of the Morgan Generation Assets. Furthermore, when flying in IMC pilots may be under the control of ATC with an appropriate level of radar service and flying at an altitude which provides the required separation from obstacles below them.

11.9.2.45 The MOD, ATC service providers and helicopter operators have been consulted with regard to the potential for the Morgan Generation Assets to create an obstruction to military and other low flying operations conducted in the vicinity of the Morgan Array Area. No concerns were raised on this issue.

11.9.2.46 The stakeholders' ability to continue to conduct military and other low flying operations in the Irish Sea airspace is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **medium**.

Helicopter operations

11.9.2.47 As described in paragraph 11.9.2.17, consultation with NHV during the Scoping phase indicated the potential for impact on helicopter operations to offshore hydrocarbon platforms due to the creation of obstacles. Following consultation on the PEIR, the Applicant has held several meetings with Harbour Energy to discuss the potential impact (Table 11.4).

11.9.2.48 It is understood that access to NUIs typically occurs in daylight and predominately under VMC. There is potential for decommissioning schedules to be affected if day VMC access is restricted, however the potential impact is logistical rather than safety related. The assets being decommissioned will no longer be productive.

11.9.2.49 The Applicant presented the findings of the HAR to Harbour Energy in December 2023 and discussions are ongoing between the parties.

11.9.2.50 The receptor is deemed to be of low vulnerability, high recoverability and medium value. The sensitivity of the receptor is therefore, considered to be **low**.

Instrument Flight Procedures

11.9.2.51 Walney Aerodrome, RAF Valley (via the MOD) and Ronaldsway (IoM) Airport have been consulted throughout the pre-application phase, as presented in Table 11.4. Walney Aerodrome are discussing internally the management of the requirement to increase the Walney Aerodrome MSA. The Applicant is continuing to engage with all stakeholders to provide an agreed route to mitigation.

11.9.2.52 The receptor is deemed to be of high vulnerability, low recoverability and high value. The sensitivity of the receptor is therefore, considered to be **high**.

Significance of the effect

Military and other low flying operations

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

Helicopter operations

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

Instrument Flight Procedures

11.9.2.55 Overall, the magnitude of the impact is deemed to be medium and the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms.

Further mitigation and residual effect

Instrument Flight Procedures

11.9.2.56 Consultation with regard to the potential breach of the SMAA, ATCSMAC and MSA with Ronaldsway (IoM) Airport, the MOD and Walney Aerodrome is continuing with a view to reaching agreement on mitigation to maintain a safe altitude for aircraft flying IFR procedures in the sectors of the SMAA/ATCSMAC and MSA impacted by the Morgan Array Area.

11.9.2.57 Agreement with the impacted stakeholders is being sought to raise the impacted MSA/SMAA altitudes to a level that will provide the required minimum of 300 m separation between the highest obstacle (wind turbine) and IFR flight rules aircraft operating within the affected area. Procedures for raising the RAF Valley ATCSMAC are discussed in paragraph 11.9.2.29.

11.9.2.58 It is considered that the residual impact to the Ronaldsway (IoM) Airport SMAA, RAF Valley ATCSMAC and Walney Aerodrome MSA would be **minor adverse** with mitigation in place, which is not significant in EIA terms.

Decommissioning phase

Significance of effect

Military and other low flying operations

11.9.2.59 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Helicopter operations

11.9.2.60 There is no potential for impact during the decommissioning phase, as the installations potentially affected are planned to be decommissioned by 2032 (see Table 11.4).

Instrument Flight Procedures

11.9.2.61 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms.

Further mitigation and residual effect

Instrument Flight Procedures

11.9.2.62 Consultation with regard to the potential breach to the SMAA, ATCSMAC and MSA with Ronaldsway (IoM) Airport, the MOD and Walney Aerodrome is continuing with a view to reaching agreement on mitigation to maintain a safe altitude for aircraft flying IFR procedures in the sectors of the SMAA/ATCSMAC and MSA impacted by the Morgan Array Area.

11.9.2.63 Agreement with the impacted stakeholders is being sought to raise the impacted SMAA/MSA altitudes to a level that will provide the required minimum of 300 m separation between the highest obstacle (wind turbine) and IFR flight rules aircraft operating within the affected area. Procedures for raising the RAF Valley ATCSMAC are discussed in section 11.9.2.28.

11.9.2.64 It is considered that the residual impact to the Ronaldsway (IoM) Airport SMAA, RAF Valley ATCSMAC and Walney Aerodrome MSA would be **minor adverse** with mitigation in place, which is not significant in EIA terms.

11.9.3 Wind turbines causing interference on aviation PSR systems

Operations and maintenance phase

Magnitude of impact

11.9.3.1 A radar Line of Sight (LoS) analysis across the Morgan Array Area has been completed to establish theoretical radar detectability of the wind turbines, placed within the Morgan Array Area, to selected PSR systems located in the UK based on a maximum upper blade tip height of 364 m above LAT. The full details are presented in Volume 4, Annex 11.1: Aviation and radar technical report of the Environmental Statement.

11.9.3.2 Radar LoS modelling results indicate that operational wind turbines in the Morgan Array Area would be theoretically detectable by the following PSR systems:

- NATS Lowther Hill (due to the vertical extent of the wind turbines, approximately 90% of the Morgan Array Area is theoretically highly likely to be in radar LoS to this NATS PSR)
- NATS St Anne's (all wind turbines are theoretically highly likely to be in radar LoS to this NATS PSR)
- Ronaldsway (IoM) Airport (all wind turbines are theoretically highly likely to be in radar LoS to this NATS PSR).

11.9.3.3 Wind turbines detectable by a PSR system may 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.

11.9.3.4 Without mitigation, the impact created by the detection of operational wind turbines is predicted to be of regional spatial extent, long term duration, continuous and low

reversibility for the operations and maintenance phase. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **medium**.

Sensitivity of receptor

11.9.3.5 The ability of operators of aviation PSR systems to accurately use their respective radar systems for the provision of an ATS could be impacted by the presence of wind turbine interference and the production of radar clutter onto radar displays.

11.9.3.6 As summarised in Table 11.4, consultation with NATS and Ronaldsway (IoM) Airport has taken place throughout the pre-application phase. All parties are actively engaged with the Applicant to provide an agreed route to mitigation of effect.

