CALEDONIA
Offshore Wind Farm

Code: UKCAL-CWF-CON-EIA-RPT-00002-2011

Volume 2 Proposed Development (Offshore)

Chapter 11 Military and Civil Aviation

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OCEAN WINDS

Volume 2 Chapter 11 Military and Civil Aviation

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Acronyms and Abbreviations

AARA	Air-to-Air Refuelling Area
AD	Air Defence
AD&OW	Air Defence and Offshore Wind
ADR	Air Defence Radar
AIFS	Aviation Impact Feasibility Study
AIP	Aeronautical Information Publication
AMSL	Above Mean Sea Level
ANO	Air Navigation Order
ATC	Air Traffic Control
ATS	Air Traffic Service
BEIS	Department for Business, Energy and Industrial Strategy
CAA	Civil Aviation Authority
CaP	Cable Plan
CAP	Civil Aviation Publication
CIA	Cumulative Impact Assessment
CMS	Construction Method Statement
CTA	Control Area
DA	Danger Area
DESNZ	Department for Energy Security and Net Zero
DGC	Defence Geographic Centre
DP	Decommissioning Programme
DSLP	Development Specification and Layout Plan

EIA	Environmental Impact Assessment
ERCoP	Emergency Response Cooperation Plan
FIR	Flight Information Region
FL	Flight Level
ft	Feet
HIAL	Highlands and Islands Airports Limited
HMRI	Helicopter Main Routing Indicator
IFR	Instrument Flight Rules
IFP	Instrument Flight Procedure
IMC	Instrument Meteorological Conditions
km	Kilometre
LARS	Lower Airspace Radar Service
LMP	Lighting and Marking Plan
m	Metres
MCA	Maritime and Coastguard Agency
MD-LOT	Marine Directorate - Licensing Operations Team
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MoD	Ministry of Defence
nm	Nautical Mile
NSP	Navigational Safety Plan
OEC	Offshore Export Cable
OECC	Offshore Export Cable Corridor
Ofcom	Office of Communications

OREI	Offshore Renewable Energy Installation
OSP	Offshore Substation Platform
OWF	Offshore Wind Farm
OWIC	Offshore Wind Industry Council
PEXA	Practice and Exercise Area
PSR	Primary Surveillance Radar
RAF	Royal Air Force
RRH	Remote Radar Head
RLoS	Radar Line of Sight
SAR	Search and Rescue
SSR	Secondary Surveillance Radar
TMZ	Transponder Mandatory Zone
TRA	Temporary Reserved Area
UK	United Kingdom
UKHO	UK Hydrographic Office
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VMP	Vessel Management Plan
WTG	Wind Turbine Generator
ZoI	Zone of Influence

Executive Summary

The desk-based assessment for military and civil aviation has considered effects with respect to impacts on radar and United Kingdom airspace predicted due to the physical presence of the Proposed Development (Offshore) during the construction, operation and decommissioning phases. Potential impacts are physical obstruction to aircraft and interference on radars caused by rotating Wind Turbine Generator blades.

Potentially affected aviation stakeholders include civil and military aerodromes and radar facilities, and offshore fixed-wing and helicopter flights such as military low flying activities, Search and Rescue (SAR) operations, and helicopter support for the oil and gas industry.

A range of mitigation measures related to military and civil aviation have been embedded in the design envelope to reduce potential aviation effects. These include notification to aviation stakeholders during construction (and decommissioning) of the Offshore Wind Farm, an aviation obstacle lighting scheme agreed with the relevant authorities, and the development of an Emergency Response Cooperation Plan to mitigate the effect on SAR operations.

Consultation has been advanced with aviation stakeholders to detail additional appropriate mitigations to safeguard airport operations. Adverse impact on Wick Airport's Instrument Flight Procedures (IFPs) can be mitigated by amendment of the IFPs, and it is anticipated that agreement with the stakeholder can be reached to put in place the required mitigation.

Technical mitigation solutions are available for radar interference and such solutions are being further discussed with affected radar operators such as NATS and the Ministry of Defence.

No residual significant effects on military and civil aviation have been identified.

11 Military and Civil Aviation

11.1 Introduction

11.1.1.1 This chapter of the Environmental Impact Assessment Report (EIAR) identifies the potential effects on military and civil aviation associated with the construction, operation and decommissioning of the of the Proposed Development (Offshore) seaward of Mean High Water Spring (MHWS).

11.1.1.2 Wind Turbine Generators (WTGs) have the potential to cause a variety of adverse effects on military and civil aviation receptors. WTGs can impact the radars used by civilian and military air traffic controllers as the characteristics of moving turbine blades are similar to those of aircraft, leading to spurious returns, or clutter, on radar displays. This can affect the safe provision of air traffic services or interfere with tracking of aircraft by the military. WTGs can also have the potential to present a physical obstruction for aviation activities such as military low flying or helicopter Search and Rescue (SAR) operations.

11.1.1.3 Aviation stakeholders potentially affected include NATS (formerly National Air Traffic Services), the Ministry of Defence (MoD), Highlands and Islands Airports Limited (HIAL), Aberdeen Airport, Wick Airport (managed and operated by HIAL) and offshore helicopter operators such as Bristow Group, who currently deliver the United Kingdom (UK) SAR contract on behalf of His Majesty's Coastguard. The Civil Aviation Authority (CAA) is the UK's regulatory aviation stakeholder.

11.1.1.4 This chapter is supported by the following Technical Appendix:

- Volume 7B, Appendix 11-1: Airspace Analysis and Radar Modelling.

11.1.1.5 This technical report identifies the radars likely to detect WTGs within the Caledonia OWF and provides details of the Radar Line of Sight (RLoS) analyses. It also sets out a detailed analysis of the airspace occupied by the Caledonia OWF and outlines the effects that the Proposed Development (Offshore) is likely to have on aviation activities in the vicinity.

11.2 Legislation, Policy and Guidance

11.2.1.1 Volume 1, Chapter 2: Legislation and Policy of this EIAR sets out the policy and legislation associated with the Proposed Development.

11.2.1.2 Legislation, Policy and Guidance that relate to the military and civil aviation assessment are identified and described in Table 11-1.

Table 11-1: Legislation Policy and Guidance.

Relevant Legislation, Policy and Guidance	Description
Air Navigation Order (ANO) 2016/765 (CAA, 2022[1])	The ANO implements the UK's obligations under the Chicago Convention on International Civil Aviation and regulates aspects of aviation safety. It provides regulatory and enforcement powers for the CAA needed in respect of retained safety legislation. Article 222 details the requirements for the lighting of en-route obstacles that are 150m or more above ground level. Article 223 modifies the requirements of Article 222 with respect to WTGs in UK territorial waters of 60m or more above the level of the sea at the highest astronomical tide. Article 225A details the requirements for notifying the CAA of any planned works to erect new en-route obstacles that are 100m or more above sea level.
Civil Aviation Publication (CAP) 764: Policy and Guidelines on Wind Turbines (CAA, 2016[2])	CAP 764 details the CAA policy and guidelines associated with wind turbine impacts on aviation that aviation stakeholders and wind energy developers need to consider when assessing a development's viability.
National Planning Framework 4 (Scottish Government, 2023[3])	The Energy policy (Policy 11) states that project design and mitigation will demonstrate how impacts on aviation and defence interests are addressed.
Scotland's National Marine Plan (Scottish Government, 2015[4])	To maintain operational effectiveness in Scottish waters used by the armed services, development and use will be managed in these areas: ▪ Naval areas including bases and ports: Safety of navigation and access to naval bases and ports will be maintained. The extent to which a development or use interferes with access or safety of navigation, and whether reasonable alternatives can be identified, will be taken into account by consenting bodies. Proposals for development and use should be discussed with the MoD at an early stage in the process. ▪ Firing Danger Areas (DAs): Development of new permanent infrastructure is unlikely to be compatible with the use of Firing DAs by the MoD. Permitted activities may have temporal restrictions imposed. Proposals for development and use should be discussed with the MoD at an early stage in the process. ▪ Exercise Areas: Within Exercise Areas, activities may be subject to temporal restrictions. Development and use that either individually or cumulatively obstructs or otherwise prevents the defence activities supported by an exercise area may not be permitted. Proposals for development and use should be discussed with the MoD at an early stage in the process. ▪ Communications: Navigations and surveillance including radar: Development and use which causes unacceptable interference with radar and other systems necessary for

Relevant Legislation, Policy and Guidance	Description
	national defence may be prohibited if mitigation cannot be determined. Proposals for development and use should be discussed with the MoD at an early stage in the process. For the purposes of national defence, the MoD may establish by-laws for exclusions and closures of sea areas. In most areas this will mean temporary exclusive use of areas by the MoD. Where potential for conflict with other users is identified, appropriate mitigation will be identified and agreed with the MoD, prior to planning permission, a marine licence, or other consent being granted.
CAP 168: Licensing of Aerodromes (CAA, 2022[5])	CAP 168 sets out the standards required at UK licensed aerodromes relating to management systems, operational procedures, physical characteristics, assessment and treatment of obstacles and visual aids.
CAP 670: Air Traffic Services Safety Requirements (CAA, 2019[6])	CAP 670 sets out the safety regulatory framework and highlights the requirements to be met by providers of civil air traffic services and other services in the UK in order to ensure that those services are safe for use by aircraft.
CAP 1616: The Process for Changing the Notified Airspace Design (CAA, 2023a[7])	CAP 1616 explains the airspace change process for making permanent changes to the notified airspace design. Supporting documents (CAP 1616F, G, H and I) provide guidance on how the requirements of the airspace change process may be met.
CAP 1616F: Guidance on Airspace Change Process for Permanent Change Proposals (CAA, 2023b[8])	CAP 1616F provides guidance to the aviation industry on the airspace change process requirements for permanent airspace change proposals.
CAP 1616G: Guidance on Airspace Change Process for Temporary and Trial Airspace Change Proposals (CAA, 2024a[9])	CAP 1616G provides guidance to the aviation industry on the airspace change process requirements for temporary and trial airspace change proposals.
CAP 1616H: Guidance on Airspace Change Process for Level 3 and Pre-Scaled Airspace Change Proposals (CAA, 2023c[10])	CAP 1616H provides guidance to the aviation industry on the airspace change process requirements for permanent Level 3 and pre-scaled airspace change proposals.
CAP 1616I: Environmental Assessment Requirements and Guidance for Airspace Change Proposals (CAA, 2023d[11])	CAP 1616I provides guidance to the aviation industry on providing environmental and habitats regulations assessments for airspace change proposals.
CAP 437: Standards for Offshore Helicopter Landing Areas (CAA, 2023e[12])	CAP 437 provides the criteria applied by the CAA in assessing offshore helicopter landing areas for worldwide use by

Relevant Legislation, Policy and Guidance	Description
	helicopters registered in the UK and includes winching area 'best practice' design criteria for wind turbine platforms.
CAP 032: UK Aeronautical Information Publication (AIP) (CAA, 2024b[13])	The UK AIP is the main resource for information on facilities, services and flight procedures at all licensed UK airports, as well as UK airspace rules, regulations and restrictions, en-route procedures, charts and other air navigation information.
UK Military AIP (MoD, 2024[14])	The UK Military AIP is the main resource for information and flight procedures at all military aerodromes.
MoD Obstruction Lighting Guidance (MoD, 2020[15])	The guidance includes details of MoD requirements for the lighting of offshore 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[16])	MGN 654 highlights issues to consider when assessing navigational safety and emergency response, caused by OREI developments.
MCA document Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for SAR and Emergency Response (MGN 654 Annex 5) (MCA, 2024[17])	The document provides a description of MCA policy, and guidance, advice and specific requirements to assist and enable SAR operations to, within and in the vicinity of OWFs.

11.4 Stakeholder Engagement

11.4.1 Overview

11.4.1.1 The Offshore Scoping Report (Volume 7, Appendix 2) was submitted to Marine Directorate - Licensing Operations Team (MD-LOT)[i] in September 2022, who then circulated the report to relevant consultees. A Scoping Opinion (Volume 7, Appendix 3) was received from MD-LOT on 13 January 2023. Relevant comments from the Scoping Opinion specific to military and civil aviation are provided in Table 11-2.

11.4.1.2 Further consultation has been undertaken throughout the pre-application stage. Table 11-3 summarises the consultation activities carried out relevant to military and civil aviation.

[i] In 2023, Marine Scotland was renamed Marine Directorate, and thus the marine licensing and consents team is now referred to as Marine Directorate - Licensing Operations Team (MD-LOT).

Table 11-2: Scoping Opinion Response.

Consultee	Comment	Response
MD-LOT	The Scottish Ministers are broadly content with the study area and that the baseline data gathered for the assessment is appropriate. However, The Scottish Ministers highlight the MoD representation which identifies that there are two primary air traffic control surveillance radars active at Royal Air Force (RAF) Lossiemouth and the impacts of the Proposed Development on these radars must be considered and appropriate mitigation proposed, in the EIA Report. Impacts on these arising from the Proposed Development must be considered within the EIA Report. The precision approach radar which is present at RAF Lossiemouth must also be included in the assessment.	Impact on the Primary Surveillance Radars (PSRs) at RAF Lossiemouth is considered in Section 11.8 and suitable mitigation measures are outlined in Section 11.12. Consultation with MoD will continue with the aim of delivering a suitable mitigation solution for PSR impact. The MoD no longer has any concerns regarding the Precision Approach Radar (PAR), as confirmed by an updated response in February 2024, summarised in Table 11-3.
MD-LOT	The Scottish Ministers highlight the representation by NATS which predicts that the Proposed Development is likely to generate an unacceptable level of clutter to its Radar infrastructure. The Scottish Ministers advise that the Developer validates this position in relation to the generation of radar clutter and explore how this could be mitigated in the EIA Report. NATS has also advised that the Proposed Development will likely have unacceptable impacts to Prestwick Air Traffic Control ("ATC"), Aberdeen Offshore ATC and Military ATC. The Scottish Ministers recommend the Developer engage further with NATS on these points and advise that these impacts must be assessed, including mitigation, if necessary, in the EIA Report.	Impact on NATS PSR at Allanshill is considered in Section 11.8 and suitable mitigation measures are outlined in Section 11.12. Consultation with NATS will continue with the aim of delivering a suitable mitigation solution for PSR impact.
MD-LOT	The Developer identifies the Proposed Development will be located within Danger Area D809 South in Section 15.2.3.1 of the Scoping Report. In line with the MoD representation, The Developer must ensure that no infrastructure related to the Proposed Development is installed within the boundary identified in the MoD representation. Military training activities are conducted in this Danger Area and EIA Report should consider the effects of vessels,	The MoD identified boundary where no infrastructure can be installed is no longer applicable as the MoD no longer has any concerns in relation to Highly Surveyed Routes), as confirmed by an updated

