# CHAPTER 18: MILITARY AND CIVIL AVIATION

**Technical Summary**

There is the potential for Project Alpha and Project Bravo to impact upon both military and civilian radar, with a clear safety risk as a result. It is highly unlikely that construction of the Seagreen Project will be permitted unless agreed technical measures are put in place to ensure that there are no residual impacts. Seagreen is committed to working with the relevant stakeholders to establish appropriate mitigation and on the basis that mitigation can be agreed the impacts will be acceptable and not significant.

There are no impacts upon military and civil aviation resulting from the development of the Transmission Asset Project. There is a potential cumulative impact to military aviation as a result of the Seagreen Project in combination with other wind farms, however on the basis that mitigation can be agreed, the impacts will be acceptable and not significant.

## INTRODUCTION

18.1. This chapter of the ES assesses the impacts of the Seagreen Project on military and civil aviation and provides a statement of the significance of the potential impacts of the construction, operation and decommissioning stages of the development.

18.2. The scope of the chapter was defined based on the Scoping Opinion (Marine Scotland, 2011 which can be found in Appendix B1 of ES Volume III) and consultee responses contained within it, and, where issues were not discussed in the scoping responses, on expert judgement.

18.3. This chapter of the ES has been produced by Wind Power Aviation Consultants Ltd (WPAC Ltd). Figures referred to in this chapter can be found in ES Volume II: Figures. Appendices referred to can be found in ES Volume III: Appendices.

## BACKGROUND

18.4. Radar coverage of the UK is multi-layered and over-lapping. Most civil, regional and international airports have a radar control facility referred to as Terminal Control and, while every airport varies, terminal controllers usually handle traffic in a 30-to-50 nautical mile (NM) (56km to 93km) radius from the airport. Terminal controllers are responsible for providing all Air Traffic Control (ATC) services within their airspace and, as aircraft move in and out of the terminal airspace, they are handed off to the next appropriate control facility (a control tower if landing or an en-route control facility if departing).

18.5. En-route air traffic controllers issue clearances and instructions for aircraft transiting between airports. In the UK, National Air Traffic Services En Route Limited (Ltd) (NERL) maintains a network of long range (200NM) en-route radars around the country for this purpose.

18.6. Operating alongside that civil network, major military airfields operate their own radars for the provision of Terminal Control usually out to a range of 40NM (75km). This is quite distinct from the UK Air Defence Ground Environment (UKADGE), a network of radars around the country maintained by the Ministry of Defence (MOD), to provide a policing and security service for UK airspace.

## AIR TRAFFIC CONTROL (ATC)

18.7. ATC Services[1] are generally applied to the maximum extent practicable subject only to workload, communications or equipment capability and are applied in accordance with the status of the airspace within which the participating aircraft are flying. There are two categories of service provision, namely, Radar Services and Non-Radar Services.

18.8. The application of Radar Services is determined by the category of airspace (International Civil Aviation Organisation (ICAO) Categories A, C, D, E, F and G) through which the aircraft is flying. In addition, depending on the conduct of the flight (Visual Flight Rules (VFR) or Instrument Flight Rules (IFR); the pilot may request a Deconfliction Service, Traffic Service, Procedural Service or Basic Service. Air traffic controllers have different responsibilities to aircraft operating under the different sets of rules with a Deconfliction Service being the most demanding on both pilot and controller and with the Basic Service requiring least input, or control. While providing an expeditious service, the principal objective of ATC is to minimise the Air Traffic Service (ATS) risk of an aircraft accident as far as reasonably practicable.

## CONSULTATION

18.9. In accordance with the guidance set out in the Civil Aviation Authority's (CAA) Civil Aviation Publication (CAP) 764, Policy and Guidelines on Wind Turbines Version 4, aviation consultation was undertaken for the entire Zone. Some elements of the consultation guidance are specific to onshore developments and are not relevant to Project Alpha and Project Bravo which, at their closest point, are over 27km and 38km offshore respectively.

18.10. The consultation required is in accordance with the relevant sections of CAP 764 and is shown in Table 18.1. The associated safeguarding requirement and obstacle considerations that should also be taken into account during the assessment of impact upon radar and aviation is presented in Table 18.2. A summary of the issues raised by consultees in relation to aviation and radar during the consultation process, along with the locations of where these issues have been addressed in this chapter, are presented in Table 18.3.