11.9.3.7 All radar receptors require assurance that impact created by the detection of operational wind turbines does not have a detrimental impact on the ATS they provide so that they may continue to deliver a safe and effective ATS and to monitor the airspace of operational importance to them. The radar stakeholders are considered to be of high vulnerability, low recoverability and high value. The sensitivity of these receptors is therefore, considered to be **high**.

Significance of effect

11.9.3.8 Overall, the magnitude of the impact is deemed to be medium, and the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms.

Further mitigation and residual effect

11.9.3.9 An ATS provider such as NATS and the airport authorities affected may accept that although an impact may be present, it can be managed and accepted by implementing operational mitigation in airspace that is not regularly used for the separation of aircraft. However, in the complex airspace in which the Morgan Array Area is located, operational acceptance of the effect created is unlikely to be acceptable to all ATC providers without mitigation, portions of airspace may be more important to some ATC establishments than others, due to the role and responsibility of ATC provision allocated to them. Further engagement and agreement is required with the respective radar receptor on the mitigation solution to be utilised.

NATS PSR

11.9.3.10 In the case of NATS radar systems impacted (Lowther Hill and St Anne's PSRs) previous acceptable mitigation of wind turbine impact to these systems has been achieved through agreement by NATS of radar blanking and infill. The Lowther Hill Indra PSR incorporates the latest technologies for en-route air route surveillance which may provide an enhanced capability to mitigate wind turbine effect. However, optimisation of the radar system to mitigate the potential impact of the Morgan Generation Assets will be required and be agreed by NATS.

11.9.3.11 NATS have defined a mitigation solution which will be subject to commercial agreement between the Applicant and NATS and will be implemented by radar blanking of the affected areas of the Lowther Hill 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 the removal of radar returns through radar blanking, an application to the CAA for an airspace change and the provision of a Transponder Mandatory Zone (TMZ) will remove impact created by the Morgan Generation Assets to the affected NATS PSR. A TMZ is a defined piece of airspace in which the carriage and operation of a pressure-altitude transponder is mandatory within an aircraft. The creation of a TMZ allows the airspace within and above the

development to retain its original classification, yet also allows for enhanced situational awareness for all users and for air traffic controllers. Provision can be made for non-compliant aircraft to gain access to the TMZ; the creation of the TMZ will require regulatory approval by the CAA through an airspace change proposal.

11.9.3.12 NATS has confirmed the radar mitigation solution for the Morgan Generation Assets as Large Blanking and TMZ (see Table 11.4). With mitigation implemented and associated operational processes and procedures in place, the residual effect to the impacted NATS PSR systems will be of **minor adverse** significance, which is not significant in EIA terms.

Ronaldsway (IoM) Airport PSR

11.9.3.13 Ronaldsway (IoM) Airport ATC have indicated that the airport's PSR should be capable of removing wind turbine clutter created by the Morgan Generation Assets through radar suppression system techniques which may be required to be completed by the radar manufacturer (Selex). Any primary returns from the Morgan Array Area would be similar in strength to returns currently received from operational wind farms located to the east of the Isle of Man at approximately the same range which are minimal. However, during further engagement with the airport, radar suppression of the wind turbine created clutter would not be the preferred option to provide suitable mitigation.

11.9.3.14 Consultation with the airport continues with the expectation that, if required, a technical mitigation solution will be agreed. It is anticipated that this could take the form of mitigation through installation of additional MultiLATeration (MLAT) sensors within the Morgan Array Area to aid solid secondary radar coverage within the airspace above, and/or radar blanking and airspace change application for a TMZ. Agreement will be required on the mitigation solution to be utilised. With mitigation implemented and associated operational processes and procedures in place, the residual effect to the impacted airport's PSR system will be of **minor adverse** significance, which is not significant in EIA terms.

11.9.4 Future monitoring

11.9.4.1 No aviation and radar monitoring to test the predictions made within the impact assessment is considered necessary.

11.10 Cumulative effects assessment methodology

11.10.1 Methodology

11.10.1.1 The Cumulative Effects Assessment (CEA) takes into account the impact associated with the Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets, the Morecambe Offshore Windfarm: Generation Assets, and other projects and plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise (see Volume 3, Annex 5.1: CEA screening matrix of the Environmental Statement). Each project has been considered on a case-by-case basis for screening in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

11.10.1.2 The aviation and radar CEA methodology has followed the methodology set out in Volume 1, Chapter 5: EIA methodology of the Environmental Statement. The cumulative assessment considers three scenarios:

- Scenario 1: Morgan Generation Assets plus Morgan and Morecambe Offshore Wind Farms: Transmission Assets
- Scenario 2: Morgan Generation Assets plus Morgan and Morecambe Offshore Wind Farms: Transmission Assets and the Morecambe Offshore Windfarm: Generation Assets
- Scenario 3: Morgan Generation Assets plus Morgan and Morecambe Offshore Wind Farms: Transmission Assets alongside all other projects, plans and activities. This assessment has been allocated into 'tiers' reflecting the current stage of the other projects, plans and activities within the planning and development process. This tiered approach is adopted to provide a clear assessment of the Morgan Generation Assets and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets alongside other projects, plans and activities:
  - Tier 1: includes projects, plans and activities at the following stages:
    - Under construction
    - Permitted application
    - Submitted application
    - Those currently operational that were not operational when baseline data were collected, and/or those that are operational but have an ongoing impact.
  - Tier 2: includes projects, plans and activities at the following stages:
    - Scoping report has been submitted and is in the public domain.
  - Tier 3: includes projects, plans and activities at the following stages:
    - Scoping report has not been submitted and is not in the public domain
    - Identified in a relevant Development Plan
    - Identified in other plans and programmes.

11.10.1.3 This approach to CEA has been developed to provide an assessment of the Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets (Scenario 1) and the Morecambe Offshore Windfarm: Generation Assets (Scenario 2) in order to identify, as far as possible, the combined effects of these three applications separately from the assessment that includes all other projects, plans and activities (Scenario 3).

11.10.1.4 The specific projects, plans and activities scoped into the CEA, are outlined in Table 11.16 and shown on Figure 11.3.

11.10.1.5 For the purposes of the aviation and radar CEA, the cumulative assessment of creation of physical obstacle to aircraft operations has been assessed within 40 km from the Morgan Array Area, 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 Morgan Array Area.

11.10.1.6 For the purposes of the aviation and radar CEA, the cumulative assessment of radar effect has been assessed within 100 km from the Morgan Array Area, which is considered to be the maximum range where radar cumulative effects may occur, although some impacts are likely to be localised to the Morgan Array Area due to the unmitigated effect created by the detection of operational wind turbines.