Consultee	Comment	Response
	barges, platforms and associated traffic present during the construction of the Proposed Development to ensure it does not interfere with these activities.	response in February 2024, summarised in Table 11-3. Impact on DA D809 South is considered in Section 11.8.
MD-LOT	The Scottish Ministers agree with the Highland Council representation that the Developer must demonstrate consideration of community interests it has identified relating to aviation, radar and telecommunications as part of the EIA Report. Written records of discussions and outcomes of consultations with any relevant authorities, as detailed in the Highland Council representation within Appendix I, must be included within the EIA Report. In the event that no such effects are identified, the rationale must still be included in the EIA Report.	Military and civil aviation interests are identified in Section 11.1 and potential effects considered in Section 11.8. Consultation with relevant authorities is summarised in Table 11-2 and Table 11-3. Impacts to utilities developments such as Telecommunications are assessed in Section 13.7 of Volume 2, Chapter 13: Other Human Activities.
MD-LOT	The Scottish Ministers note that HIAL have submitted a holding objection, pending the Developer's completion of an Aviation Impact Feasibility Study ("AIFS") to consider potential effects of the Proposed Development on Wick airport. The Developer must address the HIAL representation in regard to the AIFS in full in the EIA Report.	Effects of the Proposed Development (Offshore) on Wick Airport are considered in Section 11.8 and suitable mitigation measures are outlined in Section 11.12.
Civil Aviation Authority	We have reviewed the document, in particular tables 15.2 and 15.3, and have no comments to make.	This is noted by the Applicant.
Highlands and Islands Airports Limited	With reference to the above proposal, our preliminary assessment shows that, at the position and heights given in the scoping report, the proposed wind farm may impact the safeguarding criteria and operation of Wick Airport.	Effects of the Proposed Development (Offshore) on Wick Airport are considered in Section 11.8 and suitable mitigation measures are outlined in Section 11.12.
Highlands and Islands Airports Limited	Highlands and Islands Limited (HIAL) request that an Aviation Impact Feasibility Study (AIFS), of the proposed Wind Farm, is undertaken to understand any impact on the infrastructure and	Effects of the Proposed Development (Offshore) on Wick Airport's IFPs are considered in Section 11.8 and suitable

Consultee	Comment	Response
	operation of Wick Airport. The following are required to be assessed by the applicant: ▪ Instrument Flight Procedures (IFPs) ▪ Lighting Requirement ▪ Construction Management Strategy	mitigation measures are outlined in Section 11.12. Lighting requirements will be captured and construction methods, roles and responsibilities confirmed by through embedded mitigation measures M-14 and M-3, as outlined in Table 11-10.
Highlands and Islands Airports Limited	It should be noted that HIAL would work with the developer towards a resolution. However, HIAL currently submit a holding objection until the AIFS has been submitted to and reviewed by HIAL. Once the AIFS has been reviewed by HIAL, and any impact to Wick Airport is understood, the applicant may then expect to be contacted by HIAL to enter formal discussions.	Discussions have been initiated with HIAL with regards to impact on Wick Airport, as summarised in Table 11-3.
Ministry of Defence	The use of airspace in the vicinity of the proposed development for defence purposes has been appropriately identified. The Scoping Report highlights some of the aviation and radar systems that may be affected by the proposed wind farm receptor in Chapter 15 military and civil aviation of the Scoping Report and Section 15.1.1.3 identifies the MoD as a relevant aviation stakeholder.	Effects of the Proposed Development (Offshore) on MoD airspace and radar systems are identified in Section 11.8 and suitable mitigation measures are outlined in Section 11.12.
Ministry of Defence	Wind turbine development has the potential to affect, and be detectable by, radar systems and can have a significant and detrimental impact on the capability and operation of such systems. In Section 15.2.1.1 the developer appropriately identifies the potential impacts of wind turbines upon ground-based aviation surveillance radars for air traffic control as well as MoD air defence radars and the need to account for any such impacts. In Section 15.3.2.24 the developer acknowledges that the Primary Surveillance Radar at RAF Lossiemouth is nearest to the offshore array and that most of the array area will be Radar Line of Sight. The applicant should take into account that, at present, there are two primary surveillance air traffic control radars at RAF	Impact on both of the PSRs at RAF Lossiemouth is considered in Section 11.8 and suitable mitigation measures are outlined in Section 11.12. Consultation with MoD will continue with the aim of delivering a suitable mitigation solution for PSR impact.

Consultee	Comment	Response
	Lossiemouth. The impact of the development on these radars should be considered as the design is progressed and any impact will need to be mitigated, it will be for the applicant to provide appropriate technical mitigation(s).	
Ministry of Defence	Furthermore, the presence of the precision approach radar at RAF Lossiemouth has not been identified. The potential impacts of the proposed wind farm upon the effective operation of these types of radars will also need to be taken into account.	The MoD no longer has any concerns regarding the PAR, as confirmed by an updated MoD response in February 2024, summarised in Table 11-3.
Ministry of Defence	Similarly, the effect of the development on Air Defence Radar (ADR) is acknowledged in Section 15.3.2.25 which identifies the context of the application site relative to Remote Radar Head (RRH) Buchan. The impact of the development on this radar should be considered as the design is progressed.	Impact on RRH Buchan is considered in Section 11.8 and suitable mitigation measures are outlined in Section 11.12. Consultation with MoD will continue with the aim of delivering a suitable mitigation solution for PSR impact.
Ministry of Defence	The applicant has appropriately recognised that the proposed development may have impacts upon military low flying activities that may be conducted in the area and upon military aircraft using Danger Area D809 South. The applicant has identified the necessity for the proposed offshore turbines to be fitted with aviation lighting. In implementing this, the applicant will need to ensure that MoD's lighting needs are accounted for.	Impact on DA D809 South is considered in Section 11.8. MoD lighting needs will be accounted for as part of the Lighting and Marking Plan (LMP).
Ministry of Defence	The principal development zone for the offshore windfarm outlined in the submission will be located within MoD Danger Area D809 South. The extent of MoD Practise and Exercise Areas in the locality have been accurately identified in the scoping report (ref. Section 15.2.3.1) and the need to take account of defence activities has also been recognised. However, it will be necessary for defence maritime navigational interests to be specifically taken into account in the preparation of any application for this development proposal. The eastern extent of the development zone, in which offshore	The MoD defined boundary where no offshore structures can be installed is no longer applicable as the MoD no longer has any concerns in relation to Highly Surveyed Routes), as confirmed by an updated response in February 2024, summarised in Table 11-3.

Consultee	Comment	Response
	turbine structures are to be located, extends over an area containing a highly surveyed route that is retained to maintain national defence requirements. To prevent this route from being obstructed it will be necessary to ensure that any wind turbines or other offshore structures (including associated offshore safety zones) deployed within the project boundary defined are not located eastward of a line connecting the points 58° 22.171N 002° 38.83W and 58° 07.171N 002° 19.00W.	
Ministry of Defence	In progressing this development proposal, the applicant should also take into account the effects that vessels, barges, platforms and associated traffic that will be present during the construction of the proposed windfarm and the associated offshore infrastructure may have upon the military training activities that can be conducted in Danger Area 809 South. Therefore, the applicant should make provision to ensure that the MoD is given advance notification of the schedule of marine works and activities to install the proposed development so that that this can be taken into account in the management of defence activities and interests.	Impact on DA D809 South is considered in Section 11.8. Embedded mitigation in the form of a Vessel Management Plan (VMP) (M-13) is outlined in Table 11-10 and this will facilitate coordination of activities within the DA.
Ministry of Defence	The MoD therefore has concerns with the proposed development of the Caledonia Offshore Wind Farm due to the impact upon the PSR and PAR at RAF Lossiemouth, the ADR at RRH Buchan, and defence maritime navigational interests. These need to be taken in to account in the progression of this development proposal. The MoD wishes to be consulted on all subsequent submissions relating to this proposed development.	Effects of the Proposed Development on MoD airspace and radar systems are identified in Section 11.8 and suitable mitigation measures are outlined in Section 11.12. Consultation with MoD will continue with the aim of delivering a suitable mitigation solution for PSR impact.
National Air Traffic Services	We refer to the application above. The proposed development has been examined by our technical safeguarding teams and conflicts with our safeguarding criteria. Accordingly, NATS (En Route) plc objects to the proposal. The reasons for NATS's objection are outlined in the attached report TOPA SG33685.	Impact on NATS PSR at Allanshill is considered in Section 11.8 and suitable mitigation measures are outlined in Section 11.12. Consultation with NATS will continue with the aim of delivering a suitable mitigation solution for PSR impact.

Consultee	Comment	Response
National Air Traffic Services	Predicted Impact on Allanshill RADAR: Using the theory as described in Appendix A and development specific propagation profile it has been determined that the terrain screening available will not adequately attenuate the signal, and therefore this development is likely to cause false primary plots to be generated. A reduction in the RADAR's probability of detection, for real aircraft, is also anticipated.	Impact on NATS PSR at Allanshill is considered in Section 11.8 and suitable mitigation measures are outlined in Section 11.12. Consultation with NATS will continue with the aim of delivering a suitable mitigation solution for PSR impact.
National Air Traffic Services	En-route operational assessment of RADAR impact: Where an assessment reveals a technical impact on a specific NATS' RADAR, the users of that RADAR are consulted to ascertain whether the anticipated impact is acceptable to their operations or not. ▪ Prestwick ATC: Unacceptable ▪ Aberdeen Offshore ATC: Unacceptable ▪ Military ATC: Unacceptable	Impact on the provision of ATC is considered in Section 11.8 and suitable mitigation measures are outlined in Section 11.12. Consultation with NATS will continue with the aim of delivering a suitable mitigation solution for PSR impact.
National Air Traffic Services	Predicted Impact on Navigation Aids: No impact is anticipated on NATS' navigation aids.	This is noted by the Applicant.
National Air Traffic Services	Predicted Impact on the Radio Communications Infrastructure: No impact is anticipated on NATS' radio communications infrastructure.	This is noted by the Applicant.
National Air Traffic Services	Aberdeen Airport ATC Technical Assessment: The Allanshill radar is also used by Aberdeen approach and therefore the technical impact as described also applies to Aberdeen Airport operations.	Impact on Allanshill PSR and the provision of ATC is considered in Section 11.8 and suitable mitigation measures are outlined in Section 11.12. Consultation with NATS will continue with the aim of delivering a suitable mitigation solution for PSR impact.

Consultee	Comment	Response
National Air Traffic Services	Aberdeen Airport ATC Operational Assessment: The planned development is unacceptable due to the amount of primary clutter that it is predicted to show. This area is frequented by offshore helicopters and inbound fixed wing aircraft from the North West.	Impact on Allanshill PSR and the provision of ATC is considered in Section 11.8 and suitable mitigation measures are outlined in Section 11.12. Consultation with NATS will continue with the aim of delivering a suitable mitigation solution for PSR impact.
National Air Traffic Services	The proposed development has been examined by technical and operational safeguarding teams. A technical impact is anticipated, this has been deemed to be unacceptable from both an en-route and Airport perspective.	Impact on Allanshill PSR and the provision of ATC is considered in Section 11.8 and suitable mitigation measures are outlined in Section 11.12. Consultation with NATS will continue with the aim of delivering a suitable mitigation solution for PSR impact.
The Highland Council	The EIAR needs to recognise community assets that are currently in operation for example TV, radio, tele-communication links, aviation interests including radar, MoD safeguards, etc. In this regard the applicant, when submitting a future application, will need to demonstrate what interests they have identified and the outcomes of any consultations with relevant authorities such as Ofcom, NATS, BAA, CAA, MoD, Highlands and Islands Airports Ltd, etc. through the provision of written evidence of concluded discussions / agreed outcomes. We consider the results of these surveys should be contained within the EIAR to determine whether any suspensive conditions are required in relation to such issues.	Military and civil aviation interests are identified in Section 11.1 and potential effects considered in Section 11.8. Consultation with relevant authorities is summarised in Table 11-2 and Table 11-3. Impacts to utilities developments such as Telecommunications are assessed in Section 13.7 of Volume 2, Chapter 13: Other Human Activities.
The Highland Council	If there are no predicted effects on communication links as a result of the development, the EIAR should still address this matter by explaining how this conclusion was reached.	Impacts to communication links such as Telecommunications are assessed in Section 13.7 of Volume 2, Chapter 13: Other Human Activities.

Table 11-3: Stakeholder Engagement Activities.

Date	Consultee and Type of Consultation	Summary
10 March 2023	MoD; Online meeting	Discussion of MoD scoping response.
23 June 2023	MoD; Email	MoD responded to questions from the Applicant raised in the meeting in March 2023 relating to mitigation for PSR's and the 'Highly Surveyed Route'. MoD also advised that any impacts on , Danger Area D809 South could be mititgated through lighting, marking and charting of turbines as well as submitting notification to MoD prior to construction.
13 February 2024	MoD; Updated MoD Scoping Opinion response	MoD no longer has any concerns with Caledonia North in relation to Highly Surveyed Routes. The development will also not affect the PAR sited at RAF Lossiemouth. The previously communicated concerns regarding the PSR's at RAF Lossiemouth, AD Radar at RRH Buchan and D809 South remain extant.
23 April 2024	HIAL; Online meeting	An increase in Wick Airport's Minimum Sector Altitude up to 2,200 feet (ft) or more will likely have a substantial impact on airport operations, while an increase of up to 2,000ft may be of reduced concern and is a preferred maximum.
9 May 2024	HIAL; Online meeting	Next steps agreed for identifying other procedural or operational mitigations which could be offered to secure agreement with HIAL.
5 June 2024	MoD; Email	The Applicant requested a meeting with MoD to discuss outstanding concerns regarding PSR's at RAF Lossiemouth and AD Radar at RRH Buchan. Response received from MoD agreeing to a meeting but date not agreed.
5 June 2024	NATS ; Email	NATS confirmed that mitigation, in the form of Multi-Radar Tracker blanking with an associated Transponder Mandatory Zone, had been identified as a potential solution for adverse impact on the Allanshill PSR.

Date	Consultee and Type of Consultation	Summary
18 September 2024	HIAL; Online meeting	The Applicant presented mitigation in the form of IFP amendments to HIAL for their consideration.
27 September 2024	MoD; Email	The Applicant re-iterated earlier request for a meeting with MoD to discuss outstanding concerns regarding PSR's at RAF Lossiemouth and AD Radar at RRH Buchan. Response awaited.

11.5 Baseline Characterisation

11.5.1 Study Area

11.5.1.1 Figure 11-1 shows the military and civil aviation study area. This includes the following:

- The Caledonia OWF (i.e. array area) within which will be located WTGs (and associated foundations and substructures), Offshore Substation Platforms (OSPs) (and associated foundations), inter-array cables and interconnector cables;
- The Caledonia Offshore Export Cable Corridor (OECC); and
- Military and civil aviation receptors that may be impacted by the Proposed Development (Offshore).

11.5.1.2 In considering the spatial coverage of the military and civil aviation study area, the overriding factor is the potential for WTGs within the Caledonia OWF to have an impact on civil and military radars, taking into account required radar operational ranges. In general, PSRs installed on civil and military airfields have an operational range of between 40 nautical miles (nm) (74 kilometres (km)) and 60nm (111km). All radar equipped airfields within 60nm (111km) of the Caledonia OWF are therefore included in the study area. En-route radars operated by NATS and military ADRs are required to provide coverage at ranges in excess of 60nm (111km) and so all such radars with potential RLoS of WTGs in the Caledonia OWF are also included in the study area.

11.5.1.3 The military and civil aviation study area is defined by the Caledonia OWF footprint plus an appropriate buffer. This includes the airspace between the Caledonia OWF and the UK mainland, extending from Wick Airport to the north, to Aberdeen Airport to the south. Airports and radars within the study area that are under consideration are shown in Figure 11-1.

11.5.1.4 Criteria used to identify receptors within the study area are detailed in the following sections.

Civil Aerodromes

11.5.1.5 CAP 764: Policy and Guidelines on Wind Turbines (CAA, 2016[2]) states the distances from various types of aerodromes for WTG developments where consultation should take place. These distances include:

- Aerodromes with a surveillance radar – 30km;
- Non-radar equipped licensed aerodromes with a runway of 1,100 metres (m) or more – 17km;
- Non-radar equipped licensed aerodromes with a runway of less than 1,100m – 5km;

- Unlicensed aerodromes with runways of more than 800m – 4km;
- Unlicensed aerodromes with runways of less than 800m – 3km;
- Gliding sites – 10 km; and
- Other aviation activity such as parachute sites and microlight sites within 3km.