18.11. Consultation for Project Bravo and the Transmission Asset Project has been undertaken separately but is identical to that presented in Table 18.3. Consultation has been initiated with the MOD, but, as a result of their policy of not responding to pre-planning applications, has yet to progress.

1 Defined in Civil Aviation Publication (CAP) 774 - UK Flight Information Services

**Table 18.1 Consultation requirements taken from CAP 764 and best practice**

| Type of Aviation Facility | Consultation Distance | Relevance to the Seagreen Project | Relevant Chapter Paragraph(s) |
|---|---|---|---|
| CAA Licensed Aerodrome with a Surveillance Radar | 30km | None within consultation distance | n/ a |
| CAA Non radar Licensed Aerodrome | 17km | None within consultation distance | n/ a |
| CAA Licensed Aerodrome where Wind Turbine Generators (WTGs) would lie within airspace coincidental with any published Instrument Flight Procedure | As required | None within consultation criteria | n/ a |
| Unlicensed Aerodromes with runway length greater than 800 metres (m) | 4km | None within consultation criteria | n/ a |
| Other aviation activity | 3km although the British Gliding Association request consultation to 10km | None within consultation criteria | n/ a |
| MOD consultation which covers ATC radars, | Unlimited | Essential - addressed at Table 18.3 | 18.38 – 18.49<br>18.80 – 18.84 |
| NERL Radar | Unlimited | Consultation essential | 18.50 – 18.55<br>18.85 – 18.87 |
| MOD consultation which covers Air Defence Radar, Met Office Radar, Low Flying, Danger Areas | Unlimited | Essential - addressed at Table 18.3 | 18.56 – 18.69<br>18.88 – 18.94 |
| Helicopter Main Routes (HMR) | 2NM either side of route | Consultation required with CAA, no HMRs within study area | 18.70 – 18.72<br>18.95 – 18.96 |
| Offshore Helicopter Platforms | 9NM around existing platforms | Consultation required with CAA, no Offshore Helicopter Platforms within study area | 18.71 – 18.95 |

**Table 18.2 Safeguarding requirement and obstacle considerations**[2]

| | Communication Navigation Surveillance (CNS) Facilities | Obstacle Considerations |
|---|---|---|
| Aerodrome | Safeguard Primary Surveillance Radar (PSR) and Secondary Surveillance Radar (SSR).<br>Safeguard Approach Aids<br>Safeguard Navigational Beacons<br>Safeguard Very High Frequency (VHF)<br>(Consultation required with Aerodrome Manager/ Licensee) | Obstacle Limitation Surfaces<br>Impact on procedures<br>Need for lighting to aid night conspicuity<br>Anemometer masts<br>(Consultation required with Aerodrome Manager/ Licensee) |
| Enroute | Safeguard PSR and SSR<br>Safeguard Navigational Beacons<br>Safeguard VHF<br>(Consultation required with NERL) | >300 feet (ft) / 91m chart and entry to Aeronautical Information Publication (AIP).<br>> 150m Lighting in accordance with Article 219 of the Air Navigation Order (ANO) (2009)<br>Marking of WTG in accordance with ICAO guidance<br>Potential for additional lighting where WTGs may be considered a significant hazard to air users<br>Anemometer masts<br>Emergency service units |
| Off-shore | Safeguard PSR and SSR<br>Safeguard Navigational Beacons<br>Safeguard VHF<br>(Consultation required with NERL) | Off-shore lighting in accordance with Article 220 of the ANO (2009) Directorate of Airspace Policy (DAP) guidance on off-shore lighting<br>Helicopter Main Routes<br>Operations around oil and gas platforms<br>Anemometer masts |