11.10.1.7 Certain impacts assessed for the project alone are not considered in the cumulative assessment due to:

- The highly localised nature of the impacts (i.e. they occur entirely within the Morgan Array Area)
- Management measures in place for the Morgan Generation Assets will also be in place on other projects reducing their risk of occurrence
- Segments of IFPs being designed with regard to one unique dominant vertical obstacle; the number/density of obstacles does not change that dominant feature unless an obstacle of greater height is introduced within a segment. Changes to airspace structures and/or the local obstacle environment does affect the IFP but only when a single new dominant vertical obstacle is introduced into a design segment; IFPs become more sensitive to vertical obstacles as those obstacles move nearer an associated aerodrome, rather than the numbers themselves.
- A lack of data or confidence in data preventing meaningful assessment (Tier 3).

11.10.1.8 The impacts excluded from the CEA for the above reasons are as follows:

- Wind turbines creating an impact to offshore helicopter operations to hydrocarbon platforms.
- Impact to IFP/MSA.

11.10.1.9 Therefore, the impacts that are considered in the CEA are as follows:

- Creation of physical obstacle to aircraft operations
- Wind turbines causing interference on aviation PSR systems.

Table 11.16: List of other projects, plans and activities considered within the CEA for aviation and radar.

Project/Plan	Status	Distance from the Morgan Array Area (km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Dates of construction and operation (if applicable) and overlap with the Morgan Offshore Wind Project: Generation Assets
Morgan and Morecambe Offshore Wind Farms Transmission Assets						
Morgan and Morecambe Offshore Wind Farms Transmission Assets	Pre-application	0.0	Morgan and Morecambe Offshore Wind Farms Transmission Assets	1 January 2028 to 31 December 2029	1 January 2030 to 31 December 2065	Project construction phase overlaps with the Morgan Generation Assets construction phase. Project operations and maintenance phase overlaps with the Morgan Generation Assets operations and maintenance phase.
Tier 1						
Walney Extension 4 Offshore Wind Farm	Operational	9.5	Offshore Renewables	Not applicable	Operational	Project operational phase overlaps with the Morgan Generation Assets proposed construction and operations and maintenance phases.
Walney Extension 3 Offshore Wind Farm	Operational	8.1	Offshore Renewables	Not applicable	Operational	Project operational phase overlaps with the Morgan Generation Assets proposed construction and operations and maintenance phases.
Walney 2 Offshore Wind Farm	Operational	13.3	Offshore Renewables	Not applicable	Operational	Project operational phase overlaps with the Morgan Generation Assets proposed construction and operations and maintenance phases.
West of Duddon Sands Offshore Wind Farm	Operational	15.4	Offshore Renewables	Not applicable	Operational	Project operational phase overlaps with the Morgan Generation Assets proposed construction and operations and maintenance phases.
Walney 1 Offshore Wind Farm	Operational	16.3	Offshore Renewables	Not applicable	Operational	Project operational phase overlaps with the Morgan Generation Assets proposed construction and operations and maintenance phases.

Project/Plan	Status	Distance from the Morgan Array Area (km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Dates of construction and operation (if applicable) and overlap with the Morgan Offshore Wind Project: Generation Assets
Ormonde Offshore Wind Farm	Operational	24.4	Offshore Renewables	Not applicable	Operational	Project operational phase overlaps with the Morgan Generation Assets proposed construction and operations and maintenance phases.
Barrow Offshore Wind Farm	Operational	30.1	Offshore Renewables	Not applicable	Operational	Project operational phase overlaps with the Morgan Generation Assets proposed construction and operations and maintenance phases.
Gwynt y Môr Offshore Wind Farm	Operational	51.5	Offshore Renewables	Not applicable	Operational	Project operational phase overlaps with the Morgan Generation Assets proposed construction and operations and maintenance phases.
Burbo Bank Offshore Wind Farm	Operational	61.6	Offshore Renewables	Not applicable	Operational	Project operational phase overlaps with the Morgan Generation Assets proposed construction and operations and maintenance phases.
Rhyl Flats Offshore Wind Farm	Operational	60.5	Offshore Renewables	Not applicable	Operational	Project operational phase overlaps with the Morgan Generation Assets proposed construction and operations and maintenance phases.
North Hoyle Offshore Wind Farm	Operational	61.1	Offshore Renewables	Not applicable	Operational	Project operational phase overlaps with the Morgan Generation Assets proposed construction and operations and maintenance phases.
Burbo Bank Offshore Wind Farm Extension	Operational	56.0	Offshore Renewables	Not applicable	Operational	Project operational phase overlaps with the Morgan Generation Assets proposed construction and operations and maintenance phases.
Robin Rigg East Offshore Wind Farm	Operational	78.7	Offshore Renewables	Not applicable	Operational	Project operational phase overlaps with the Morgan Generation Assets proposed construction and operations and maintenance phases.
Awel y Môr Offshore Wind Farm	Consent approved	46.8	Awel y Môr offshore wind farm, planning	Anticipated to commence in 2026	1 January 2030 to 1 January 2055	Construction anticipated to commence in 2026, predicted operational 01 January 2030 to 01 January 2055.

Project/Plan	Status	Distance from the Morgan Array Area (km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Dates of construction and operation (if applicable) and overlap with the Morgan Offshore Wind Project: Generation Assets
			to comprise up to 50 wind turbines and array area of 78 km^2.			Project construction phase overlaps with the Morgan Generation Assets proposed construction phase. Project operational phase overlaps with the Morgan Generation Assets proposed operations and maintenance phase.
Mona Offshore Wind Project	Application submitted	11.1	Proposed offshore wind farm. Maximum of 96 wind turbines and four OSPs, with minimum spacing between wind turbines of 1,400 m. Area: 300 km^2.	1 January 2028 to 31 December 2029	1 January 2030 to 31 December 2065	Project construction phase overlaps with the Morgan Generation Assets proposed construction phase. Project operational phase overlaps with the Morgan Generation Assets proposed operations and maintenance phases.
Tier 2						
Morecambe Offshore Windfarm: Generation Assets	PEIR submitted	11.2	Morecambe Offshore Windfarm Generation Assets: planning to comprise up to 35 wind turbines and indicative minimum spacing between rows	1 January 2028 to 31 December 2029	1 January 2030 to 31 December 2065	Project construction phase overlaps with the Morgan Generation Assets proposed construction phase. Project operational phase overlaps with the Morgan Generation Assets proposed operations and maintenance phase.