11.5.1.6 Consultation with licensed aerodromes should also be undertaken when the WTGs will lie within airspace coincidental with any published IFP.

11.5.1.7 CAP 764 goes on to state that these distances are for guidance purposes only and do not represent ranges beyond which all WTG developments will be approved or within which they will always be objected to. For example, most aerodromes utilise their radars at ranges considerably in excess of 30km.

11.5.1.8 As well as examining the technical impact of WTGs on Air Traffic Control (ATC) facilities, it is also necessary to consider the physical safeguarding of ATC operations using the criteria laid down in CAP 168: Licensing of Aerodromes (CAA, 2022[1]) to determine whether the Proposed Development (Offshore) has potential to breach obstacle clearance criteria at any aerodromes.

Ministry of Defence

11.5.1.9 It is necessary to take into account the aviation and air defence activities of the MoD. This includes:

- MoD airfields, both radar and non-radar equipped;
- MoD AD radars; and
- MoD Practice and Exercise Areas (PEXAs) for both aviation and non-aviation activities.

NATS Facilities

11.5.1.10 It is necessary to consider the possible effects of WTGs upon NATS' en-route electronic infrastructure; a UK-wide network of primary and secondary radars and navigation facilities.

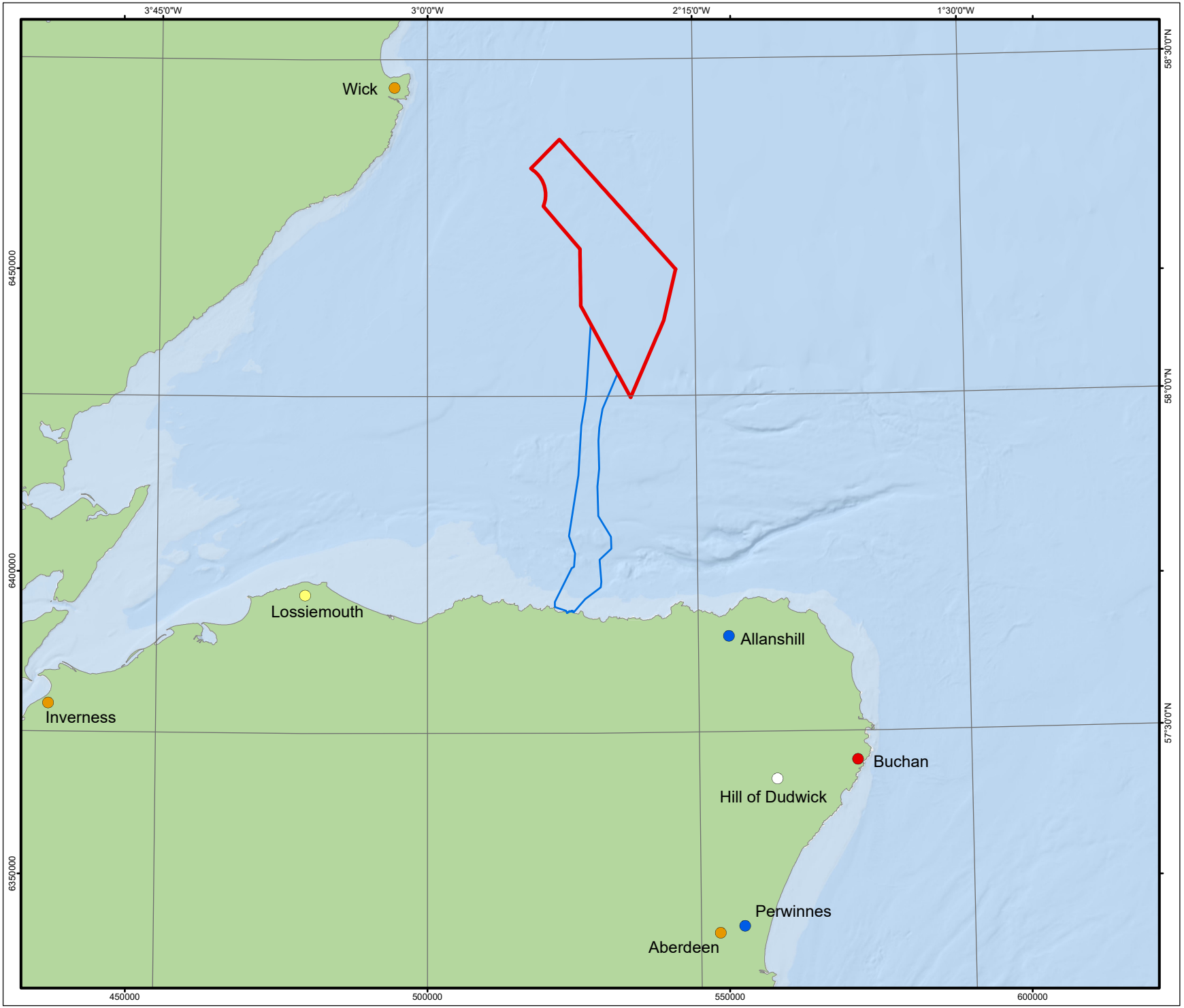
Other Aviation Activities

11.5.1.11 Other aviation activities under consideration include:

- General military low flying training operations; and
- Military and civilian 'off-route' fixed-wing and helicopter operations, SAR missions and offshore helicopter operations in support of offshore wind developments and the oil and gas industry.

Meteorological Radio Facilities

11.5.1.12 WTGs have the potential to adversely impact meteorological radio facilities such as weather radar. The Met Office must be consulted when wind turbine proposals are within a 20km radius zone of any of their UK weather radar sites. Maps of relevant consultation zones are provided by the Met Office on their website (Met Office, 2015[18]).



- Caledonia OWF
- Offshore Export Cable Corridor
- Air Defence Radars
- Civil Airports
- Military Airfields
- NATS Radars
- Weather Radars

0 10 20 30 km

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	09/09/2024	Approved	EV	BB	DH

CALEDONIA Offshore Wind Farm

GoBe APEM Group

CONTRACTOR DRAWING NO: UKCAL1_GO_WNF_MAV_MAP_00208	CONTRACTOR REV: 01
GEODETIC PARAMETERS: WGS 84 / UTM zone 30N (EPSG: 32630)	

DRAWING TITLE

Figure 11-1: Airports and Radars Within the Military and Civil Aviation Study Area

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11.5.2 Data Sources

Desk Study

11.5.2.1 The data sources that have been used to inform this Military and Civil Aviation chapter of the EIAR are presented within Table 11-4.

Table 11-4: Summary of key publicly available datasets for military and civil aviation.

Title	Author	Year
CAP 032: UK AIP	CAA[13]	2024
Offshore infrastructure data	North Sea Transition Authority[19]	2024
UK Military AIP	MoD[14]	2024
Protected Radar List	Office of Communications (Ofcom)[20]	2023
Met Office Planning Maps	Met Office[18]	2015
Wind farm self-assessment maps	NATS[21]	2012

Site-specific Surveys

11.5.2.2 No site-specific survey work has been completed of relevance to military and civil aviation.

11.5.3 Baseline Description

Caledonia OWF

Civil Aviation

11.5.3.1 The airspace above and adjacent to the Caledonia OWF is used by civil and military aircraft and lies within the Scottish Flight Information Region (FIR). This airspace is regulated by the UK CAA. The Scottish FIR is adjacent to the Polaris FIR, whose boundary is approximately 235km to the north-east of the Caledonia OWF at its closest point and which is regulated by CAA Norway.

11.5.3.2 Airspace is classified as either controlled or uncontrolled and is divided into a number of classes depending on what kind of Air Traffic Service (ATS) is provided and under what conditions. In the UK, there are five classes of airspace; specifically A, C, D, E and G. The first four are controlled airspace classes while Class G is uncontrolled. Within controlled airspace, aircraft are monitored and instructed by ATC, whereas in uncontrolled airspace aircraft are not subject to ATC instruction but rather operate according to a simple set

of regulations. ATC may still provide information, if requested, to ensure flight safety.

11.5.3.3 Aircraft operate under one of two flight rules: Visual Flight Rules (VFR) or Instrument Flight Rules (IFR). VFR flight is permitted when the weather satisfies Visual Meteorological Conditions (VMC) and is conducted with visual reference to the natural horizon. Aircraft must be flown under IFR when weather restricts visibility, known as Instrument Meteorological Conditions (IMC). IFR flight requires reference solely to aircraft instrumentation.

11.5.3.4 From sea level to Flight Level (FL) 195, approximately 19,500ft Above Mean Sea Level (AMSL), the airspace in the vicinity of the Caledonia OWF is Class G uncontrolled airspace. This airspace is used predominantly by low level flight operations and generally by aircraft flying under VFR, meaning that pilots fly and navigate with reference to the natural horizon and terrain features they see outside. Pilots are required to maintain minimum distances from notified obstacles, including WTGs, and may only fly within the minimum weather and visibility criteria (VMC).

11.5.3.5 Above FL195 is Class C controlled airspace in the form of a Temporary Reserved Area (TRA). This airspace, specifically TRA 008B, has an upper vertical limit of FL245, approximately 24,500ft AMSL, and is available for use by both military and civil aircraft, though its main use is to accommodate VFR military flying activity.

11.5.3.6 The western extent of the Caledonia OWF lies partially within Moray Firth Transponder Mandatory Zone (TMZ), as depicted in Figure 11-2, which extends from the sea surface to an upper vertical limit of FL100, approximately 10,000ft AMSL. Within a TMZ the carriage and operation of aircraft transponder equipment is mandatory. This enables such aircraft to be detected and tracked by Secondary Surveillance Radar (SSR) systems.

11.5.3.7 The Moray Firth TMZ encompasses the Beatrice, Moray West and Moray East OWFs and is used to mitigate the impact the associated WTGs have on PSR. The establishment of a TMZ over the Caledonia OWF is one of the potential mitigation measures to be considered during the design process.

11.5.3.8 Laterally, the closest controlled airspace to the Caledonia OWF is the Moray Control Area (CTA), which is divided into CTAs 1 to 17. Of these elements, the closest to the Caledonia OWF is CTA 6, as shown in Figure 11-2, approximately 6.5km to the west. Moray CTA 6 is Class E controlled airspace with a lower limit of FL75, approximately 7,500ft AMSL, and an upper limit of FL155, approximately 15,500ft AMSL. CTA 6 facilitates air traffic transiting between Aberdeen and Wick. The Moray CTA is also a TMZ.

11.5.3.9 Wick Airport is the nearest UK civil airport to the Caledonia OWF, approximately 26km to the north-west (Figure 11-1). It provides daily scheduled flights to Aberdeen Airport and is regularly used by helicopters operating offshore. The Caledonia OWF is in airspace coincidental with Wick Airport's published IFPs.

11.5.3.10 Aberdeen Airport is 90km south of the Caledonia OWF (Figure 11-1). It is Scotland's third busiest airport and is the main heliport for offshore helicopter operations in the northern North Sea.

11.5.3.11 Inverness Airport is 110km south-west of the Caledonia OWF and is Scotland's fourth busiest airport (Figure 11-1). It is equipped with a combined PSR/SSR facility.

11.5.3.12 NATS provides en-route civil air traffic services within the Scottish FIR and operates a network of radar facilities providing en-route information for ATC on both civil and military aircraft. The closest NATS radars to the Caledonia OWF are based at Allanshill, 43km to the south, and Perwinnes, 89 km to the south (Figure 11-1). NATS radar facilities are combined PSR/SSR systems. Allanshill and Perwinnes radars are also the ATC radars for Aberdeen Airport.

Military Aviation

11.5.3.13 The Caledonia OWF lies within the Moray Firth (South) DA EGD809S, as shown in Figure 11-2. When active the DA has vertical limits from the sea surface up to 55,000ft AMSL. Ordnance, munitions and explosives, unmanned aircraft system, and high energy manoeuvre activities take place within this DA.

11.5.3.14 Approximately 55km south-west of the Caledonia OWF is the Tain DA, EGD703 (Figure 11-2), which when active has vertical limits from the sea surface up to 15,000ft AMSL. Similar activities to those within Moray Firth (South) DA take place within Tain DA, with the addition of para dropping, electronic and optical hazard activities.

11.5.3.15 The Caledonia OWF also lies beneath the Northern Complex DA, one of four DA complexes in UK airspace that provide segregated airspace for military flying training involving high energy manoeuvres. Specifically, the Caledonia OWF is beneath DA EGD712D (Figure 11-2) which, when activated, has vertical limits from FL245 to FL660 (approximately 66,000ft AMSL).

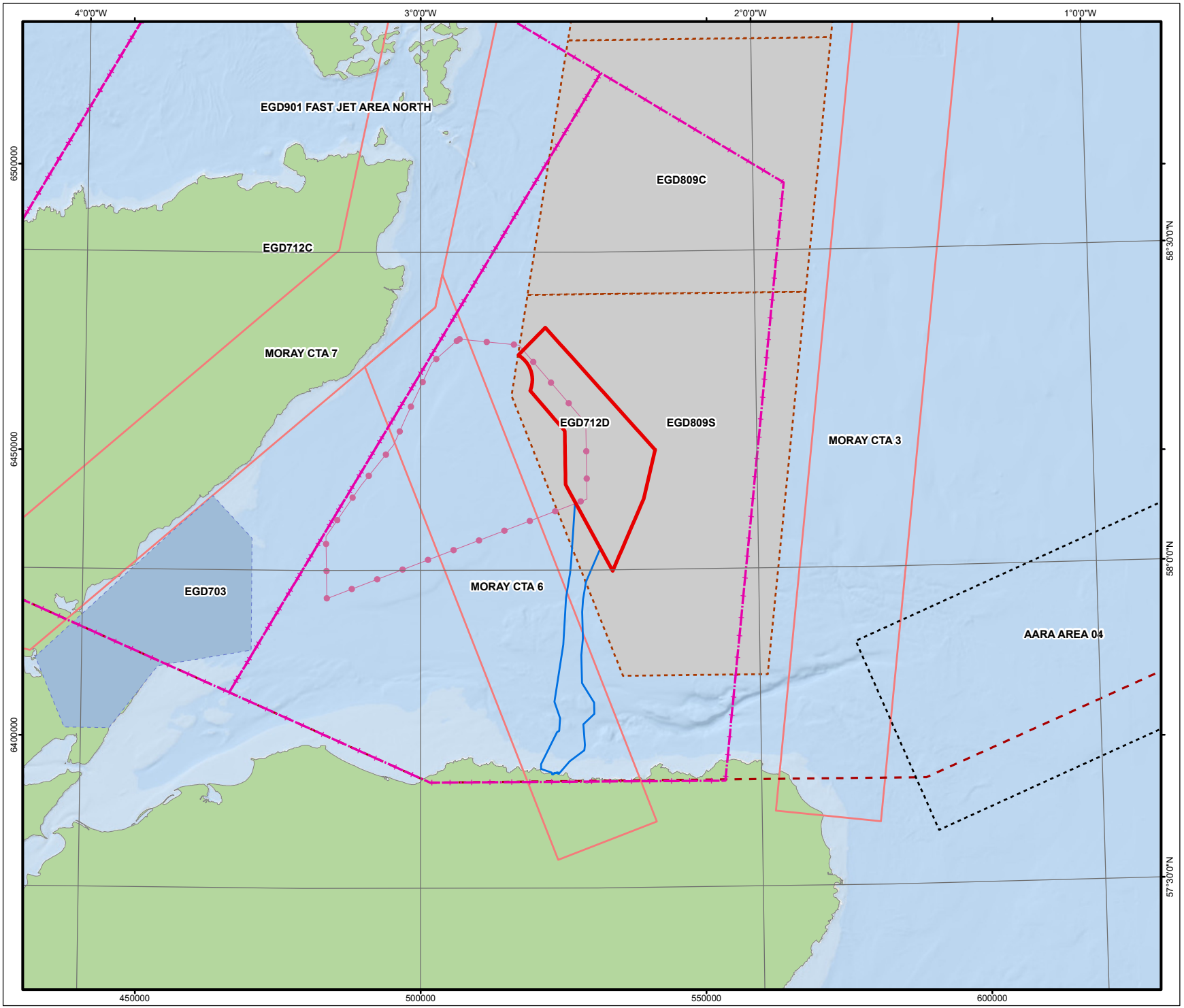
11.5.3.16 Also above the Caledonia OWF is a further DA, EGD901, known as Fast Jet Area North. This DA has vertical limits from FL245 to FL550 (approximately 55,000ft AMSL). This DA is solely in support of Exercise Joint Warrior, a biannual multinational conduct readiness military training exercise that takes place in the spring and autumn. High energy manoeuvres, ordnance, munitions and explosives activities take place within EGD901.