2 CAP 764, Policy and Guidelines on Wind Turbines Version 4

**Table 18.3 Summary of consultation to date and issues**

| Date | Consultee | Issue | Relevant Chapter Paragraph(s) |
|---|---|---|---|
| 17/ 08/ 2010 | MOD (in relation to entire Firth of Forth Offshore Area) | ATC Radar Royal Air Force (RAF) Leuchars<br>Air Defence Radar<br>Low Flying | 18.56 – 18.69<br>18.88 – 18.94 |
| 17/ 09/ 2010 | BAA Airports | Assessment of impact on Aberdeen and Edinburgh Airport operations – no issues as confirmed in Scoping Opinion (Marine Scotland, 2010) | n/ a |
| 23/ 11/ 2010 | Meeting with NATS | Present the Firth of Forth Zone and the development approach and timescales | n/ a |
| 04/ 06/ 2010 | CAA Directorate of Airspace Policy | No observations except to contact NERL and lighting advice | 18.31 – 18.34<br>18.50 – 18.55<br>18.76 – 18.76 |
| 09/ 10/ 2010 | Highlands and Islands Airports Ltd | Possible impact on RAF Leuchars radar in relation to Dundee Airport (covered by MOD response) | 18.56 – 18.69<br>18.88 – 18.94 |
| 27/ 08/ 2010 | NERL | Response to scoping report – generic response offering further consultation | 18.31 – 18.34<br>18.50 – 18.55 |
| 05/ 04/ 2012 | MOD Seagreen Project Consultation Proformas issued | No response to date from MOD | n/ a |
| 05/ 04/ 2012 | NATS Seagreen Project Consultation Proformas issued | No response to date from NATS | n/ a |
| 11/ 06/ 2012 | Meeting with NATS | Discussion on Primary Surveillance Radar. NATS confirmed that they will only let a condition if there is an existing solution and that they will only set conditions that are achievable. | 18.31 – 18.34<br>18.50 – 18.55 |

## POTENTIAL IMPACTS: PRIMARY SURVEILLANCE RADAR (PSR)

18.12. CAP 764 states *"that in view of the complex issues surrounding wind farm development, it is necessary to accurately assess whether a proposed development is likely to affect the operational performance of an aeronautical radar station."*[3] Offshore Wind Farm (OWF) developments can have the following effects on PSR:

a. False Radar Returns (clutter) - In basic terms, PSR transmits a pulse of energy that is reflected back to the radar receiver by an object that is within line of sight (LOS) of the radar. The amount of reflected energy picked up by the receiver will depend upon factors such as the size, shape and orientation of the obstacle, as well as receiver sensitivity and weather. The amount of energy that an object reflects back is related

3 CAP 764 Appendix 2

to the object's Radar Cross Section (RCS). Generally, the larger a WTG is, the larger its RCS will be, which will result in more energy being reflected and an increased chance of it creating false returns (i.e. non aircraft), known as 'clutter'.

b. Track Seduction - The false plots caused by the WTG can also generate the effect known as 'track seduction' on radar screens. Track seduction occurs when the false plots generated by the WTG, are selected as the updated plots and causes the effect of steering the true track away from the actual path of the aircraft. If on subsequent scans further 'alternative' plots are available to sustain the deviated path then the track is said to have been seduced. The criticality of such occurrence has to be taken into consideration depending on the density of traffic levels within the coverage and the false targets caused by the wind farm. Furthermore, it may also be possible that the WTGs increase the number of false targets by being in the path of radar signals and reflecting the radar signals such that the plot indicated to the controller by the received signal would not represent the true aircraft position.

c. Loss of Receiver Sensitivity - WTGs can cause conditions leading to the loss of sensitivity in detection to such an extent that the aircraft returns are completely lost.

d. Plot Extractor/ Filter Memory Overload - On radars fitted with a plot extractor, every target picked up by the radar is processed and filtered. Due to the constraints of memory size, there is a limit to the number of plots and tracks a system can handle. Therefore, if a particular radar has a high number of false plots, its memory capacity may be reached and no new tracks will be processed.

e. Receiver Saturation - Radar receivers require a large dynamic range in order to detect the reflected energy from both large and small aircraft. However, if an obstacle such as a WTG reflects a significant amount of power, the receiver can be pushed beyond its dynamic range and can become saturated.

f. Obscuration - In simple terms, obscuration is a vertical cylinder of interference above the WTG location which might prevent aircraft from being detected or which might distort an aircraft's radar return.