Project/Plan	Status	Distance from the Morgan Array Area (km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Dates of construction and operation (if applicable) and overlap with the Morgan Offshore Wind Project: Generation Assets
			of wind turbines of 1,400 m. Area: 87 km^2.			
Mooir Vannin Offshore Wind Farm	Scoping Report submitted	4.8	The Mooir Vannin offshore wind farm, located off the northeast coast of the Isle of Man. Maximum of 100 wind turbines in an area of 253 km^2.	Construction anticipated to start in 2030	Planning to be operational from 2032	Project operational phase overlaps with the Morgan Generation Assets proposed construction and operations and maintenance phases.

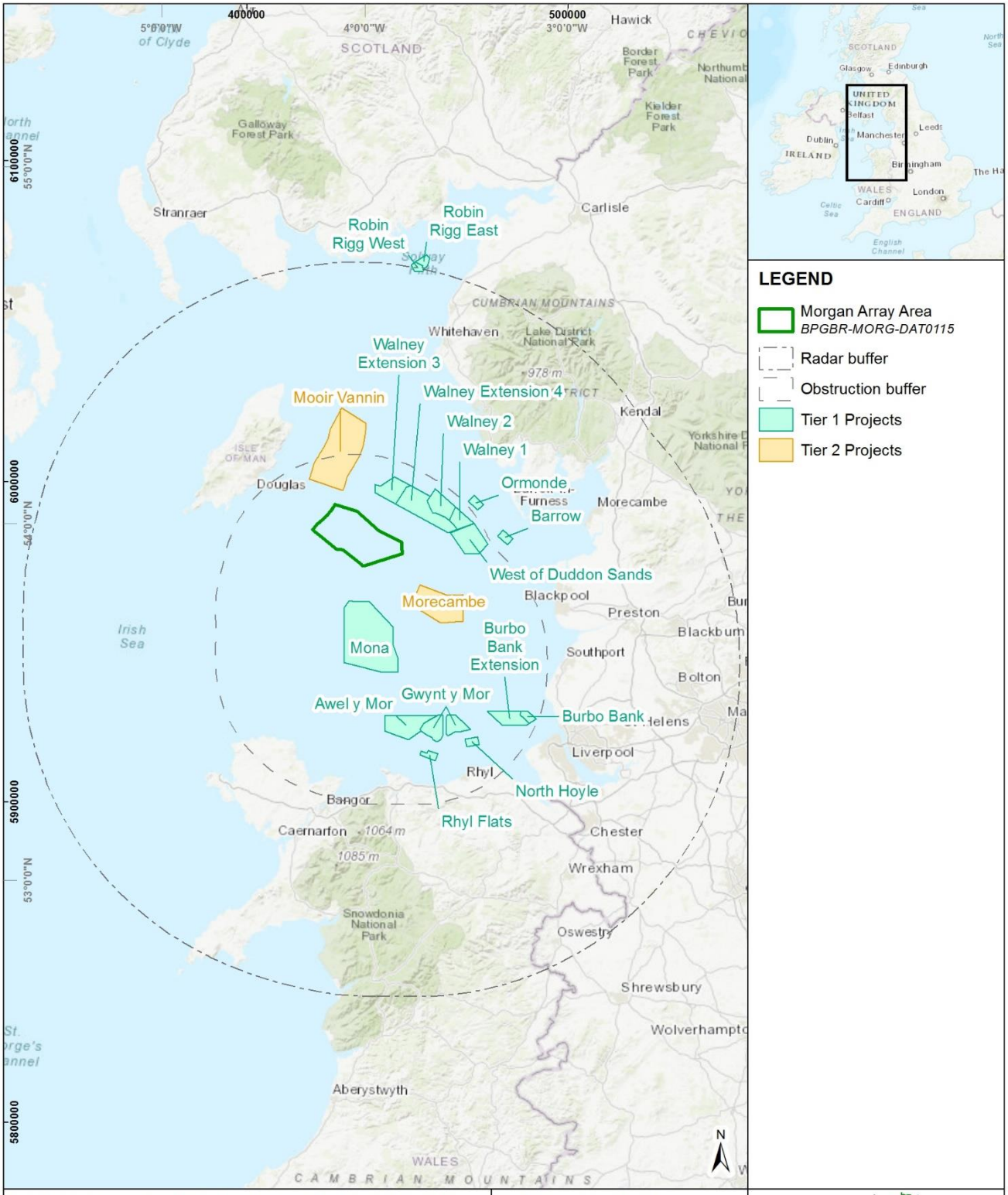


Figure 11.3: Other projects, plans and activities screened into the cumulative effects assessment.

11.10.2 Maximum Design Scenario

11.10.2.1 The MDSs identified in Table 11.17 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the Project Design Envelope provided in Volume 1, Chapter 3: Project description of the Environmental Statement as well as the information available on other projects and plans. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g. different wind turbine layout), to that assessed here, be taken forward in the final design scheme.

11.10.2.2 The CEA has considered the Morgan Generation Assets and the Morgan and Morecambe Offshore Wind Farms Transmission Assets, alongside the Mona Offshore Wind Project and the Morecambe Offshore Windfarm Generation Assets. The CEA has been undertaken on the basis of the information included within the Preliminary Environmental Information Report (PEIR) for the Morgan and Morecambe Offshore Wind Farms Transmission Assets (Morgan Offshore Wind Limited and Morecambe Offshore Windfarm Limited, 2023), the application for the Mona Offshore Wind Project (Mona Offshore Wind Ltd., 2024) and the PEIR for the Morecambe Offshore Windfarm Generation Assets (Morecambe Offshore Windfarm Ltd., 2023). Updated boundaries for the Mona Offshore Wind Project and the Morecambe Offshore Windfarm Generation Assets were published in September 2023 in project newsletters. The updated project boundary for the Mona Offshore Wind Project has been considered in the CEA. The updated boundaries for the Morecambe Offshore Windfarm Generation Assets have not been included within the CEA as the project has not published updated assessments with these boundaries.

Table 11.17: Maximum design scenario considered for the assessment of potential cumulative effects on aviation and radar.