11.5.3.17 Approximately 44km south-east of the Caledonia OWF is Air to Air Refuelling Area (AARA) Area 04 (Figure 11-2). AARA Area 04 is permanently available to military traffic and has vertical limits from FL70 (approximately 7,000ft AMSL) to FL240 (approximately 24,000ft AMSL). Within AARA airspace, fuel is transferred from tanker aircraft to receiver aircraft under a radar service provided by military controllers based at Swanwick.

11.5.3.18 There are no known further PEXAs, including PEXAs for non-aviation activities, within the study area.

11.5.3.19 The nearest radar equipped military airfield to the Caledonia OWF is Royal Air Force (RAF) Lossiemouth, 63km (34nm) to the south-west (Figure 11-1). Controllers at this station may offer a Lower Airspace Radar Service (LARS) to aircraft operating outside controlled airspace up to FL100 (approximately 10,000ft AMSL) within the limits of radio and radar cover. The maximum range for the Lossiemouth LARS provision is 40nm (74.1km). RAF Lossiemouth is equipped with two PSR facilities and a PAR.

11.5.3.20 The nearest MoD AD radar to the Caledonia OWF is based at Remote Radar Head (RRH) Buchan, 71km (38.3nm) to the south-east (Figure 11-1).



- Caledonia OWF
- Offshore Export Cable Corridor
- Air To Air Refuelling Area (AARA) Area 04
- Fast Jet Area North
- Moray Control Area (CTA)
- Moray Firth Danger Area
- Moray Firth Transponder Mandatory Zone (TMZ)
- Northern Complex
- Tain Danger Area

0 10 20 30 km

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CALEDONIA Offshore Wind Farm

GoBe APEM Group

CONTRACTOR DRAWING NO: UKCAL1_GO_WNF_MAV_MAP_00209_	CONTRACTOR REV: 01
GEODETIC PARAMETERS: WGS 84 / UTM zone 30N (EPSG: 32630)	

DRAWING TITLE

Figure 11-2: Existing Military and Civil Airspace Environment

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Helicopter Main Routing Indicators

11.5.3.21 A network of low level offshore routes over the northern North Sea are flown by civilian helicopters in support of offshore oil and gas installations. The routes typically and routinely flown are published on charts as Helicopter Main Routing Indicators (HMRIs) to alert other airspace users to concentrations of frequent low-level helicopter traffic.

11.5.3.22 These routes have no lateral dimensions and assume the background airspace classification within which they lie (in this case Class G). HMRIs over the northern North Sea generally extend vertically from 1,500ft AMSL to FL85 (approximately 8,500ft AMSL), although icing conditions or other flight safety considerations may require helicopters to operate below 1,500ft AMSL.

11.5.3.23 CAP 764 advises that planned obstacles within 2nm (3.7km) of an HMRI route centreline should be consulted upon with helicopter operators and the Air Navigation Service Provider (Aberdeen Radar). The closest HMRI to the Caledonia OWF is HMRI X-Ray, as shown in Figure 11-3, which tracks between Aberdeen and the Atlantic Rim and passes the Caledonia OWF by 8.7nm (16.1km) to the west.

Offshore Helidecks

11.5.3.24 To help achieve a safe operating environment, a 9nm (16.7km) consultation zone for planned obstacles exists around offshore helicopter destinations. Within 9nm (16.7km), obstacles such as WTGs can potentially impact upon the feasibility of helicopters to safely fly low visibility or missed approach procedures at the associated helideck site.

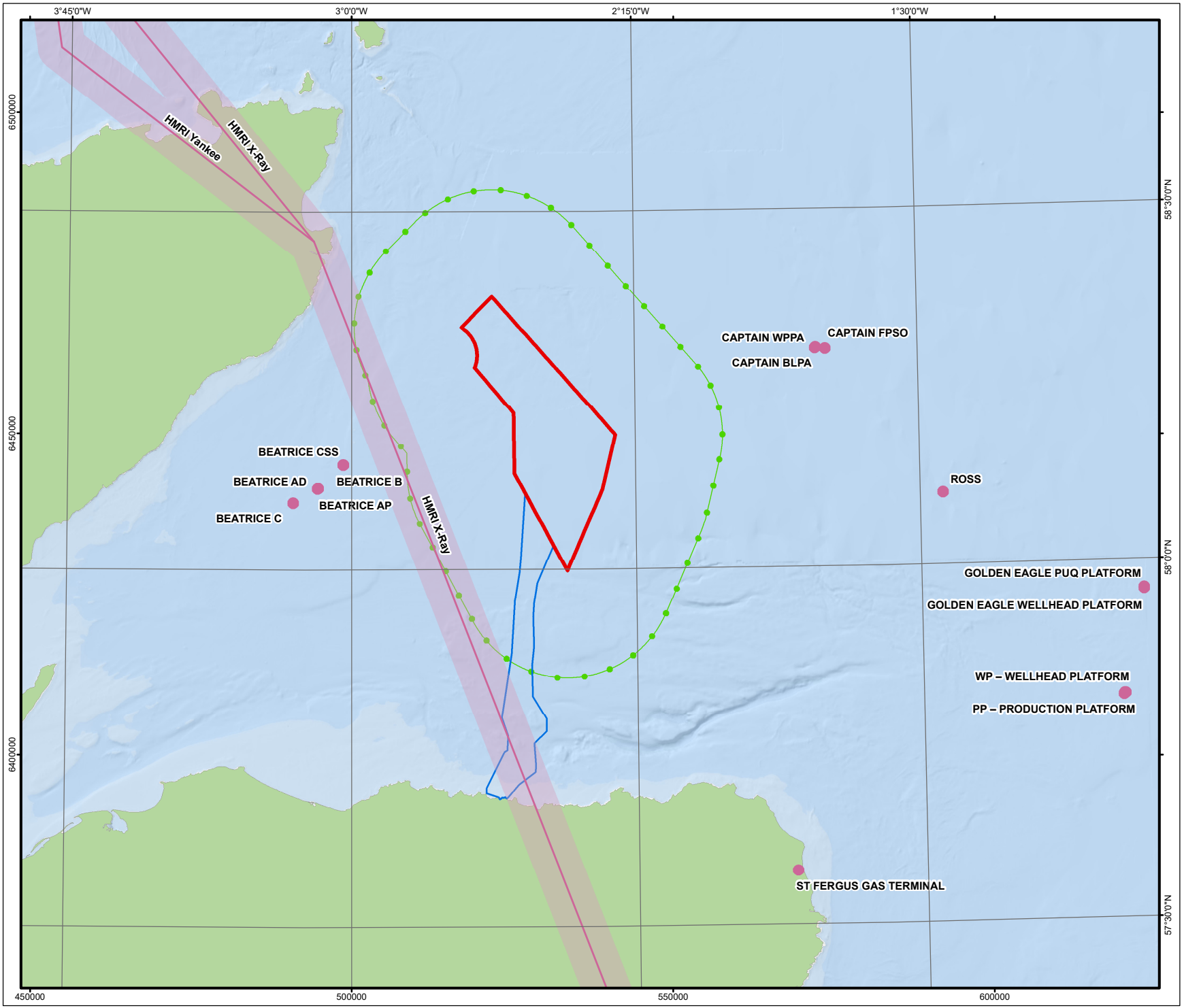
11.5.3.25 The closest helidecks to the Caledonia OWF are associated with the five platform structures within the Beatrice oil field (Figure 11-3); however, at a minimum range of more than 13nm (25.4km) to the west, the platforms are beyond the 9nm (16.7km) consultation zone. The Beatrice oil field has now ceased production and plans are underway for the decommissioning of the platform complex. Decommissioning plans were approved by the UK government in 2019.

Search and Rescue

11.5.3.26 There are ten helicopter SAR bases around the UK with Bristow Helicopters providing helicopters and aircrew. The nearest SAR base is at Inverness Airport.

Met Office Weather Radars

11.5.3.27 The closest Met Office weather radar to the Caledonia OWF is located at Hill of Dudwick in Aberdeenshire (Figure 11-1), 67km (36.2nm) south of the Caledonia OWF.



Caledonia OWF

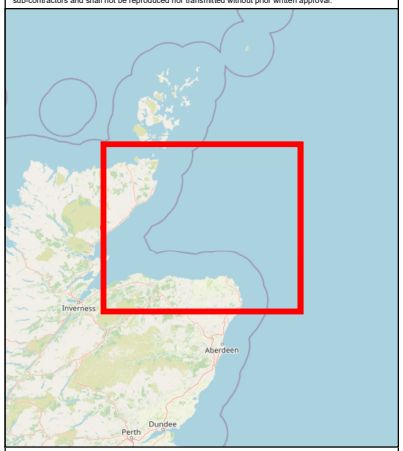
Offshore Export Cable Corridor

Caledonia OWF 9nm Buffer

Helicopter Main Routing Indicators (HMRIs)

HMRI 2nm Consultation Buffer

Oil and Gas Platforms



0 10 20 30 km

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CALEDONIA Offshore Wind Farm

GoBe APEM Group

CONTRACTOR DRAWING NO: UKCAL1_GO_WNF_MAV_MAP_00210	CONTRACTOR REV: 01
GEODETIC PARAMETERS: WGS 84 / UTM zone 30N (EPSG: 32630)	

DRAWING TITLE

Figure 11-3: HMRIs and Oil and Gas Infrastructure in the Vicinity of the Array Area

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DRAWING NUMBER: N/A	SHEET NO: 01 of 01	REV: N/A

Caledonia Offshore Export Cable Corridor

Civil Aviation

11.5.3.28 The airspace above and adjacent to the Caledonia OECC is within the Scottish FIR. The southern two thirds of the Caledonia OECC is beneath Moray CTA 6 (Figure 11-2).

11.5.3.29 The nearest UK civil airport to the Caledonia OECC is Aberdeen Airport, 58km (31.3nm) to the south-east (Figure 11-1).

11.5.3.30 The nearest NATS radar facility to the Caledonia OECC is at Allanshill, 23km (12.4nm) to the east (Figure 11-1).

Military Aviation

11.5.3.31 A portion of the Caledonia OECC that is adjacent to the Caledonia OWF lies within the Moray Firth (South) DA EGD809S (Figure 11-2), which when active has vertical limits from the sea surface up to 55,000ft AMSL. Ordnance, munitions and explosives, unmanned aircraft system, and high energy manoeuvre activities take place within this DA.

11.5.3.32 The nearest radar equipped military airfield to the Caledonia OECC is RAF Lossiemouth, 41km (22.1nm) to the west (Figure 11-1).

11.5.3.33 The nearest MoD AD radar to the OECC is based at RRH Buchan, 51km (27.5nm) to the south-east (Figure 11-1).

Helicopter Main Routing Indicators

11.5.3.34 The OECC is crossed by HMRI X-Ray (Figure 11-3), which extends vertically from 1,500ft AMSL to FL85 (approximately 8,500ft AMSL), although icing conditions or other flight safety considerations may require helicopters to operate below 1,500ft AMSL.

Met Office Weather Radars

11.5.3.35 The closest Met Office weather radar to the Caledonia OECC is located at Hill of Dudwick in Aberdeenshire, 43km (23.2nm) south-east of the OECC (Figure 11-1).

11.5.4 Do Nothing Baseline

11.5.4.1 If the Proposed Development (Offshore) does not come forward, an assessment of the future baseline conditions has also been carried out and is described within this section.

11.5.4.2 As oil and gas infrastructure in the North Sea is decommissioned, this will potentially reduce the volume of helicopter traffic to and from offshore platforms. However, this may be offset by traffic associated with offshore wind developments. An increase in low-level autonomous drone traffic can also be foreseen.

11.5.5 Data Gaps and Limitations

11.5.5.1 No overarching assumptions or limitations have been identified that apply to the assessment for military and civil aviation. The data employed in the assessment are considered robust and sufficient for purpose.

11.6 EIA Approach and Methodology

11.6.1 Overview

11.6.1.1 This section outlines the methodology for assessing the likely significant effects on military and civil aviation from the construction, operation and decommissioning of the Proposed Development.

11.6.2 Impacts Scoped in to the Assessment

11.6.2.1 The Offshore Scoping Report (Volume 7, Appendix 2) was submitted to MD-LOT in September 2022. The Offshore Scoping Report set out the overall approach to assessment and allowed for the refinement of the Proposed Development over the course of the assessment. The proposed scope of the assessment is set out in Table 11-5.

Table 11-5: Military and Civil Aviation Scope of Assessment.

Potential Impact	Phase	Nature of Impact
Creation of an aviation obstacle environment	Construction	Direct
Creation of an aviation obstacle environment	Operation	Direct
Impact on military and civil PSR systems	Operation	Direct

11.6.3 Impacts Scoped out of the Assessment

11.6.3.1 The impacts scoped out of the assessment during EIA scoping, and the justification for this, are listed in Table 11-6.

11.6.3.2 The decommissioning impact "Increased air traffic in the area related to wind farm activities" was originally anticipated to be scoped in according to the Offshore Scoping Report (Volume 7, Appendix 2) but has since been scoped out as no helicopters are expected to be used during construction, O&M and decommissioning, and therefore there are no impacts upon military and civil aviation receptors associated with the decommissioning of the Proposed Development (Offshore). More details can be found in Table 11-6.

Table 11-6: Impacts Scoped Out for Military and Civil Aviation.