## DATA COLLECTION AND SURVEY

18.13. A comprehensive data review has been carried out to ensure that the extent of the aviation infrastructure in the area of the development was accurately captured and was assured. That data review included a detailed examination of published aviation information using the sources described below. Full references are provided in the 'References' section this ES chapter and include:

- CAP 764 CAA Policy and Guidelines on Wind Turbines Version 4 January 2012;
- CAP 168 Licensing of Aerodromes April 2011;
- CAP 774 UK Flight Information Services;
- CAP 738 Safeguarding of Aerodromes;
- CAP 493 Manual of Air Traffic Services Part 1;
- Military Aviation Authority Air Traffic Management (3000 series) Regulatory Instructions;
- Military Aviation Authority Low Flying Manual;
- UK Military Aeronautical Information Publication (UK MIL AIP)[4];

4 http:/ / www.nats-uk.ead-it.com/ public/ index.php%3Foption=com_content&task=blogcategory&id=165&Itemid=3.html

- UK Aeronautical Information Publications (AIP) (updated every 28 days);
- CAA 1:250,000 and 1:500,000 Visual Flight Rules (VFR) Charts;
- Joint MOD/ CAA Wind Energy and Aviation Interests Interim Guidelines; and
- MOD Defence Airspace and Air Traffic Management Policy Statement Reference 20090907-ATMPC dated 01 October 2009.

18.14. The initial radar impact assessment has employed WPAC Ltd's specialist radar propagation prediction software, Rview 2.1, in the assessment. Rview 2.1 models the behaviour of a radar beam in the atmosphere by applying median annual atmospheric refraction at the midpoint between the radar and the WTG location.

18.15. The projections are undertaken twice using two separate digital terrain models, SRTM (Shuttle Radar Topography Mission) and Ordnance Survey (OS) Landform Panorama. SRTM uses a smoothed terrain model with data points every 3 arc seconds (approximately 90 metres (m))[5] and OS Landform Panorama uses a post spacing of 50 m and has a Root Mean Square (RMS) error of 3 m.

18.16. By using two separate and independently generated digital terrain models, consistent results are assured and inconsistencies identified. A complete range of atmospheric conditions can be modelled in those circumstances where it is deemed critical.

18.17. Table 18.4 provides a summary of key data.

**Table 18.4 . Summary of key data**

| Title | Source | Year | Reference |
|---|---|---|---|
| MOD Radar Positions Database | MOD Defence Estates | 2010 | Unreferenced |
| WPAC Ltd Radar Database | WPAC Ltd | 2012 | Version 31 |

## Summary of key data and surveys

### *Project Alpha and Project Bravo*

18.18. Since December 2010 developers have been required to undertake their own pre-planning assessment of potential aviation related issues which consider the factors presented in Table 18.2 as a minimum.

18.19. This chapter presents an assessment of the potential aviation issues relating to the development of the Seagreen Project elements, Project Alpha, Project Bravo and the Transmission Asset Project on aviation assets. The assessment utilises technical knowledge to assess if the projects will be acceptable in terms of safeguarding aviation or unacceptable. Where impacts are found to be unacceptable, mitigation will be applied to find a management or design solution to ensure the impact is acceptable.

18.20. Due to the fact that aviation and radar related impacts are not subject to the immediate geographical constraints of a tightly geographically defined study area and may even, in some cases, extend as far as 200NM from an OWF development; expert judgement has been used to consider the extent of the impact and/ or to quantify the extent of that impact.

5 A minute of arc is a unit of angular measurement equal to one sixtieth (1⁄60) of one degree. In turn, a second of arc is one sixtieth (1⁄60) of one minute of arc.

18.21. The assessment presented in this chapter therefore does not follow the assessment guidance as presented in Chapter 6: EIA Process of this ES, which assigns a significance to impacts and is more appropriate to other technical chapters. With respect to this chapter, an acceptable impact is deemed to be not significant in terms of the EIA Regulations whilst unacceptable impacts are deemed to be significant in terms of the EIA Regulations.

18.22. This chapter focuses on industry wide accepted practice for the assessment of proposed OWF developments on adjacent aviation infrastructure as listed at CAP 764, Version 4 and as listed at Table 18.1.

18.23. The receptors which Project Alpha and Project Bravo could cause radar and aviation effects upon are set in accordance with the criteria laid down in Table 18.1. The map extracts at Figure 18.1 and Figure 18.2 show Project Alpha and Project Bravo site areas overlaid on an aviation chart, which illustrates the potential receptors.