[a] C=construction, O=operations and maintenance, D=decommissioning

Potential cumulative effect	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
Creation of physical obstacle to aircraft operations	✓	✓	✓	**Scenario 1** Maximum design scenario as described for the Morgan Generation Assets (Table 11.17) assessed cumulatively with the Morgan and Morecambe Offshore Wind Farms Transmission Assets. **Scenario 2** Maximum design scenario as described for the Morgan Generation Assets (Table 11.17) assessed cumulatively with the Morgan and Morecambe Offshore Wind Farms Transmission Assets and the Morecambe Offshore Windfarm Generation Assets. **Scenario 3** Maximum design scenario as described for the Morgan Generation Assets (Table 11.17) assessed cumulatively with the Morgan and Morecambe Offshore Wind Farms Transmission Assets and the following other projects/plans within 40 km of the Morgan Array Area: <u>Tier 1</u> • Walney Extension 4 Offshore Wind Farm • Walney Extension 3 Offshore Wind Farm • Walney 2 Offshore Wind Farm • Walney 1 Offshore Wind Farm • West of Duddon Sands Offshore Wind Farm • Gwynt y Môr Offshore Wind Farm • Burbo Bank Offshore Wind Farm • Burbo Bank Extension Offshore Wind Farm • North Hoyle Offshore Wind Farm • Rhyl Flats Offshore Wind Farm • Awel y Môr Offshore Wind Farm	This includes the presence of other developments which have the potential to create a cumulative aviation obstacle and affect the available airspace for other users in the same region within a representative 40 km buffer of the Morgan Array Area.

Potential cumulative effect	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
				• Mona Offshore Wind Project. Tier 2 • Morecambe Offshore Wind Farm Generation Assets • Mooir Vannin Offshore Wind Farm.	
Wind turbines causing interference on aviation PSR systems	×	✓	×	**Scenario 1** Maximum design scenario as described for the Morgan Generation Assets (Table 11.17) assessed cumulatively with the Morgan and Morecambe Offshore Wind Farms Transmission Assets. **Scenario 2** Maximum design scenario as described for the Morgan Generation Assets (Table 11.17) assessed cumulatively with the Morgan and Morecambe Offshore Wind Farms Transmission Assets and the Morecambe Offshore Windfarm Generation Assets. **Scenario 3** Maximum design scenario as described for the Morgan Generation Assets (Table 11.17) assessed cumulatively with the Morgan and Morecambe Offshore Wind Farms Transmission Assets and the following other projects/plans within 100 km of the Morgan Array Area: Tier 1 • Walney Extension 4 Offshore Wind Farm • Walney Extension 3 Offshore Wind Farm • Walney 2 Offshore Wind Farm • Walney 1 Offshore Wind Farm • West of Duddon Sands Offshore Wind Farm • Ormonde Offshore Wind Farm • Barrow Offshore Wind Farm • Gwynt y Môr Offshore Wind Farm • Burbo Bank Offshore Wind Farm	Maximum aviation and radar cumulative effect is calculated within a representative 100 km buffer of the Morgan Array Area.

Potential cumulative effect	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
				• Burbo Bank Offshore Wind Farm Extension • North Hoyle Offshore Wind Farm • Robin Rigg East Offshore Wind Farm • Rhyl Flats Offshore Wind Farm • Awel y Môr Offshore Wind Farm • Mona Offshore Wind Project. <u>Tier 2</u> • Morecambe Offshore Windfarm Generation Assets • Mooir Vannin Offshore Wind Farm.	

11.11 Cumulative effects assessment

11.11.1.1 A description of the significance of cumulative effects upon aviation and radar receptors arising from each identified impact is given below.

11.11.1.2 The CEA is presented in a series of tables (one for each potential cumulative impact), and considers the following:

- Scenario 1: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets
- Scenario 2: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and the Morecambe Offshore Windfarm Generation Assets
- Scenario 3: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and other relevant Tier 1, Tier 2 and Tier 3 projects and plans[4].

[4] Tier 3 projects have been screened out of the CEA for aviation and radar, as described in Volume 3, Annex 5.1: Cumulative effects screening matrix of the Environmental Statement.

11.11.2 Creation of physical obstacle to aircraft operations

Table 11.18: Creation of physical obstacle to aircraft operations – military and other low flying operations.

	Scenario 1: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets	Scenario 2: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets + Morecambe Offshore Windfarm Generation Assets	Scenario 3: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets + Tier 1, Tier 2, Tier 3 projects
Construction phase			
Magnitude of impact	The cumulative effects assessment for Scenario 1 considers the following: • Creation of physical obstacle to aircraft operations due to the installation of the Morgan Generation Asset infrastructure as described in section 11.9.2. • Creation of physical obstacle to aircraft operations due to the installation of the OSPs associated with the Morgan and Morecambe Offshore Wind Farms Transmission Assets. • Aviation operations in the UK are highly regulated. The Morgan Generation Assets and Morgan and Morecambe Offshore Wind Farms Transmission Assets are located in airspace where the provision of an air traffic service is routine. The same rules of the air which maintain a safe operating environment in the current baseline will continue to apply in the Irish Sea and the provision of an air traffic service will not be affected. The cumulative effect is predicted to be of regional spatial extent, short term duration, intermittent and low reversibility once construction has commenced. It is predicted that the impact will	The cumulative effects assessment for Scenario 2 considers the following: • Creation of physical obstacle to aircraft operations due to the installation of the Morgan Generation Asset infrastructure and the Morgan and Morecambe Offshore Wind Farms Transmission Assets, as described for Scenario 1. • Creation of physical obstacle to aircraft operations due to the installation of the Morecambe Offshore Windfarm Generation Assets. • Aviation operations in the UK are highly regulated as described for Scenario 1. The cumulative effect is predicted to be of regional spatial extent, short term duration, intermittent and low reversibility once construction has commenced. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **low**.	**Tier 1/Tier 2** The cumulative effects assessment for Scenario 3 considers the following: • Creation of physical obstacle to aircraft operations due to the installation of the Morgan Generation Asset infrastructure and the Morgan and Morecambe Offshore Wind Farms Transmission Assets, as described for Scenario 1. • Creation of physical obstacle to aircraft operations due to the operation and/or installation of the Tier 1 and Tier 2 projects listed in Table 11.17. • Aviation operations in the UK are highly regulated as described for Scenario 1. The cumulative effect is predicted to be of regional spatial extent, short term duration, intermittent and low reversibility once construction has commenced. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **low**.