Potential Impact	Justification
Increased air traffic in the area related to wind farm activities	The impact was scoped into the assessment during EIA scoping; however, use of helicopters is not anticipated during the construction, operation or decommissioning phases and therefore it is appropriate to scope the impact out.
Impact on military and civil PSR systems	To discriminate wanted aircraft targets from unwanted clutter, PSRs ignore static objects and only display moving targets. PSRs that can see the rotating blades of WTGs can mistake them for aircraft and so present them on the radar display as clutter. Until WTG blades in RLoS are allowed to rotate, they will not generate PSR clutter. Similarly, tall construction vessels and cranes, and floating WTGs under tow from wet storage areas to the Caledonia OWF that are in RLoS will not be moving fast enough to generate PSR clutter. Floating WTG blades will be locked whilst being towed to the Caledonia OWF.
Impact from the Offshore Export Cables (OECs)	The OECs will be below sea level and will have no impact on aviation activities
Impact on military and civil SSR systems	NATS do not consider the impact of WTGs on SSR to be material or relevant for WTGs that are beyond approximately 28km from their SSR facilities. Furthermore, CAP 764 states that WTG effects on SSR "*…are typically only a consideration when the turbines are located very close to the SSR i.e., less than 10km*". The nearest SSR facility, at Allanshill, is 43km from the Caledonia OWF and will not be adversely impacted by WTGs.
Impact on Inverness Airport PSR	RLoS modelling indicates that the WTGs will not be visible to Inverness PSR.
Impact on NATS Perwinnes PSR	RLoS modelling indicates that the WTGs will not be visible to Perwinnes PSR.
Impact on RAF Lossiemouth PAR	The MoD confirmed in February 2024 that the Caledonia OWF will not be in RLoS of the PAR and can therefore be scoped out, as detailed in Table 11-3.
Creation of an aviation obstacle environment	During the decommissioning phase the existing WTGs will be gradually dismantled and therefore the aviation obstacle environment will be removed. No specific decommissioning impacts are foreseen above those present in the construction and operation phases.
Impact on military and civil PSR systems	During the decommissioning phase the blades of WTGs will cease rotating, therefore the impact on PSRs will gradually reduce until the last WTG ceases operation. Any mitigations will remain in place until the blades of the last WTG stop rotating or until such other time that may be required by a

Potential Impact	Justification
	radar mitigation scheme agreement. There will be no other specific impacts on PSRs during decommissioning.
Impact on MoD highly surveyed routes	The MoD retains highly surveyed routes to maintain national defence requirements that are not defined in the public domain. These routes must not be obstructed by offshore developments such as WTGs. The MoD confirmed in February 2024 that the impact of the Caledonia OWF on highly surveyed routes can be scoped out, as detailed in Table 11-3.
Impact on weather radars	The closest Met Office weather radar is at Hill of Dudwick, 67km south of the Caledonia OWF and therefore outside the Met Office 20km radius consultation zone. WTGs that are in RLoS and in the beam of a weather radar can have an adverse impact, blocking radar data and creating clutter that obscures real precipitation signals. WTGs in the Caledonia OWF will be in RLoS, but will be below the lowest elevation scan and therefore unlikely to have a significant impact.

11.6.4 Assessment Methodology

11.6.4.1 The project-wide generic approach to assessment is set out in Volume 1, Chapter 7: EIA Methodology. The assessment methodology for military and civil aviation for the EIAR is consistent with that provided in the Offshore Scoping Report (Volume 7, Appendix 2).

11.6.4.2 The assessment has been supported by desk-based studies including RLoS modelling to identify aviation and radar receptors. RLoS is determined using radar propagation modelling software and 3D terrain data and is detailed in Volume 7B, Appendix 11-1: Airspace Analysis and Radar Modelling. The assessment for military and civil aviation has been undertaken in compliance with the guidance documents listed in Table 11-1.

11.6.4.3 To determine the significance of an effect, the magnitude of the potential impact and the sensitivity of the receptors are defined.

11.6.4.4 The magnitude criteria for military and civil aviation are provided in Table 11-7.

Table 11-7: Impact Magnitude.

Impact Magnitude	Description
High	Total loss of ability to carry on activities and/or impact is of extended physical extent and/or long term duration and/or frequency of repetition is continuous and/or effect is not reversible for the Proposed Development (Offshore).
Medium	Loss or alteration to significant portions of key components of current activity and/or physical 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 the Proposed Development (Offshore).
Low	Minor shift away from baseline, leading to a reduction in level of activity that may be undertaken and/or physical extent of impact is low and/or short to medium term duration and/or frequency of repetition is low to continuous and/or effect is not reversible for the Proposed Development (Offshore).
Negligible	Very slight change from baseline condition and/or physical extent of impact is negligible and/or short term duration and/or frequency of repetition is negligible to continuous and/or effect is reversible.

11.6.4.5 The sensitivity criteria for military and civil aviation receptors are provided in Table 11-8.

Table 11-8: Receptor Sensitivity.

Sensitivity Value	Description
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 Proposed Development (Offshore) and/or recoverability is slow and/or costly.
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 Proposed Development (Offshore) 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 Proposed Development (Offshore) and/or has high recoverability.
Negligible	Receptor, or the activities of the receptor, is of negligible value to the local, regional or national economy and/or the receptor or the activities of the receptor, is not vulnerable to impacts that may arise from the Proposed Development and/or has high recoverability.

11.6.4.6 The significance of an effect is determined by combining the impact magnitude with the receptor sensitivity, as shown in Table 11-9.

11.6.4.7 A significance of effect level of moderate or major is considered 'significant' in EIA terms, whereas a level of minor or negligible is considered 'not significant'.

Table 11-9: Significance of Effect

Significance of Effect		Sensitivity of Receptor			
		Negligible	Low	Medium	High
Impact Magnitude	Negligible	Negligible	Negligible	Negligible	Negligible
	Low	Negligible	Negligible	Minor	Minor
	Medium	Negligible	Minor	Moderate	Moderate
	High	Negligible	Minor	Moderate	Major

11.6.5 Approach to Cumulative Impacts

11.6.5.1 The Cumulative Impact Assessment (CIA) assesses the impact associated with the Proposed Development (Offshore) together with other relevant plans, projects and activities. Cumulative impacts are therefore the combined effect of the Proposed Development (Offshore) in combination with the effects from a number of different projects, on the same receptor or resource.

11.6.5.2 The approach to the CIA for military and civil aviation follows the process outlined in Volume 1, Chapter 7: EIA Methodology.

11.6.5.3 The list of relevant developments for inclusion within the CIA is outlined in Volume 7A, Appendix 7-1: Cumulative Impact Assessment Methodology.

11.6.5.4 Developments which are located within 100km of the Caledonia OWF have the potential to result in a cumulative impact. Developments which are either operational or in the decommissioning stage are considered to be part of the baseline and are not considered within the assessment unless they could have an ongoing impact.

11.6.6 Embedded Mitigation

11.6.6.1 Where possible, mitigation measures will be embedded into the design of the Proposed Development (Offshore), specifically Caledonia North and Caledonia South. Where embedded mitigation measures have been developed into the design of the Proposed Development (Offshore) with specific regard to military and civil aviation, these are described in Table 11-10. The impact assessment presented in Sections 11.8 to 11.11 take into account this embedded mitigation.

Table 11-10: Embedded Mitigation.

Code	Mitigation Measure	Securing Mechanism
M-2	Development of and adherence to a Development Specification and Layout Plan (DSLP). The DSLP will confirm the layout and design parameters of the Proposed Development (Offshore).	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-3	Development of and adherence to a Construction Method Statement (CMS). The CMS will confirm construction methods and the roles and responsibilities of parties engaged in construction. It will detail any construction-related mitigation measures.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-10	Development of and adherence to a Decommissioning Programme (DP). The DP will outline measures for the decommissioning of the Proposed Development (Offshore).	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-13	Development of and adherence to a Vessel Management Plan (VMP). The VMP will confirm the types and numbers of vessels that will be engaged on the Proposed Development (Offshore), and consider vessel coordination including indicative transit route planning.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-14	Development of and adherence to a Lighting and Marking Plan (LMP). The LMP will confirm compliance with legal requirements with regards to shipping, navigation and aviation marking and lighting.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-25	Development of and adherence to an Emergency Response Cooperation Plan (ERCoP). The ERCoP will be prepared in line with MCA guidance and confirms what measures the Proposed Development has in place to support any emergency response.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.

Code	Mitigation Measure	Securing Mechanism
M-27	Compliance with Maritime and Coastguard Agency (MCA) Marine Guidance Note (MGN) 654 (MCA, 2021) and its annexes where applicable. Also MGN 543 Search and Rescue (SAR) annex 5 (MCA, 2024).	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-28	Appropriate marking of the Proposed Development on Admiralty and aeronautical charts. This will include provision of the positions and heights of structures to the UK Hydrographic Office (UKHO), CAA, MoD and Defence Geographic Centre (DGC).	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-34	Aviation lighting and marking, as described in the LMP, will be installed in accordance with Article 223 of CAP 393, the UK Air Navigation Order ANO 2016 which sets out the mandatory requirements to be followed for lighting of offshore WTGs.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-35	The layout of the Proposed Development, as presented in the DSLP, will be finalised in discussion with the MCA and the NLB in order to ensure the specific WTG layout is compatible with potential Search and Rescue activity.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-36	Failures to Proposed Development (Offshore) lighting and marking will be appropriately reported and rectified as soon as practicable. Interim hazard warnings will be put in place as required.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.

11.7 Key Parameters for Assessment

11.7.1.1 Volume 1, Chapter 3: Proposed Development Description (Offshore) details the parameters of the Proposed Development (Offshore) using the Rochdale Envelope approach. This section identifies those parameters during construction, operation and decommissioning relevant to potential impacts on military and civil aviation.

11.7.1.2 The worst case assumptions with regard to military and civil aviation are summarised in Table 11-11.

Table 11-11: Worst Case Assessment Scenario Considered for Each Impact as Part of the Assessment of Likely Significant Effects.

Potential Impact	Assessment Parameter	Explanation
Construction		
Impact 1: Creation of an aviation obstacle environment	**Construction/installation of:** ▪ 140 WTGs: o Maximum blade tip height of 355m AMSL. o WTG installation vessels; ▪ Four OSPs with a maximum height of 55m AMSL: o OSP installation vessels; and ▪ Impact starting from a point of zero infrastructure present to full presence, a sequential construction scenario with a gap of up to five years between phases.	The maximum physical obstruction to aviation operations due to the size and number of above sea level infrastructure and vessels within the Caledonia OWF and Caledonia OECC.
Operation and Maintenance		
Impact 2: Creation of an aviation obstacle environment	**Operation of:** ▪ 140 WTGs: o Maximum blade tip height of 355m AMSL; ▪ Four OSPs with a maximum height of 55m AMSL; and ▪ Impact present for operation period of 35 years.	The maximum physical obstruction to aviation operations due to the size and number of above sea level infrastructure within the Caledonia OWF.
Impact 3: Impact on military and civil PSR systems	**Operation of:** ▪ 140 WTGs: o Maximum blade tip height of 355m AMSL; and ▪ Impact present for operation period of 35 years.	These parameters represent the worst case for height of infrastructure within the Caledonia OWF which has the greatest potential for interference with radar systems.
Decommissioning		
There are no impacts upon military and civil aviation receptors anticipated from the decommissioning of the Proposed Development (Offshore). Please see Section 11.6.3.2 for more details.		

11.8 Potential Effects

11.8.1 Construction

Impact 1: Creation of an Aviation Obstacle Environment

11.8.1.1 Construction of the Proposed Development (Offshore) will involve tall crane vessels and the installation of infrastructure above sea level which may pose a physical obstruction to aircraft utilising the airspace in the vicinity, potentially increasing the risk of obstacle collision or requiring aircraft to fly extended routes to avoid obstacles. From a starting point of no infrastructure within the Caledonia OWF, the infrastructure outlined in Table 11-11 will be installed over a sequential construction period with a gap of up to five years between phases. The construction period reduces to approximately three years if the phases are installed concurrently.

11.8.1.2 Specifically, permanent or temporary obstacles may impact the following receptors:

- Military low flying activities;
- Offshore helicopter operations;
- SAR helicopters; and
- Wick Airport IFPs.

Military Low Flying Activities

11.8.1.3 As detailed in Table 11-10, potential impacts on military low flying activities in the vicinity of the Caledonia OWF and Caledonia OECC will be mitigated through the development of an LMP in agreement with key aviation stakeholders including the MoD and through the provision of the positions and heights of structures to the CAA, MoD and DGC to enable appropriate marking on aeronautical charts. The movement of floating WTGs from wet storage locations to the Caledonia OWF will also be notified to enable promulgation to key aviation stakeholders. The LMP will cover the lighting and marking of construction equipment such as tall cranes.

11.8.1.4 The Caledonia OWF and a portion of the Caledonia OECC infringe DA EGD809S. Embedded mitigation in the form of a VMP will facilitate advance notification to the MoD of scheduled WTG and cable installation vessel movements during the construction phase and assist with the management of military training activities conducted within the DA. Embedded commitment measures with respect to notification, charting, marking and lighting will make all pilots aware of temporary and permanent obstacles in the Caledonia OWF and Caledonia OECC, and it is assumed that pilots will comply with aviation regulatory requirements. The ultimate responsibility for seeing and avoiding obstacles rests with pilots.

Magnitude of Impact

11.8.1.5 The impact on military low flying activity is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **Low**.

Sensitivity of Receptor

11.8.1.6 Military low flying activity 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

11.8.1.7 Taking the medium sensitivity of military low flying activity and the low magnitude of impact, the overall effect of the creation of an aviation obstacle environment during construction is considered to be **Minor and Not Significant in EIA terms**.

Offshore Helicopter Operations

11.8.1.8 As detailed in Table 11-10, potential impacts on offshore helicopter operations in the vicinity of the Caledonia OWF and Caledonia OECC will be mitigated through the development of an LMP in agreement with key aviation stakeholders and through the provision of the positions and heights of structures to the CAA, MoD and DGC to enable appropriate marking on aeronautical charts. The movement of floating WTGs from wet storage locations to the Caledonia OWF will also be notified to enable promulgation to key aviation stakeholders. The LMP will cover the lighting and marking of construction equipment such as tall cranes.

11.8.1.9 The Caledonia OWF is more than 9nm (16.7km) from the nearest offshore helideck and more than 2nm (3.7km) from HMRI X-Ray. The Caledonia OECC is crossed by HMRI X-Ray but cable installation vessels are considered low-profile obstacles that will have no impact on helicopters using the HMRI.

11.8.1.10 Embedded mitigation measures with respect to notification, charting, marking and lighting will make all pilots aware of temporary and permanent obstacles in the Caledonia OWF and Caledonia OECC, and it is assumed that pilots will comply with aviation regulatory requirements. The ultimate responsibility for seeing and avoiding obstacles rests with pilots.

Magnitude of Impact

11.8.1.11 The impact on offshore helicopter operations is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **Low**.

Sensitivity of Receptor

11.8.1.12 Offshore helicopter operations are 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

11.8.1.13 Taking the medium sensitivity of offshore helicopter operations and the low magnitude of impact, the overall effect of the creation of an aviation obstacle environment during construction is considered to be **Minor and Not Significant in EIA terms**.

SAR Helicopters

11.8.1.14 As detailed in Table 11-10, potential impacts on offshore helicopter operations in the vicinity of the Caledonia OWF and Caledonia OECC will be mitigated through the development of an LMP in agreement with key aviation stakeholders and through the provision of the positions and heights of structures to the CAA, MoD and DGC to enable appropriate marking on aeronautical charts. The movement of floating WTGs from the wet storage location to the Caledonia OWF will also be notified to enable promulgation to key aviation stakeholders. The LMP will cover the lighting and marking of construction equipment such as tall cranes.

11.8.1.15 Embedded mitigation measures with respect to notification, charting, marking and lighting will make all pilots aware of temporary and permanent obstacles in the Caledonia OWF and Caledonia OECC, and it is assumed that pilots will comply with aviation regulatory requirements. The ultimate responsibility for seeing and avoiding obstacles rests with pilots.

11.8.1.16 Lighting of WTGs will consider SAR requirements and the final WTG layout will be compatible with SAR helicopter operations. An ERCoP will be developed and implemented for all phases of the Proposed Development (Offshore).

Magnitude of Impact

11.8.1.17 The impact on SAR helicopters is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **Low**.

Sensitivity of Receptor

11.8.1.18 SAR helicopters are 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

11.8.1.19 Taking the medium sensitivity of SAR helicopters operations and the low magnitude of impact, the overall effect of the creation of an aviation obstacle environment during construction is considered to be **Minor and Not Significant in EIA terms**.

Wick Airport IFPs

11.8.1.20 WTGs within the Caledonia OWF could become a physical obstacle to flight operations at Wick Airport. Specifically, WTGs could infringe the protected obstacle clearance surfaces associated with Wick Airport's published IFPs. An IFP is a set of instructions used by aircraft navigating at aerodromes by reference to flight instruments. The IFP gives pilots reassurance of properly designated obstacle and terrain protection whilst manoeuvring in poor weather. WTGs infringing IFP protected surfaces will require IFPs to be redesigned with higher minimum safe altitudes which could result in an impact on Wick Airport operations due to the potential reduction in aircraft being able to land at the airport in poor weather.