18.24. As detailed in Chapter 5: Project Description of this ES, provision has been made for repowering the OWFs after an estimated 25 years of operation. If realised, it is not anticipated that repowering will involve any change in the WTG blade tip height for Project Alpha and Project Bravo and as a result repowering is not considered further in this chapter.

### *Transmission Asset Project*

18.25. There are neither radar nor aviation impacts associated with the Transmission Asset Project and as a result no assessment of the Transmission Asset Project has been undertaken as part of this chapter.

## EXISTING ENVIRONMENT

18.26. The existing aviation environment for Project Alpha and Project Bravo sites can be characterised as being an offshore environment outside UK Territorial Airspace, but within the Scottish Flight Information Region (FIR)[6] As such, the UK is responsible for the provision of Flight Information Services to aircraft operating within the FIR. The positions of Projects Alpha and Bravo in relation to the Angus coastline and the existing aviation infrastructure are shown in Figures 18.1 and 18.2.

18.27. Both Project Alpha and Project Bravo sites have been examined taking into account the nature of aviation operations in and around the FIR and the availability and coverage of aviation infrastructure, such as radar and radio navigation aids, used by both civil and military aviation stakeholders.

## ASSESSMENT OF IMPACTS – SCENARIOS

18.28. The Applicants are seeking to consent up to 75 WTGs in Project Alpha and 75 WTG in Project Bravo. On this basis the only two parameters within the Rochdale Envelopes for Project Alpha and Project Bravo that could result in an impact on radar and aviation are:

- the WTG blade tip heights above LAT; and
- the geographical extent of the Project Alpha and Project Bravo sites.

6 UK airspace is divided into two Flight Information Regions (FIR), the London FIR with control exercised from Swanwick Air Traffic Control Centre and the Scottish FIR, controlled from Prestwick.

18.29. The range in WTG blade tip heights are the same in both Project Alpha and Project Bravo. Minimum WTG blade tip height is 148mLAT to a maximum of 210mLAT.

18.30. The sites areas for the projects are fixed. The total area within the Project Alpha site boundary is 197km$^2$. The total area within the Project Bravo site boundary is 194km$^2$.

## IMPACT ASSESSMENT – CONSTRUCTION PHASE

### Project Alpha

18.31. During the construction phase the impact on radar and thus aviation operations is minimal. The impact of the WTGs themselves on radars will not become a factor until the operational stage when the WTG is commissioned and the blades begin to rotate; stationary WTGs and stanchions will not cause radar interference.

18.32. The physical presence of cranes and WTGs on low flying activity can be mitigated by ensuring that information on construction activity is passed to the NATS Aeronautical Information Service (AIS) in time to ensure that it can be promulgated to all affected airspace users. This is a mandated and recognised method of disseminating information concerning the presence of temporary hazards to aviation and will highlight the potential impact of the construction phase. It will detail the vertical heights of obstacles, initially those of a temporary nature such as cranes used to erect the WTGs and, progressively, the permanent wind farm. This communication with the NATS AIS will be undertaken as a matter of due course in line with best practice guidelines for safeguarding aviation infrastructure. This will ensure there is no unacceptable impact on aviation. This impact of the Project Alpha construction phase is therefore **not significant** in terms of the EIA Regulations.

### Project Bravo

18.33. The assessment of the construction phase impacts of the development of Project Bravo will mirror that for Project Alpha as stated above. Therefore the impact is acceptable and is not significant in terms of the EIA Regulations.

#### *Mitigation*

**Mitigation**

No additional mitigation is proposed to the communication with NATS AIS stated above.

The publication of the construction and site details through the mandated and accepted NATS AIS procedures will be undertaken as a matter of course to ensure complete dissemination of all necessary information to all air users.

#### *Residual Impact*

18.34. The residual impact is acceptable and **not significant** in terms of the EIA Regulations.

## IMPACT ASSESSMENT – OPERATION PHASE

### Project Alpha

18.35. Radar coverage calculations have been undertaken by WPAC Ltd to determine the baseline situation. These calculations demonstrate that low level radar coverage is possible at the Project Alpha site using a variety of existing radars, both civil and military, which are utilised for a number of different purposes, the assessment against which is presented as follows.