	Scenario 1: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets	Scenario 2: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets + Morecambe Offshore Windfarm Generation Assets	Scenario 3: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets + Tier 1, Tier 2, Tier 3 projects
	affect the receptor directly. The magnitude is therefore, considered to be **low**.		
Sensitivity of receptor	The MOD, ATC service providers and helicopter operators have been consulted with regard to the potential for the Morgan Generation Assets 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 Morgan Generation Assets, Morgan and Morecambe Offshore Wind Farms Transmission Assets and other offshore developments considered within the CEA will be included within applicable military and civil aviation publications and charts; pilots will be aware of the presence of the developments through notification procedures (see Table 11.5). Notification of construction, operation and decommissioning of the wind farm and the lighting and promulgation on aviation charts of all wind farms considered to provide a cumulative obstruction to aviation will reduce any physical obstruction effect to aviation activities in the region of the Morgan Generation Assets. Due to measures adopted, it is considered that low flying operations in the uncontrolled airspace available below CAS between the operational and planned offshore wind farms, though constricted would not be affected by the operation of the Morgan Generation Assets, Morgan and Morecambe Offshore Wind Farms Transmission Assets and other offshore developments considered within the CEA. It is predicted that the impact will affect the aviation receptors operating in the airspace directly but without a change to present operating parameters. The low flying aircraft operator 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 effect	Overall, the magnitude of the cumulative impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.
Operations and maintenance phase			
Magnitude of impact	The cumulative effects assessment for Scenario 1 considers the following: • Creation of physical obstacle to aircraft operations due to the presence of the Morgan Generation Asset infrastructure as described in section 11.9.2.	The cumulative effects assessment for Scenario 2 considers the following: • Creation of physical obstacle to aircraft operations due to the presence of the Morgan Generation Asset infrastructure and the Morgan and Morecambe Offshore Wind Farms Transmission Assets, as described for Scenario 1.	**Tier 1/Tier 2** The cumulative effects assessment for Scenario 3 considers the following: • Creation of physical obstacle to aircraft operations due to the presence of the Morgan Generation Asset infrastructure and the Morgan and Morecambe Offshore Wind Farms

	Scenario 1: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets	Scenario 2: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets + Morecambe Offshore Windfarm Generation Assets	Scenario 3: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets + Tier 1, Tier 2, Tier 3 projects
	• Creation of physical obstacle to aircraft operations due to the presence of the OSPs associated with the Morgan and Morecambe Offshore Wind Farms Transmission Assets. • Aviation operations in the UK are highly regulated as described for the construction phase. The cumulative impact is predicted to be of regional spatial extent, long term duration, continuous, and low reversibility during the operations and maintenance phase. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **low**.	• Creation of physical obstacle to aircraft operations due to the presence of the Morecambe Offshore Windfarm Generation Assets. • Aviation operations in the UK are highly regulated as described for the construction phase. The cumulative impact is predicted to be of regional spatial extent, long term duration, continuous and low reversibility during the operations and maintenance phase. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **low**.	Transmission Assets, as described for Scenario 1. • Creation of physical obstacle to aircraft operations due to the operation of the Tier 1 and Tier 2 projects listed in Table 11.17. • Aviation operations in the UK are highly regulated as described for the construction phase. The cumulative impact is predicted to be of regional spatial extent, long term duration, continuous and low reversibility during the operations and maintenance phase. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **low**.
Sensitivity of receptor	The MOD, ATC service providers and helicopter operators have been consulted with regard to the potential for the Morgan Generation Assets to create an obstruction to aviation activities conducted in the vicinity. Sensitivity of the receptor is as described for the construction phase. The low flying aircraft operator 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 effect	Overall, the magnitude of the cumulative impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.	Overall, the magnitude of the cumulative impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.
Decommissioning phase			
Significance of effect	The cumulative effects of decommissioning activities are expected to be the same or similar to the effects from construction. The effect will,	The cumulative effects of decommissioning activities are expected to be the same or similar to the effects from construction. The effect will,	The cumulative effects of decommissioning activities are expected to be the same or similar to the effects from construction. The effect will,

	Scenario 1: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets	Scenario 2: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets + Morecambe Offshore Windfarm Generation Assets	Scenario 3: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets + Tier 1, Tier 2, Tier 3 projects
	therefore, be of **minor adverse** significance, which is not significant in EIA terms.	therefore, be of **minor adverse** significance, which is not significant in EIA terms.	therefore, be of **minor adverse** significance, which is not significant in EIA terms.

11.11.3 Wind turbines causing interference on aviation PSR systems

Table 11.19: Wind turbines causing interference on aviation PSR systems.

	Scenario 1: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets	Scenario 2: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets + Morecambe Offshore Windfarm Generation Assets	Scenario 3: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets + Tier 1, Tier 2, Tier 3 projects
Operations and maintenance phase			
Magnitude of impact	The cumulative effects assessment for Scenario 1 considers the following: • Interference on aviation PSR systems due to the operation of the Morgan Generation Asset wind turbines as described in section 11.9.3. • No potential for interference on aviation PSR systems due to the presence of the Morgan and Morecambe Offshore Wind Farms Transmission Assets. Stationary objects (e.g. OSPs) are not normally detected by aviation radar as the radar can be optimised through radar signal processing techniques to remove them. The stationary infrastructure will not be displayed on radar. As such, there is no potential for a cumulative effect on aviation PSR systems arising from Scenario 1. The potential for cumulative effects arising from Scenario 1 is not considered further.	The cumulative effects assessment for Scenario 2 considers the following: • Interference on aviation PSR systems due to the operation of the Morgan Generation Asset wind turbines as described in section 11.9.3. • No potential for interference on aviation PSR systems due to the presence of the Morgan and Morecambe Offshore Wind Farms Transmission Assets, as described for Scenario 1. • Interference on aviation PSR systems due to the operation of the Morecambe Offshore Windfarm Generation Assets. • The Morgan Generation Assets wind turbines may be theoretically detectable by the PSR systems of NATS Lowther Hill, NATS St Anne's and Ronaldsway (IoM) Airport. Unmitigated, the potential cumulative effect created by the detection of the Morgan Generation Assets and Morecambe Offshore Windfarm Generation Assets wind turbines may be to potentially add to radar screen clutter that may be operationally managed by the aviation stakeholder, potentially leading to an increase in the individual signal processing demands of the predicted affected PSRs. The impact is predicted to be of regional spatial extent, long term duration, continuous and low	**Tier 1/Tier 2** The cumulative effects assessment for Scenario 3 considers the following: • Interference on aviation PSR systems due to the operation of the Morgan Generation Asset wind turbines as described in section 11.9.3. • No potential for interference on aviation PSR systems due to the presence of the Morgan and Morecambe Offshore Wind Farms Transmission Assets, as described for Scenario 1. • Interference on aviation PSR systems due to the operation of the Tier 1 and Tier 2 projects listed in Table 11.17. • The Morgan Generation Assets wind turbines would be theoretically detectable by the PSR systems of NATS Lowther Hill, NATS St Anne's and Ronaldsway (IoM) Airport. It is likely that those consented and operational wind farms included in the CEA are already mitigated against the effect to aviation radar; for example, Awel y Môr radar mitigation is secured in the associated DCO. Unmitigated, the potential cumulative effect created by the detection of operational wind