11.8.1.21 The Applicant is continuing to engage with HIAL and Wick Airport to agree suitable mitigation.

Magnitude of Impact

11.8.1.22 The impact on Wick Airport IFPs is predicted to be of regional spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **Medium**.

Sensitivity of Receptor

11.8.1.23 Wick Airport IFPs are deemed to be of high vulnerability as any infringements of protected IFP surfaces would necessitate the withdrawal from use of the IFP. IFPs are considered to have low recoverability as redesigning IFPs is a costly and slow process. IFPs are of high value as their non-availability could have a direct impact on Wick Airport's viability. The sensitivity of the receptor is therefore considered to be **High**.

Significance of Effect

11.8.1.24 Taking the high sensitivity of Wick Airport IFPs and the medium magnitude of impact, the overall effect of the creation of an aviation obstacle environment during construction is considered to be **Moderate and Significant in EIA terms**.

11.8.2 Operation

Impact 2: Creation of an Aviation Obstacle Environment

11.8.2.1 During the operation phase the infrastructure outlined in Table 11-11 will be present in the Caledonia OWF. This may pose a physical obstruction to aircraft utilising the airspace in the vicinity, potentially increasing the risk of obstacle collision or requiring aircraft to fly extended routes to avoid obstacles.

11.8.2.2 Specifically, permanent obstacles may impact the following receptors:

- Military low flying activities;
- Offshore helicopter operations;
- SAR helicopters; and
- Wick Airport IFPs.

Military Low Flying Activities

11.8.2.3 As detailed in Table 11-10, potential impacts on military low flying activities in the vicinity of the Caledonia OWF will be mitigated through the development of an LMP in agreement with key aviation stakeholders including the MoD and through the provision of the positions and heights of structures to the CAA, MoD and DGC to enable appropriate marking on aeronautical charts. The movement of floating WTGs between the Caledonia OWF and wet storage locations will also be notified to enable promulgation to key aviation stakeholders.

11.8.2.4 Embedded mitigation measures with respect to notification, charting, marking and lighting will make all pilots aware of permanent obstacles in the Caledonia OWF, and it is assumed that pilots will comply with aviation regulatory requirements. The ultimate responsibility for seeing and avoiding obstacles rests with pilots.

Magnitude of Impact

11.8.2.5 The impact on military low flying activity is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **Low**.

Sensitivity of Receptor

11.8.2.6 Military low flying activity 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

11.8.2.7 Taking the medium sensitivity of military low flying activity and the low magnitude of impact, the overall effect of the creation of an aviation obstacle environment during operation is considered to be **Minor and Not Significant in EIA terms**.

Offshore Helicopter Operations

11.8.2.8 As detailed in Table 11-10, potential impacts on offshore helicopter operations in the vicinity of the Caledonia OWF will be mitigated through the development of an LMP in agreement with key aviation stakeholders and through the provision of the positions and heights of structures to the CAA, MoD and DGC to enable appropriate marking on aeronautical charts. The movement of floating WTGs between the Caledonia OWF and wet

storage locations will also be notified to enable promulgation to key aviation stakeholders.

11.8.2.9 The Caledonia OWF is more than 9nm (16.7km) from the nearest offshore helideck and more than 2nm (3.7km) from HMRI X-Ray.

11.8.2.10 Embedded mitigation measures with respect to notification, charting, marking and lighting will make all pilots aware of permanent obstacles in the Caledonia OWF, and it is assumed that pilots will comply with aviation regulatory requirements. The ultimate responsibility for seeing and avoiding obstacles rests with pilots.

Magnitude of Impact

11.8.2.11 The impact on offshore helicopter operations is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **Low**.

Sensitivity of Receptor

11.8.2.12 Offshore helicopter operations are 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

11.8.2.13 Taking the medium sensitivity of offshore helicopter operations and the low magnitude of impact, the overall effect of the creation of an aviation obstacle environment during operation is considered to be **Minor and Not Significant in EIA terms**.

SAR Helicopters

11.8.2.14 As detailed in Table 11-10, potential impacts on offshore helicopter operations in the vicinity of the Caledonia OWF will be mitigated through the development of an LMP in agreement with key aviation stakeholders and through the provision of the positions and heights of structures to the CAA, MoD and DGC to enable appropriate marking on aeronautical charts. The movement of floating WTGs between the Caledonia OWF and wet storage locations will also be notified to enable promulgation to key aviation stakeholders.

11.8.2.15 Embedded mitigation measures with respect to notification, charting, marking and lighting will make all pilots aware of permanent obstacles in the Caledonia OWF, and it is assumed that pilots will comply with aviation regulatory requirements. The ultimate responsibility for seeing and avoiding obstacles rests with pilots.

11.8.2.16 Lighting of WTGs will consider SAR requirements and the final WTG layout will be compatible with SAR helicopter operations. An ERCoP will be developed and implemented for all phases of the Proposed Development (Offshore).

Magnitude of Impact

11.8.2.17 The impact on SAR helicopters is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **Low**.

Sensitivity of Receptor

11.8.2.18 SAR helicopters are 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

11.8.2.19 Taking the medium sensitivity of SAR helicopters operations and the low magnitude of impact, the overall effect of the creation of an aviation obstacle environment during construction is considered to be **Minor and Not Significant in EIA terms**.

Wick Airport IFPs

11.8.2.20 WTGs within the Caledonia OWF could become a physical obstacle to flight operations at Wick Airport. Specifically, WTGs could infringe the protected obstacle clearance surfaces associated with Wick Airport's published IFPs. An IFP is a set of instructions used by aircraft navigating at aerodromes by reference to flight instruments. The IFP gives pilots reassurance of properly designated obstacle and terrain protection whilst manoeuvring in poor weather. WTGs infringing IFP protected surfaces will require IFPs to be redesigned with higher minimum safe altitudes which could result in an impact on Wick Airport operations due to the potential reduction in aircraft being able to land at the airport in poor weather.

11.8.2.21 The Applicant is continuing to engage with HIAL and Wick Airport to agree suitable mitigation.

Magnitude of Impact

11.8.2.22 The impact on Wick Airport IFPs is predicted to be of regional spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **Medium**.

Sensitivity of Receptor

11.8.2.23 Wick Airport IFPs are deemed to be of high vulnerability as any permanent infringements of protected IFP surfaces would necessitate the withdrawal from use of the IFP. IFPs are considered to have low recoverability as redesigning IFPs is a costly and slow process. IFPs are of high value as their non-availability could have a direct impact on Wick Airport's viability. The sensitivity of the receptor is therefore considered to be **High**.

Significance of Effect

11.8.2.24 Taking the high sensitivity of Wick Airport IFPs and the medium magnitude of impact, the overall effect of the creation of an aviation obstacle environment during operation is considered to be **Moderate and Significant in EIA terms**.

Impact 3: Impact on Military and Civil PSR Systems

11.8.2.25 The Caledonia OWF will be within the operational range of radar systems serving both civil and military agencies. When operational (with blades fitted and rotating), WTGs have the potential to generate 'clutter' (or false targets) upon radar displays because current generation PSRs cannot easily differentiate between the moving blades of WTGs and aircraft. As a consequence, radar operators may be unable to distinguish between primary radar returns generated by WTGs and those generated by aircraft.

11.8.2.26 As a general rule, controllers are required to provide 5nm (2.7km) lateral separation between traffic receiving an ATS and 'unknown' primary radar returns in Class G airspace. This may therefore have an adverse impact on the provision of a safe and effective en-route surveillance service by controllers at NATS Prestwick Centre and other ATS providers such as Aberdeen Airport and RAF Lossiemouth and may compromise the ability of the MoD to undertake its Air Defence role.

11.8.2.27 Specifically, WTGs in the Caledonia OWF may impact the following PSR receptors:

- NATS Allanshill;
- RAF Lossiemouth; and
- RRH Buchan.

NATS Allanshill

11.8.2.28 Radar modelling detailed in Volume 7B, Appendix 11-1: Airspace Analysis and Radar Modelling shows that all WTGs within the Caledonia OWF will be theoretically detectable by the NATS PSR at Allanshill. Allanshill PSR is used by NATS en-route ATC and by approach controllers at Aberdeen Airport providing ATC to offshore helicopters.

11.8.2.29 In its Scoping response, NATS has confirmed that the Proposed Development (Offshore) is likely to cause false primary plots to be generated for Allanshill PSR and reduce the PSR's probability of detection for real aircraft. NATS further state that the amount of predicted clutter would lead to an unacceptable impact on en-route traffic operations at Prestwick Centre, Aberdeen Airport ATC operations and military ATC operations.

Magnitude of Impact

11.8.2.30 The impact on Allanshill PSR is predicted to be of local spatial extent (i.e. limited to the Caledonia OWF), long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **High**.

Sensitivity of Receptor

11.8.2.31 Allanshill PSR is deemed to be of high vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore considered to be **High**.

Significance of Effect

11.8.2.32 Taking the high sensitivity of Allanshill PSR and the high magnitude of impact, the overall effect of the impact on PSR during operation is considered to be **Major and Significant in EIA terms**.

RAF Lossiemouth

11.8.2.33 RAF Lossiemouth currently has two PSR facilities: a Watchman PSR, and a newly installed Thales STAR NG PSR which is intended to replace the legacy Watchman facility. Radar modelling detailed in Volume 7B, Appendix 11-1: Airspace Analysis and Radar Modelling shows that WTGs within most of the Caledonia OWF will be theoretically detectable by the Watchman PSR, and all WTGs within the Caledonia OWF will be theoretically detectable by the STAR NG PSR.

Magnitude of Impact

11.8.2.34 The impact on the Lossiemouth PSRs is predicted to be of local spatial extent (i.e. limited to the Caledonia OWF), long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptors directly. The magnitude is therefore considered to be **High**.

Sensitivity of Receptor

11.8.2.35 The Lossiemouth PSRs are deemed to be of high vulnerability, high recoverability and high value. The sensitivity of the receptors is therefore considered to be **High**.

Significance of Effect

11.8.2.36 Taking the high sensitivity of the Lossiemouth PSRs and the high magnitude of impact, the overall effect of the impact on PSR during operation is considered to be **Major and Significant in EIA terms**.

RRH Buchan

11.8.2.37 Radar modelling detailed in Volume 7B, Appendix 11-1: Airspace Analysis and Radar Modelling shows that WTGs within most of the Caledonia OWF will be theoretically detectable by the MoD AD radar at RRH Buchan.

Magnitude of Impact

11.8.2.38 The impact on Buchan PSR is predicted to be of local spatial extent (i.e. limited to the Caledonia OWF), long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **High**.

Sensitivity of Receptor

11.8.2.39 Buchan AD PSR is deemed to be of high vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore considered to be **High**.

Significance of Effect

11.8.2.40 Taking the high sensitivity of Buchan PSR and the high magnitude of impact, the overall effect of the impact on PSR during operation is considered to be **Major and Significant in EIA terms**.

11.8.3 Decommissioning

11.8.3.1 There are no impacts upon military and civil aviation receptors anticipated from the decommissioning of the Proposed Development (Offshore). Please see Section 11.6.3.2 for more details.

11.9 Cumulative Effects

11.9.1 Overview

11.9.1.1 The list of developments identified for assessing cumulative effects is presented in Volume 7A, Appendix 7-1: Cumulative Impacts Assessment Methodology. In Table 11-12, the potential for cumulative effects with each of these developments is examined, and an assessment of the cumulative effects presented where appropriate.

11.9.1.2 For this military and civil aviation assessment, two Zones of Influence (ZoIs) have been considered for the relevant impacts.

11.9.1.3 The first ZoI has considered projects within a 100km range of the overall Caledonia OWF. This distance is the maximum range at which radar cumulative effects are considered to occur. The potential cumulative effect of radar impacts on ATC operations diminishes as the separation between wind farm sites increases. A separation distance of 100km is considered to be a pragmatic range beyond which cumulative effects will be negligible.

11.9.1.4 The second ZoI covers a distance of 40km from the Caledonia OWF, and is considered to be the maximum range at which the cumulative effects from the creation of an aviation obstacle environment may occur.

Table 11-12: Military and Civil Aviation Cumulative Effects.

Development	Potential for Significant Cumulative Effects	Comment
Moray West OWF[ii]	Yes	14.24km from the Caledonia OWF. Potential for cumulative effects from the creation of an aviation obstacle environment and impacts on civil and military PSRs.
Stromar OWF	Yes	21.56km from the Caledonia OWF. Potential for cumulative effects from the creation of an aviation obstacle environment and impacts on civil and military PSRs.
Broadshore OWF	Yes	24.03km from the Caledonia OWF. Potential for cumulative effects from the creation of an aviation obstacle environment and impacts on civil and military PSRs.
Sinclair OWF	Yes	28.44km from the Caledonia OWF. Potential for cumulative effects from the creation of an aviation obstacle environment and impacts on civil and military PSRs.
Scaraben OWF	Yes	35.07km from the Caledonia OWF. Potential for cumulative effects from the creation of an aviation obstacle environment and impacts on civil and military PSRs.
Ayre OWF	Yes	48.31km from the Caledonia OWF. Potential for cumulative effects from impacts on civil and military PSRs.
Buchan OWF	Yes	55.97km from the Caledonia OWF. Potential for cumulative effects from impacts on civil and military PSRs.
Pentland Floating OWF	Yes	74.44km from the Caledonia OWF. Potential for cumulative effects from impacts on civil and military PSRs.
Salamander OWF	Yes	80.33km from the Caledonia OWF. Potential for cumulative effects from impacts on civil and military PSRs.
Hywind OWF	Yes	83.11km from the Caledonia OWFea. Potential for cumulative effects from impacts on civil and military PSRs.

[ii] Moray West Export Cable was commissioned after the CIA was undertaken, and therefore has been included as part of the longlist.

Development	Potential for Significant Cumulative Effects	Comment
Marram OWF	Yes	84.47km from the Caledonia OWF. Potential for cumulative effects from impacts on civil and military PSRs.
Flora OWF	Yes	91.22km from the Caledonia OWF. Potential for cumulative effects from impacts on civil and military PSRs.
West of Orkney OWF	Yes	92.47km from the Caledonia OWF. Potential for cumulative effects from impacts on civil and military PSRs.
Green Volt OWF	Yes	94.28km from the Caledonia OWF. Potential for cumulative effects from impacts on civil and military PSRs.

11.9.2 Construction

Impact 1: Creation of an Aviation Obstacle Environment

11.9.2.1 Construction of the Proposed Development (Offshore) will involve tall crane vessels and the installation of infrastructure above sea level. Together with the installation of WTGs associated with other projects and other operational OWFs, this may pose a physical obstruction to aircraft utilising the airspace in the vicinity of the various projects, potentially increasing the risk of obstacle collision or requiring aircraft to fly extended routes to avoid obstacles. From a starting point of no infrastructure within the Caledonia OWF, the infrastructure outlined in Table 11-11 will be gradually installed over a sequential construction period with a gap of up to five years between phases.

11.9.2.2 Specifically, permanent or temporary obstacles may impact the following receptors:

- Military low flying activities;
- Offshore helicopter operations;
- SAR helicopters; and
- Wick Airport IFPs.