18.36. It is assumed that the radar operators will undertake their own modelling to verify those results and, consequently, it is not intended to present any explanatory data in this document.

## *Terminal Radar*

### Civil

18.37. The Project Alpha site is not visible to any civil terminal aerodrome radar, there is no coverage in this FIR and none is required. Therefore, with respect to civil terminal radar, Project Alpha is acceptable and does not present a **significant** impact in terms of the EIA Regulations. The radar Line of Sight illustration for Edinburgh is at Figure 18.3.

### Military

18.38. The Project Alpha site is located 62km to the north east of RAF Leuchars and in an area where there is currently significant military activity associated with a number of Danger Areas that lie to the east. Military aircraft currently transit through Project Alpha site whilst in receipt of a radar service from RAF Leuchars and aircraft are separated from each other and from other traffic transiting up and down the coast.

18.39. The ATC radar at RAF Leuchars has line of sight at low level across the entire Project Alpha site; radar projections by WPAC Ltd, illustrated in Figure 18.4 and confirmed by the initial generic MOD response (Marine Scotland, 2010), indicate that all of the WTGs may be visible to the radar at RAF Leuchars. A large area of 'clutter', or unwanted radar returns on the ATC displays at the airfield will be visible and an area of 'obscuration' above Project Alpha is possible.

18.40. Where WTGs create radar 'clutter', controllers cannot always distinguish WTG returns from low, slow aircraft. Under a Deconfliction Service, an agreement between the pilots and the air traffic controller regarding the minimum separation that the pilot requires to have from other aircraft, the controller will have to assume that the clutter could be concealing an unknown aircraft and will be required to attempt to avoid the clutter (or unknown aircraft) by at least 5NM. This will restrict the controllers' ability to provide a Deconfliction Service to any aircraft within 5NM of the WTGs.

18.41. The Project Alpha site is well beyond the standard radar recovery patterns for RAF Leuchars. However, the unit currently provides an air traffic control service to aircraft entering and departing the military Danger Areas to the east and the existence of a large area of clutter on the radar would significantly degrade their ability to provide such a service. In addition, the unit also provides a Lower Airspace Radar Service (LARS)[7] to any aircraft transiting through the Project Alpha site within 40NM when clear of controlled airspace and below 10,000 feet (ft.).

18.42. The operational impact of any clutter will vary and will depend upon the amount of traffic operating in the FIR requiring a radar service. Furthermore, the situation could well change over the next year as it has been announced that RAF Leuchars will close in 2013. If that closure is affected, and it is subject to on-going debate, it could result in a significant reduction in military flying in the area and the impact of the resultant clutter will therefore become of a lower magnitude than currently envisaged. Conversely, the RAF might decide that they need to retain radar coverage for the aircraft that will have to transit to the Danger Areas from their bases now further afield; however, until such time

7 As defined UK Aeronautical Information Publication ENR 1.6

as the MOD decides what to do about the radar and the nature of operations across their aircraft fleet, it is difficult to:

- accurately quantify the scale of the impact or the MOD response to Project Alpha; and
- to determine what the final operational impact will be; it is not clear how the gap in coverage will be filled, or even if it will be filled.

18.43. What is clear is that the installation and operation of WTGs at Project Alpha will have an impact on radar coverage and ATC operations when compared to the current baseline where there is currently unencumbered radar coverage. It is essential, therefore, to maintain a continuous and constructive dialogue with the MOD as the development progresses.

18.44. If it is assumed that the radar is to be retained and the MOD conclude that, even with the closure of RAF Leuchars, an operational requirement exists to provide an unlimited air traffic control radar service above and within 5NM of Project Alpha using the RAF Leuchars radar,, the operation of Project Alpha would present an impact on aviation outwith acceptable limits which would be in terms of the EIA Regulations.

18.45. In the event RAF Leuchars radar is not maintained after 2013, associated with the closure of the base, the operation of Project Alpha would not occur during the operation of RAF Leuchars and thus the impact would be acceptable and **not significant** in terms of the EIA Regulations.