	Scenario 1: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets	Scenario 2: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets + Morecambe Offshore Windfarm Generation Assets	Scenario 3: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms Transmission Assets + Tier 1, Tier 2, Tier 3 projects
		reversibility for the operations and maintenance phase, with loss of significant system components. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **medium**.	turbines will be to potentially add to radar screen clutter that presently may be operationally managed by the aviation stakeholder, potentially leading to an increase in the individual signal processing demands of the predicted affected PSRs. The impact is predicted to be of regional spatial extent, long term duration, continuous and low reversibility for the operations and maintenance phase, with loss of significant system components. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **medium**.
Sensitivity of receptor	There is no potential for a cumulative effect on aviation PSR systems arising from Scenario 1, as described above. The potential for cumulative effects arising from Scenario 1 is not considered further.	NATS and airport authorities require assurance that impact created by the detection of operational wind turbines does not have a detrimental impact on the ATS they provide so that they may continue to deliver a safe and effective ATS. Ronaldsway (IoM) Airport have also identified this potential impact to their PSR. The radar stakeholders are considered to be of high vulnerability, low recoverability and high value. The sensitivity of these receptors is therefore, considered to be **high**.	
Significance of effect	There is no potential for a cumulative effect on aviation PSR systems arising from Scenario 1, as described above. The potential for cumulative effects arising from Scenario 1 is not considered further.	Overall, the magnitude of the impact is deemed to be medium, and the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **moderate adverse** significance which is significant in EIA terms.	Overall, the magnitude of the impact is deemed to be medium, and the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **moderate adverse** significance which is significant in EIA terms.
Further mitigation and residual significance	N/A	Further mitigation is described in section 11.9.3. With mitigation implemented and associated operational processes and procedures in place, the residual effect to the impacted PSR systems will be of **minor adverse** significance, which is not significant in EIA terms.	

11.11.1 Future monitoring

11.11.1.1 No aviation and radar monitoring to test the predictions made within the cumulative impact assessment is considered necessary.

11.12 Transboundary effects

11.12.1.1 A screening of transboundary impacts has been carried out and has identified that there was no potential for significant transboundary effects with regard to aviation and radar from the Morgan Generation Assets upon the interests of other states.

11.13 Inter-related effects

11.13.1.1 Inter-relationships are considered to be the impacts and associated effects of different aspects of the proposal on the same receptor. These are considered to be:

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the Morgan Generation Assets (construction, operations and maintenance, and decommissioning), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three phases (e.g. subsea noise effects from piling, operational wind turbines, vessels and decommissioning)
- Receptor-led effects: Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on aviation and radar (creation of physical obstacle to aircraft operations and wind turbines causing interference on aviation PSR systems) may interact to produce a different, or greater effect on a receptor than when the effects are considered in isolation. Receptor-led effects may be short term, temporary or transient effects, or incorporate longer term effects.

11.13.1.2 A description of the likely inter-related effects arising from the Morgan Generation Assets on aviation and radar is provided in Volume 2, Chapter 15: Inter-related effects (offshore) of the Environmental Statement. There are no inter-related effects that are of greater significance than those assessed in isolation.

11.14 Summary of impacts, measures adopted and monitoring

11.14.1.1 Information on aviation and radar within the aviation and radar study area was collected through desktop review and consultation.

11.14.1.2 Table 11.20 presents a summary of the potential impacts, measures adopted as part of the Morgan Generation Assets and residual effects in respect to aviation and radar. The impacts assessed include:

- Creation of physical obstacle to aircraft operations
- Wind turbines causing interference on aviation PSR systems.

11.14.1.3 Overall, it is concluded that there will be the following significant effects arising from the Morgan Generation Assets during the operations and maintenance phase:

- Creation of a physical obstacle to aircraft operations – Instrument flight procedures
- Wind turbines causing interference on aviation PSR systems.

11.14.1.4 With further mitigation in place, the effect is expected to be of **minor adverse** significance, which is not significant in EIA terms.

11.14.1.5 Table 11.21 presents a summary of the potential cumulative impacts, measures adopted as part of the Morgan Generation Assets and residual effects. The cumulative impacts assessed include:

- Creation of physical obstacle to aircraft operations – Military and low flying operations
- Wind turbines causing interference on aviation PSR systems.

11.14.1.6 Overall, it is concluded that there will be the following significant cumulative effect arising from the Morgan Generation Assets alongside other projects/plans:

- Wind turbines causing interference on aviation PSR systems.

11.14.1.7 With further mitigation in place, the effect is expected to be of **minor adverse** significance, which is not significant in EIA terms.

11.14.1.8 No potential transboundary impacts have been identified in regard to effects of the Morgan Generation Assets on aviation and radar.

Table 11.20: Summary of potential environmental effects, mitigation and monitoring.

[a] C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase[a] C	O	D	Measures adopted as part of the Morgan Generation Assets	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
Creation of physical obstacle to aircraft operations – Military and low flying operations	✓	✓	✓	Design Plan Lighting and marking Notification	C: Low O: Low D: Low	C: Medium O: Medium D: Medium	C: Minor adverse O: Minor adverse D: Minor adverse	None	C: N/A O: N/A D: N/A	None
Creation of physical obstacle to aircraft operations – Helicopter operations	✓	✓	✓	Design Plan Lighting and marking Notification	C: Low O: Low D: N/A	C: Low O: Low D: N/A	C: Minor adverse O: Minor adverse D: N/A	None	C: N/A O: N/A D: N/A	None
Creation of physical obstacle to aircraft operations – Instrument flight procedures	✓	✓	✓	None	C: Medium O: Medium D: Medium	C: High O: High D: High	C: Moderate adverse O: Moderate adverse D: Moderate adverse	Raise the impacted SMAA/ATCSMAC/MSA altitudes to a level that will provide the required minimum of 300 m separation between the highest obstacle (wind turbine) and IFR flight rules aircraft operating within the affected area.	C: Minor adverse O: Minor adverse D: Minor adverse	None
Wind turbines causing interference on aviation PSR systems	×	✓	×	None	C: N/A O: Medium D: N/A	C: N/A O: High D: N/A	C: N/A O: Moderate adverse D: N/A	NATS – Radar blanking and TMZ. Ronaldsway (IoM) Airport – Radar blanking and airspace	C: N/A O: Minor adverse D: N/A	None

Description of impact	Phase[a] C	O	D	Measures adopted as part of the Morgan Generation Assets	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
								change application and/or improvement of the airport MLAT system.		