Military Low Flying Activities

11.9.2.3 As detailed in Table 11-10, potential impacts on military low flying activities in the vicinity of the Caledonia OWF and Caledonia OECC will be mitigated through the development of an LMP in agreement with key aviation stakeholders including the MoD and through the provision of the positions and heights of structures to the CAA, MoD and DGC to enable appropriate marking on aeronautical charts. The movement of floating WTGs from wet storage

locations to the Caledonia OWF will also be notified to enable promulgation to key aviation stakeholders. The LMP will cover the lighting and marking of construction equipment such as tall cranes. Similar embedded mitigations will be in place for other OWFs under construction.

11.9.2.4 The Caledonia OWF and a portion of the Caledonia OECC infringe DA EGD809S. Embedded mitigation in the form of a VMP will facilitate advance notification to the MoD of scheduled WTG and cable installation vessel movements during the construction phase and assist with the management of military training activities conducted within the DA.

11.9.2.5 Operational OWFs already have suitable aviation lighting and are marked on relevant aeronautical charts to make pilots aware of their presence.

11.9.2.6 Embedded mitigation measures with respect to notification, charting, marking and lighting will make all pilots aware of temporary and permanent obstacles in the Caledonia OWF and Caledonia OECC, and similar measures will be in place for other OWF developments. It is assumed that pilots will comply with aviation regulatory requirements. The ultimate responsibility for seeing and avoiding obstacles rests with pilots.

Magnitude of Impact

11.9.2.7 The impact on military low flying activity is predicted to be of regional spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **Low**.

Sensitivity of Receptor

11.9.2.8 Military low flying activity 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

11.9.2.9 Taking the medium sensitivity of military low flying activity and the low magnitude of impact, the cumulative effect of the creation of an aviation obstacle environment during construction is considered to be **Minor and Not Significant in EIA terms**.

Offshore Helicopter Operations

11.9.2.10 As detailed in Table 11-10, potential impacts on offshore helicopter operations in the vicinity of the Caledonia OWF and Caledonia OECC will be mitigated through the development of an LMP in agreement with key aviation stakeholders and through the provision of the positions and heights of structures to the CAA, MoD and DGC to enable appropriate marking on aeronautical charts. The movement of floating WTGs from wet storage locations to the Caledonia OWF will also be notified to enable promulgation to key aviation stakeholders. The LMP will cover the lighting and marking of construction equipment such as tall cranes. Similar embedded mitigations will be in place for other OWFs under construction.

11.9.2.11 Operational OWFs already have suitable aviation lighting and are marked on relevant aeronautical charts to make pilots aware of their presence.

11.9.2.12 The Caledonia OWF is more than 9nm (16.7km) from the nearest offshore helideck and more than 2nm (3.7km) from HMRI X-Ray. The Caledonia OECC is crossed by HMRI X-Ray but cable installation vessels are considered low-profile obstacles that will have no impact on helicopters using the HMRI.

11.9.2.13 Embedded mitigation measures with respect to notification, charting, marking and lighting will make all pilots aware of temporary and permanent obstacles in the Caledonia OWF and Caledonia OECC, and similar measures will be in place for other OWF developments. It is assumed that pilots will comply with aviation regulatory requirements. The ultimate responsibility for seeing and avoiding obstacles rests with pilots.

Magnitude of Impact

11.9.2.14 The impact on offshore helicopter operations is predicted to be of regional spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **Low**.

Sensitivity of Receptor

11.9.2.15 Offshore helicopter operations are 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

11.9.2.16 Taking the medium sensitivity of offshore helicopter operations and the low magnitude of impact, the cumulative effect of the creation of an aviation obstacle environment during construction is considered to be **Minor and Not Significant in EIA terms**.

SAR Helicopters

11.9.2.17 As detailed in Table 11-10, potential impacts on offshore helicopter operations in the vicinity of the Caledonia OWF and Caledonia OECC will be mitigated through the development of an LMP in agreement with key aviation stakeholders and through the provision of the positions and heights of structures to the CAA, MoD and DGC to enable appropriate marking on aeronautical charts. The movement of floating WTGs from the wet storage location to the Caledonia OWF will also be notified to enable promulgation to key aviation stakeholders. The LMP will cover the lighting and marking of construction equipment such as tall cranes. Similar embedded mitigations will be in place for other OWFs under construction. Operational OWFs already have suitable aviation lighting and are marked on relevant aeronautical charts to make pilots aware of their presence.

11.9.2.18 Embedded mitigation measures with respect to notification, charting, marking and lighting will make all pilots aware of temporary and permanent obstacles in the Caledonia OWF and Caledonia OECC, and similar measures will be in

place for other OWF developments. It is assumed that pilots will comply with aviation regulatory requirements. The ultimate responsibility for seeing and avoiding obstacles rests with pilots.

11.9.2.19 Lighting of WTGs will consider SAR requirements and the final WTG layout will be compatible with SAR helicopter operations across the Caledonia OWF and adjacent OWF Caledonia OWF. An ERCoP will be developed and implemented for all phases of the Proposed Development (Offshore).

Magnitude of Impact

11.9.2.20 The impact on SAR helicopters is predicted to be of regional spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **Low**.

Sensitivity of Receptor

11.9.2.21 SAR helicopters are 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

11.9.2.22 Taking the medium sensitivity of SAR helicopters operations and the low magnitude of impact, the cumulative effect of the creation of an aviation obstacle environment during construction is considered to be **Minor and Not Significant in EIA terms**.

Wick Airport IFPs

11.9.2.23 WTGs within the Caledonia OWF could become a physical obstacle to flight operations at Wick Airport. Specifically, WTGs could infringe the protected obstacle clearances associated with Wick Airport's published IFPs. An IFP is a set of instructions used by aircraft navigating at aerodromes by reference to flight instruments. The IFP gives pilots reassurance of properly designated obstacle and terrain protection whilst manoeuvring in poor weather.

11.9.2.24 The proposed Stromar OWF is also within airspace coincidental with Wick Airport's published IFPs and therefore WTGs associated with Stromar OWF could have a cumulative effect on the IFPs. Any WTGs infringing IFP protected surfaces will require IFPs to be redesigned with higher minimum safe altitudes which could result in an impact on Wick Airport operations due to the potential reduction in aircraft being able to land at the airport in poor weather.

11.9.2.25 The Applicant is continuing to engage with HIAL and Wick Airport to agree suitable mitigation.

Magnitude of Impact

11.9.2.26 The impact of the Caledonia OWF and Stromar OWF on Wick Airport IFPs is predicted to be of regional spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **Medium**.

Sensitivity of Receptor

11.9.2.27 Wick Airport IFPs are deemed to be of high vulnerability, low recoverability and high value. The sensitivity of the receptor is therefore considered to be **High**.

Significance of Effect

11.9.2.28 Taking the high sensitivity of Wick Airport IFPs and the medium magnitude of impact, the cumulative effect of the creation of an aviation obstacle environment during construction is considered to be **Moderate and Significant in EIA terms**.

11.9.3 Operation

Impact 2: Creation of an Aviation Obstacle Environment

11.9.3.1 During the operation phase the infrastructure outlined in Table 11-11 will be present in the Caledonia OWF. This infrastructure, together with the installation of WTGs associated with other projects and other operational OWFs, may pose a physical obstruction to aircraft utilising the airspace in the vicinity of the various projects, potentially increasing the risk of obstacle collision or requiring aircraft to fly extended routes to avoid obstacles.

11.9.3.2 Specifically, permanent obstacles may impact the following receptors:

- Military low flying activities;
- Offshore helicopter operations;
- SAR helicopters; and
- Wick Airport IFPs.

Military Low Flying Activities

11.9.3.3 As detailed in Table 11-10, potential impacts on military low flying activities in the vicinity of the Caledonia OWF will be mitigated through the development of an LMP in agreement with key aviation stakeholders including the MoD and through the provision of the positions and heights of structures to the CAA, MoD and DGC to enable appropriate marking on aeronautical charts. The movement of floating WTGs between the Caledonia OWF and wet storage locations will also be notified to enable promulgation to key aviation stakeholders. Similar embedded mitigations will be in place for other OWFs under construction, Operational OWFs already have suitable aviation lighting and are marked on relevant aeronautical charts to make pilots aware of their presence.

11.9.3.4 Embedded mitigation measures with respect to notification, charting, marking and lighting will make all pilots aware of permanent obstacles in the Caledonia OWF, and similar measures will be in place for other OWF developments. It is assumed that pilots will comply with aviation regulatory requirements. The ultimate responsibility for seeing and avoiding obstacles rests with pilots.

Magnitude of Impact

11.9.3.5 The impact on military low flying activity is predicted to be of regional spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **Low**.

Sensitivity of Receptor

11.9.3.6 Military low flying activity 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

11.9.3.7 Taking the medium sensitivity of military low flying activity and the low magnitude of impact, the cumulative effect of the creation of an aviation obstacle environment during operation is considered to be **Minor and Not Significant in EIA terms**.

Offshore Helicopter Operations

11.9.3.8 As detailed in Table 11-10, potential impacts on offshore helicopter operations in the vicinity of the Caledonia OWF will be mitigated through the development of an LMP in agreement with key aviation stakeholders and through the provision of the positions and heights of structures to the CAA, MoD and DGC to enable appropriate marking on aeronautical charts. The movement of floating WTGs between the Caledonia OWF and wet storage locations will also be notified to enable promulgation to key aviation stakeholders. Similar embedded mitigations will be in place for other OWFs under construction. Operational OWFs already have suitable aviation lighting and are marked on relevant aeronautical charts to make pilots aware of their presence.

11.9.3.9 The Caledonia OWF is more than 9nm (16.7km) from the nearest offshore helideck and more than 2nm (3.7km) from HMRI X-Ray.

11.9.3.10 Embedded mitigation measures with respect to notification, charting, marking and lighting will make all pilots aware of permanent obstacles in the Caledonia OWF, and similar measures will be in place for other OWF developments. It is assumed that pilots will comply with aviation regulatory requirements. The ultimate responsibility for seeing and avoiding obstacles rests with pilots.

Magnitude of Impact

11.9.3.11 The impact on offshore helicopter operations is predicted to be of regional spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **Low**.

Sensitivity of Receptor

11.9.3.12 Offshore helicopter operations are 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

11.9.3.13 Taking the medium sensitivity of offshore helicopter operations and the low magnitude of impact, the cumulative effect of the creation of an aviation obstacle environment during operation is considered to be **Minor and Not Significant in EIA terms**.

SAR Helicopters

11.9.3.14 As detailed in Table 11-10, potential impacts on offshore helicopter operations in the vicinity of the Caledonia OWF will be mitigated through the development of an LMP in agreement with key aviation stakeholders and through the provision of the positions and heights of structures to the CAA, MoD and DGC to enable appropriate marking on aeronautical charts. The movement of floating WTGs between the Caledonia OWF and wet storage locations will also be notified to enable promulgation to key aviation stakeholders. Similar embedded mitigations will be in place for other OWFs under construction. Operational OWFs already have suitable aviation lighting and are marked on relevant aeronautical charts to make pilots aware of their presence.

11.9.3.15 Embedded mitigation measures with respect to notification, charting, marking and lighting will make all pilots aware of permanent obstacles in the Caledonia OWF, and similar measures will be in place for other OWF developments. It is assumed that pilots will comply with aviation regulatory requirements. The ultimate responsibility for seeing and avoiding obstacles rests with pilots.

11.9.3.16 Lighting of WTGs will consider SAR requirements and the final WTG layout will be compatible with SAR helicopter operations across the Caledonia OWF and adjacent OWF array areas. An ERCoP will be developed and implemented for all phases of the Proposed Development (Offshore).

Magnitude of Impact

11.9.3.17 The impact on SAR helicopters is predicted to be of regional spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **Low**.

Sensitivity of Receptor

11.9.3.18 SAR helicopters are 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

11.9.3.19 Taking the medium sensitivity of SAR helicopters operations and the low magnitude of impact, the cumulative effect of the creation of an aviation obstacle environment during operation is considered to be **Minor and Not Significant in EIA terms**.

Wick Airport IFPs

11.9.3.20 WTGs within the Caledonia OWF could become a physical obstacle to flight operations at Wick Airport. Specifically, WTGs could infringe the protected obstacle clearance surfaces associated with Wick Airport's published IFPs. An IFP is a set of instructions used by aircraft navigating at aerodromes by reference to flight instruments. The IFP gives pilots reassurance of properly designated obstacle and terrain protection whilst manoeuvring in poor weather.

11.9.3.21 The proposed Stromar OWF is also within airspace coincidental with Wick Airport's published IFPs and therefore WTGs associated with Stromar OWF could have a cumulative effect on the IFPs. Any WTGs infringing IFP protected surfaces will require IFPs to be redesigned with higher minimum safe altitudes which could result in an impact on Wick Airport operations due to the potential reduction in aircraft being able to land at the airport in poor weather.

11.9.3.22 The Applicant is continuing to engage with HIAL and Wick Airport to agree suitable mitigation.

Magnitude of Impact

11.9.3.23 The impact of Caledonia OWF and Stromar OWF on Wick Airport IFPs is predicted to be of regional spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **Medium**.

Sensitivity of Receptor

11.9.3.24 Wick Airport IFPs are deemed to be of high vulnerability, low recoverability and high value. The sensitivity of the receptor is therefore considered to be **High**.

Significance of Effect

11.9.3.25 Taking the high sensitivity of Wick Airport IFPs and the medium magnitude of impact, the cumulative effect of the creation of an aviation obstacle environment during operation is considered to be **Moderate and Significant in EIA terms**.

Impact 3: Impact on Military and Civil PSR Systems

11.9.3.26 The Caledonia OWF will be within the operational range of radar systems serving both civil and military agencies. Radar detection of rotating WTG blades from multiple OWF developments may result in a significant increase in clutter being generated over a larger area on radar displays. This may therefore have an adverse impact on the provision of a safe and effective en-route surveillance service by controllers at NATS Prestwick Centre and other ATS providers such as Aberdeen Airport and RAF Lossiemouth and may compromise the ability of the MoD to undertake its Air Defence role.

11.9.3.27 Specifically, WTGs in the Caledonia OWF and at other OWFs may impact the following PSR receptors:

- NATS Allanshill;
- RAF Lossiemouth; and
- RRH Buchan.

NATS Allanshill

11.9.3.28 Radar modelling detailed in Volume 7B, Appendix 11-1: Airspace Analysis and Radar Modelling shows that all WTGs within the Caledonia OWF will be theoretically detectable by the NATS PSR at Allanshill. Allanshill PSR is used by NATS en-route ATC and by approach controllers at Aberdeen Airport providing ATC to offshore helicopters.

11.9.3.29 In its Scoping response, NATS has confirmed that the Proposed Development (Offshore) is likely to cause false primary plots to be generated for Allanshill PSR, and reduce the PSR's probability of detection for real aircraft. NATS further state that the amount of predicted clutter would lead to an unacceptable impact on en-route traffic operations at Prestwick Centre, Aberdeen Airport ATC operations and military ATC operations.

11.9.3.30 Multiple proposed OWFs that are detected by Allanshill PSR are likely to have similar impacts. Proposed OWFs that may be detected by Allanshill PSR include Stromar, Broadshore, Sinclair, Scaraben, Ayre, Buchan, Salamander, Marram, Flora and Green Volt.

Magnitude of Impact

11.9.3.31 The impact on Allanshill PSR is predicted to be of regional spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **High**.

Sensitivity of Receptor

11.9.3.32 Allanshill PSR is deemed to be of high vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore considered to be **High**.

Significance of Effect

11.9.3.33 Taking the high sensitivity of Allanshill PSR and the high magnitude of impact, the cumulative effect of the impact on PSR during operation is considered to be **Major and Significant in EIA terms**.