Table 11.21: Summary of potential cumulative environmental effects, mitigation and monitoring.

[a] C=construction, O=operations and maintenance, D=decommissioning

Description of effect	Phase[a]			Measures adopted as part of the Morgan Generation Assets	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
Scenario 1										
Creation of a physical obstacle to aircraft operations – Military and low flying operations	✓	✓	✓	Design Plan Lighting and marking Notification	C: Low O: Low D: Low	C: Medium O: Medium D: Medium	C: Minor adverse O: Minor adverse D: Minor adverse	Not required	N/A	None
Wind turbines causing interference on aviation PSR systems	×	✓	×	None	C: N/A O: N/A D: N/A	C: N/A O: N/A D: N/A	C: N/A O: N/A D: N/A	N/A	C: N/A O: N/A D: N/A	None
Scenario 2										
Creation of a physical obstacle to aircraft operations – Military and low flying operations	✓	✓	✓	Design Plan Lighting and marking Notification	C: Low O: Low D: Low	C: Medium O: Medium D: Medium	C: Minor adverse O: Minor adverse D: Minor adverse	Not required	N/A	None
Wind turbines causing interference on aviation PSR systems	×	✓	×	None	C: N/A O: Medium D: N/A	C: N/A O: High D: N/A	C: N/A O: Moderate adverse D: N/A	NATS – Radar blanking and TMZ. Ronaldsway (IoM) Airport – Radar blanking and airspace change application and/or	C: N/A O: Minor adverse D: N/A	None

Description of effect	Phase[a] C	O	D	Measures adopted as part of the Morgan Generation Assets	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
								improvement of the airport MLAT system.		
Scenario 3										
Tier 1/Tier 2										
Creation of a physical obstacle to aircraft operations – Military and low flying operations	✓	✓	✓	Design Plan Lighting and marking Notification	C: Low O: Low D: Low	C: Medium O: Medium D: Medium	C: Minor adverse O: Minor adverse D: Minor adverse	Not required	N/A	None
Wind turbines causing interference on aviation PSR systems	×	✓	×	None	C: N/A O: Medium D: N/A	C: N/A O: High D: N/A	C: N/A O: Moderate adverse D: N/A	NATS – Radar blanking and TMZ. Ronaldsway (IoM) Airport – Radar blanking and airspace change application and/or improvement of the airport MLAT system.	C: N/A O: Minor adverse D: N/A	None

11.15 References

Anatec Limited (Anatec) (2023) Morgan Offshore Wind Farm Helicopter Access Report (HAR).

Civil Aviation Authority (CAA) (2016a) Civil Aviation Publication (CAP) 764 Policy and Guidelines on Wind Turbines. Available: http://publicapps.caa.co.uk/modalapplication.aspx?catid=33&pagetype=65&appid=11&mode=detail&id=5609. Accessed November 2023.

CAA (CAA) (2022) The Air Navigation Order.

CAA CAP 168 Licensing of Aerodromes (CAA) (2022) Available: https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=6114. Accessed November 2023.

CAA CAP 437 Standards for Offshore Helicopter Landing Areas (CAA) (2023) Available: https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=523. Accessed November 2023.

CAA CAP 670 Air Traffic Services Safety Requirements (CAA) (2019) Available: https://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&mode=detail&id=9124. Accessed November 2023.

CAA CAP 032 UK Aeronautical Information Publication (CAA) (2024) Available: https://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&mode=detail&id=223. Accessed February 2024.

Department for Energy Security and Net Zero (DESNZ) (2023a) Overarching National Policy Statement for Energy (NPS EN-1). Available: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1147380/NPS_EN-1.pdf]. Accessed February 2024.

Department for Energy Security and Net Zero (DESNZ) (2023b) NPS for Renewable Energy Infrastructure (EN-3) Available: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1147382/NPS_EN-3.pdf]. Accessed February 2024.

IEMA (2016) Environmental Impact Assessment. Guide to Delivering Quality Development. Available: https://www.iema.net/download-document/7014. Accessed November 2023.

International Civil Aviation Organisation (ICAO) (2018) Procedures for Air Navigation Services Aircraft Operations Ops/611.

Marine Management Organisation (MMO) (2021) North West Inshore and North West Offshore Marine Plan, June 2021.

Maritime and Coastguard Agency (MCA) Safety of Navigation Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response. (MCA) (2021). Available: https://www.gov.uk/government/publications/mgn-654-mf-safety-of-navigation-offshore-renewable-energy-installations-oreis-uk-navigational-practice-safety-and-emergency-response. Accessed November 2023.

Ministry of Defence (MOD) (2024) Military Aeronautical Information Publication (MilAIP).

Mona Offshore Wind Ltd. (2024) Mona Offshore Wind Ltd. Environmental Statement. Available: https://infrastructure.planninginspectorate.gov.uk/projects/wales/mona-offshore-wind-farm/?ipcsection=docs. Accessed March 2024.

Morecambe Offshore Windfarm Ltd. (2023) Morecambe Offshore Windfarm Generation Assets Preliminary Environmental Information Report. Available:

https://morecambeandmorgan.com/morecambe/en/consultationhub/#peir. Accessed November 2023.

North Sea Transition Authority (NTSA) (2023) Oil and Gas Authority Annual Report and Accounts 2022–23. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1170945/oil-and-gas-authority-annual-report-and-accounts-2022-23-accessible.pdf. Accessed November 2023.

Oil and Gas Authority (OGA) (2022) Oil and Gas Authority Annual Report and Accounts 2021–22. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1090783/oga-nsta-annual-report-accounts-2021-2022-web-optimised.pdf. Accessed November 2023.

Osprey Consulting Services (Osprey) (2024) Morgan and Mona Windfarms - Instrument Flight Procedure (IFP) Impact Assessment.

UK Government (Gov) (2017) The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. Available: https://www.legislation.gov.uk/uksi/2017/572/contents/made. Accessed November 2023.