RAF Lossiemouth

11.9.3.34 RAF Lossiemouth currently has two PSR facilities: a Watchman PSR, and a newly installed Thales STAR NG PSR which is intended to replace the legacy Watchman facility. Radar modelling detailed in Volume 7B, Appendix 11-1: Airspace Analysis and Radar Modelling shows that WTGs within most of the Caledonia OWF will be theoretically detectable by the Watchman PSR, and all WTGs within the Caledonia OWF will be theoretically detectable by the STAR NG PSR.

Magnitude of Impact

11.9.3.35 The impact on the Lossiemouth PSRs is predicted to be of regional spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptors directly. The magnitude is therefore considered to be **High**.

Sensitivity of Receptor

11.9.3.36 WTGs that are detected by PSRs will generate radar clutter. The proposed Broadshore and Stromar OWFs may be detected by the Lossiemouth STAR NG PSR and are likely to have similar impacts. The Lossiemouth PSRs are deemed to be of high vulnerability, high recoverability and high value. The sensitivity of the receptors is therefore considered to be **High**.

Significance of Effect

11.9.3.37 Taking the high sensitivity of the Lossiemouth PSRs and the high magnitude of impact, the cumulative effect of the impact on PSR during operation is considered to be **Major and Significant in EIA terms**.

RRH Buchan

11.9.3.38 Radar modelling detailed in Volume 7B, Appendix 11-1: Airspace Analysis and Radar Modelling shows that WTGs within most of the Caledonia OWF will be theoretically detectable by the MoD AD radar at RRH Buchan.

Magnitude of Impact

11.9.3.39 The impact on Buchan PSR is predicted to be of regional spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be **High**.

Sensitivity of Receptor

11.9.3.40 WTGs that are detected by PSRs will generate radar clutter. Multiple proposed OWFs that are detected by Buchan PSR are likely to have similar impacts. Proposed OWFs that may be detected by Buchan PSR include Stromar, Broadshore, Sinclair, Scaraben, Buchan, Salamander, Marram, Flora and Green Volt. Buchan PSR is deemed to be of high vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore considered to be high.

Significance of Effect

11.9.3.41 Taking the high sensitivity of Buchan PSR and the high magnitude of impact, the cumulative effect of the impact on PSR during operation is considered to be **Major and Significant in EIA terms**.

11.9.4 Decommissioning

11.9.4.1 There are no impacts upon military and civil aviation receptors anticipated from the decommissioning of the Proposed Development (Offshore). Please see Section 11.6.2 for more details.

11.10 In-combination Effects

11.10.1.1 In-combination impacts may occur through the inter-relationship with another EIAR topic that may lead to different or greater environmental effects than in isolation. There is also the potential for in-combination impacts resulting from onshore and offshore works.

11.10.1.2 The potential in-combination effects for military and civil aviation receptors resulting from effects between offshore Proposed Development (Offshore) works are described below.

11.10.1.3 There is an inter-relationship between this topic and Shipping and Navigation (also see Volume 2, Chapter 9: Shipping and Navigation). The LMP will be developed to meet the requirements of Military and Civil Aviation and Shipping and Navigation stakeholders and will be consulted upon at the same time.

11.11 Transboundary Effects

11.11.1.1 The potential impacts of WTGs on military and civil aviation receptors are localised and the Caledonia OWF is completely within UK airspace, with the nearest Norwegian operated airspace 235km to the north-east. Furthermore, the Caledonia OWF is significantly beyond the expected radar coverage from the nearest non-UK airport.

11.11.1.2 Due to the localised nature of any potential impacts, no transboundary effects are predicted.

11.12 Mitigation Measures and Monitoring

11.12.1 Construction

Impact 1: Creation of an Aviation Obstacle Environment

Military Low Flying Activities

11.12.1.1 No additional military and civil aviation mitigation is considered necessary (beyond the mitigation outlined in Table 11-10).

Offshore Helicopter Operations

11.12.1.2 No additional military and civil aviation mitigation is considered necessary (beyond the mitigation outlined in Table 11-10).

SAR Helicopters

11.12.1.3 No additional military and civil aviation mitigation is considered necessary (beyond the mitigation outlined in Table 11-10).

Wick Airport IFPs

11.12.1.4 Consultation has been initiated, and is ongoing, with HIAL and Wick Airport to make them aware of potential obstacle infringements of IFPs and operational effects, and progress made in identifying mitigation solutions. Before construction commences, final details of WTG locations and blade tip heights will be provided to the stakeholders to enable suitable revisions to IFPs to be made. In order to revise IFPs, an airspace change proposal must be prepared and submitted for CAA approval. The formal airspace change process that has to be followed is explained in CAP 1616: The Process for Changing the Notified Airspace Design (CAA, 2023a[7]).

Cumulative Effects

11.12.1.5 No additional military and civil aviation mitigation is considered necessary (beyond the mitigation outlined in Table 11-10).

11.12.2 Operation

Impact 2: Creation of an Aviation Obstacle Environment

Military Low Flying Activities

11.12.2.1 No additional military and civil aviation mitigation is considered necessary (beyond the mitigation outlined in Table 11-10).

Offshore Helicopter Operations

11.12.2.2 No additional military and civil aviation mitigation is considered necessary (beyond the mitigation outlined in Table 11-10).

SAR Helicopters

11.12.2.3 No additional military and civil aviation mitigation is considered necessary (beyond the mitigation outlined in Table 11-10).

Wick Airport IFPs

11.12.2.4 Consultation has been initiated, and is ongoing, with HIAL and Wick Airport to make them aware of potential obstacle infringements of IFPs and operational effects, and progress made in identifying mitigation solutions. Before construction commences, final details of WTG locations and blade tip heights will be provided to the stakeholders to enable suitable revisions to IFPs to be made.

Cumulative Effects

11.12.2.5 No additional military and civil aviation mitigation is considered necessary (beyond the mitigation outlined in Table 11-10).

Impact 3: Impact on Military and Civil PSR Systems

NATS Allanshill

11.12.2.6 Secondary mitigation in respect of Allanshill PSR may involve:

- Blanking (not displaying radar data) over the Caledonia OWF (either at the radar head or in the radar display system) so as to remove the PSR data containing the WTG returns from the radar data presented to controllers; or
- In addition to blanking, introducing a TMZ over the Caledonia OWF which requires all aircraft that wish to transit the TMZ airspace to be equipped with SSR transponders to enable controllers to track aircraft through what will otherwise be a 'black hole' in primary surveillance cover. Implementation of a TMZ would require the submission of an airspace change proposal to the CAA. The formal airspace change process that has to be followed is explained in CAP 1616: The Process for Changing the Notified Airspace Design (CAA, 2023a[7]). Recent changes made to the process by the CAA have been designed to facilitate airspace changes in a more proportionate and efficient way that better reflects the nature of the required change. CAP 1616H: Guidance on Airspace Change Process for Level 3 and Pre-Scaled Airspace Change Proposals (CAA, 2023c[10]) includes specific guidance for the establishment of TMZs for OWFs and is a pre-scaled airspace change process that excludes some of the more onerous requirements for more significant airspace changes.

11.12.2.7 Consultation with NATS will continue with the aim of delivering a suitable mitigation solution for Allanshill PSR prior to the operation phase of the Proposed Development (Offshore). A TMZ may take the form of an extension to the existing Moray Firth TMZ which lies to the west of the Caledonia OWF and was previously agreed for Moray East, Moray West and Beatrice OWFs.

RAF Lossiemouth

11.12.2.8 The Lossiemouth Watchman PSR is expected to be removed pending the successful commissioning into service of the Thales STAR NG PSR. The STAR NG system is known to have enhanced capability for filtering out clutter from WTGs and can potentially be configured to mitigate the impact of WTGs should this be required to safeguard ATC operations.

11.12.2.9 Alternatively, radar blanking and a TMZ over the Caledonia OWF may also be a suitable mitigation. The MoD has previously accepted a TMZ as an interim mitigation solution for the Beatrice, Moray East and Moray West OWFs (Moray Firth TMZ) pending the development of an enduring radar solution.

11.12.2.10 Consultation with the MoD will continue with the aim of delivering a suitable mitigation solution for the Lossiemouth PSRs prior to the operation phase of the Proposed Development (Offshore).

RRH Buchan

11.12.2.11 In August 2019 an Air Defence and Offshore Wind (AD&OW) Windfarm Mitigation Task Force was formed as a collaborative initiative between the MoD, what was then the Department for Business, Energy and Industrial Strategy (BEIS) and is now the Department for Energy Security and Net Zero (DESNZ), the Offshore Wind Industry Council (OWIC) and The Crown Estate. The Scottish Government and Crown Estate Scotland joined the Task Force in March 2022. The aim of the Task Force is to enable the co-existence of UK Air Defence and offshore wind by identifying potential mitigations and supporting processes, allowing offshore wind to contribute towards meeting the UK Government's Net Zero target without degrading the nation's AD surveillance capability.

11.12.2.12 In parallel with the work of the Task Force the MoD, through programme NJORD, is currently working on deploying mitigations as quickly as possible for the current Air Defence system using existing technologies, to enable OWFs to be built that will become operational from 2025 onwards.

11.12.2.13 Consultation with the MoD will continue with the aim of delivering a suitable mitigation solution for Buchan AD PSR prior to the operation phase of the Proposed Development.

Cumulative Effects

11.12.2.14 It is assumed that for existing OWF developments within RLoS of NATS and MoD radars any required radar mitigation solutions have been implemented. Future operational offshore wind developments, including the Proposed Development (Offshore), will also require any necessary radar mitigation solutions to be in place before becoming operational.

11.13 Residual Effects

11.13.1 Construction Effects

Impact 1: Creation of an Aviation Obstacle Environment

Wick Airport IFPs

11.13.1.1 The Applicant is taking active steps to ensure mitigation is in place within the required timeframes.

11.13.1.2 With suitable revisions to Wick Airport IFPs in place the magnitude of the impact is considered to be low.

11.13.1.3 With the implementation of revised IFPs mitigation, and taking the high sensitivity of Wick Airport IFPs and the low magnitude of impact, the residual effect of the creation of an aviation obstacle environment during construction is considered to be **Minor and Not Significant in EIA terms**.

11.13.2 Operation Effects

Impact 2: Creation of an Aviation Obstacle Environment

Wick Airport IFPs

11.13.2.1 The Applicant is taking active steps to ensure mitigation is in place within the required timeframes.

11.13.2.2 With suitable revisions to Wick Airport IFPs in place the magnitude of the impact is considered to be low.

11.13.2.3 With the implementation of revised IFPs mitigation and taking the high sensitivity of Wick Airport IFPs and the low magnitude of impact, the residual effect of the creation of an aviation obstacle environment during operation is considered to be **Minor and Not Significant in EIA terms**.

Impact 3: Impact on Military and Civil PSR Systems

11.13.2.4 The Applicant is actively engaging with relevant stakeholders to secure mitigation for impacts on civil and military PSR systems to make sure they are in place prior to operation.

NATS Allanshill

11.13.2.5 With a suitable radar mitigation solution in place the magnitude of impact is considered to be negligible.

11.13.2.6 With the implementation of suitable radar mitigation and taking the high sensitivity of Allanshill PSR and the negligible magnitude of impact, the residual effect of the impact on PSR during operation is considered to be **Negligible and Not Significant in EIA terms**.

RAF Lossiemouth

11.13.2.7 With a suitable radar mitigation solution in place the magnitude of impact is considered to be negligible.

11.13.2.8 With the implementation of suitable radar mitigation and taking the high sensitivity of the Lossiemouth PSRs and the negligible magnitude of impact, the residual effect of the impact on PSR during operation is considered to be **Negligible and Not Significant in EIA terms**.

RRH Buchan

11.13.2.9 With a suitable radar mitigation solution in place the magnitude of impact is considered to be negligible.

11.13.2.10 With the implementation of suitable radar mitigation and taking the high sensitivity of Buchan PSR and the negligible magnitude of impact, the residual effect of the impact on PSR during operation is considered to be **Negligible and Not Significant in EIA terms**.

Cumulative Effects

11.13.2.11 With any necessary radar mitigation solutions in place the magnitude of impact is considered to be negligible.

11.13.2.12 With the implementation of any necessary radar mitigation and taking the high sensitivity of PSRs and the negligible magnitude of impact, the residual cumulative effect of the impact on PSR during operation is considered to be **Negligible and Not Significant in EIA terms**.

11.14 Summary of Effects

11.14.1.1 Table 11-13 presents a summary of the significant effects assessed within this EIAR, any mitigation required, and the residual effects are provided.

Table 11-13: Summary of Effects for Military and Civil Aviation.

Potential Impact	Magnitude	Sensitivity of Receptor	Significance	Mitigation Measure	Residual Effect
Construction					
Impact 1: Creation of an aviation obstacle environment - Military low flying activities	Low	Medium	Minor (not significant)	None beyond embedded	Minor (not significant)
Impact 1: Creation of an aviation obstacle environment - Offshore helicopter operations	Low	Medium	Minor (not significant)	None beyond embedded	Minor (not significant)
Impact 1: Creation of an aviation obstacle environment - SAR helicopters	Low	Medium	Minor (not significant)	None beyond embedded	Minor (not significant)
Impact 1: Creation of an aviation obstacle environment - Wick Airport IFPs	Medium	High	Moderate (significant)	Consultation with HIAL and Wick Airport to agree suitable revisions to IFPs.	Minor (not significant)
Operation and Maintenance					
Impact 2: Creation of an aviation obstacle environment - Military low flying activities	Low	Medium	Minor (not significant)	None beyond embedded	Minor (not significant)

Potential Impact	Magnitude	Sensitivity of Receptor	Significance	Mitigation Measure	Residual Effect
Impact 2: Creation of an aviation obstacle environment - Offshore helicopter operations	Low	Medium	Minor (not significant)	None beyond embedded	Minor (not significant)
Impact 2: Creation of an aviation obstacle environment - SAR helicopters	Low	Medium	Minor (not significant)	None beyond embedded	Minor (not significant)
Impact 2: Creation of an aviation obstacle environment - Wick Airport IFPs	Medium	High	Moderate (significant)	Consultation with HIAL and Wick Airport to agree suitable revisions to IFPs.	Minor (not significant)
Impact 3: Impact on civil and military PSR systems - NATS Allanshill	High	High	Major (significant)	Consultation with NATS to agree a suitable radar mitigation solution. A potential solution would be to blank the radar and establish a TMZ over the Caledonia OWF .	Negligible (not significant)
Impact 3: Impact on civil and military PSR systems - RAF Lossiemouth	High	High	Major (significant)	Consultation with MoD to agree a suitable radar mitigation solution. Potential solutions include utilising the	Negligible (not significant)

Potential Impact	Magnitude	Sensitivity of Receptor	Significance	Mitigation Measure	Residual Effect
				STAR NG PSR's wind farm filtering capability, or combining radar blanking with a TMZ.	
Impact 3: Impact on civil and military PSR systems - RRH Buchan	High	High	Major (significant)	Consultation with MoD to agree a suitable radar mitigation solution. The MoD is working on deploying mitigations using existing technologies (programme NJORD) and the Windfarm Mitigation Task Force is identifying longer term mitigation solutions.	Negligible (not significant)
Decommissioning					
There are no impacts upon military and civil aviation receptors anticipated from the decommissioning of the Proposed Development (Offshore). Please see Section 11.6.3.2 for more details.					

11.15 References

[1] Civil Aviation Authority (CAA) (2022) 'Air Navigation Order (ANO) 2016/765'. Available at: https://www.caa.co.uk/uk-regulations/aviation-safety/civil-aviation-act-1982-the-ano-2016-the-rules-of-the-air-2015-and-the-dg-regulations-2002/the-civil-aviation-air-navigation-order-2016/ (Accessed 30/09/2024)

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