## Mitigation

**Mitigation**

It is anticipated the RAF Leuchars base will close in 2013. It is not yet known if this closure will result in the removal of the radar in this location. If this radar is removed the impact of the operational Project Alpha will be acceptable and therefore no mitigation will be required.

In the event the radar is maintained after 2013, a technical radar solution will be implemented.

18.46. The most likely mitigation will be a form of 'in-fill radar'. At this time it is not necessary or desirable to recommend or select a specific system; however, the choices may include:

- the Aveillant Radar System or systems;
- the C-speed Lightwave;
- the Terma Scanter 4002 radar; or
- the QinetiQ Verifeye.

18.47. The selected system will have to be capable of providing radar surveillance data to a level agreed with the MOD and be integrated into the radar display system in accordance with the MOD performance criteria (MOD 20090907-ATMPC, October 2009). An alternative mitigation approach may be to consider installing a conventional ATC radar on shore in a location where it is capable of providing the agreed level of coverage but where it cannot detect the WTGs due to terrain screening. Whilst providing a possibly lower risk solution due to being located on land, there will be significant challenges in terms of identifying a suitable location and ensuring that the radar can be integrated to meet any MOD requirement.

## Residual impact

18.48. If RAF Leuchars closes in 2013 and the radar is not retained there will no impact on the radar as it will no longer be in existence. The impact will therefore be acceptable and **not significant** in terms of the EIA Regulations.

18.49. In the event the radar at RAF Leuchars is retained, a technical solution will be found through liaison between Seagreen and the relevant aviation consultees. This is likely to utilise one of the mitigation options identified above which will ensure the operation of the OWF is acceptable in terms of the operation of this radar and thus is **not significant** in terms of the EIA Regulations.

### *En-Route Radar*

18.50. As the UK Air Navigation Service Provider (ANSP), NATS En-Route (NERL) operates a network of long range en route radar and radio navigation facilities. Initial examination of radar coverage conducted by WPAC Ltd has identified that the radar located at Perwinnes, near Aberdeen, will have line of sight of all or part of the Project Alpha site as illustrated in Figure 18.5.

18.51. The radar data is utilised to provide radar services both from NATS Aberdeen and from the Scottish Air Traffic Control Centre at Prestwick. A Conditional Route[8], designated PAPA 18[9], passes over the Project Alpha site routing from Aberdeen to Newcastle but this is only activated for a limited number of hours in early morning and at weekends in order to avoid the potential for conflict or interference with military activity. The ATC service on this route is provided by NERL from the Scottish Area Control Centre at Prestwick. Whilst low level coverage in this FIR is not required, control of aircraft on this Conditional Route is vital to NERL. Project Alpha could therefore effect NERL operations resulting in an impact outwith acceptable limits which is significant in terms of the EIA Regulations.

18.52. Early consultation was initiated with NERL in July 2010 and a meeting was held in November 2010 to discuss the impact of the entire Zone. NERL will need to assess the impact specific to the Project Alpha site but have indicated that mitigation is possible. NERL will need to be requested to carry out a formal technical and operational impact assessment either following further refinement of the Rochdale Envelope once the WTG heights have been fixed or by using the parameters laid down in the Rochdale Envelope presented at the time of submission for consent.

## Mitigation

**Mitigation**

Seagreen will seek a formal technical and operational impact assessment with NERL.

Following that, consideration of the available technical mitigation solutions and their acceptability to both Seagreen and NERL for use within the existing Multi-Radar Tracking System, will be undertaken to identify an acceptable mitigation solution for Project Alpha.

8 As defined in Eurocontrol Flexible Airspace Structures:
A Conditional Route is a non-permanent Air Traffic Services (ATS) route or portion thereof which can be planned and used under specified conditions. According to their foreseen availability, flight planning possibilities and the expected level of activity of the possible associated Temporary Segregated Areas (TSA), Conditional Route (CDRs) can be divided into the following categories:
- Category One : Permanently Plannable CDR,
- Category Two : Non-Permanently Plannable CDR,
- Category Three : Not Plannable CDR.

9 Air routes are designated by a letter, pronounced phonetically, followed by a number.

18.53. Mitigation is possible as NERL use a multi-radar tracking system (MRT) at both the London and Scottish Area Control Centres. Over-lapping radar coverage from different radars might allow the controllers to change from the data derived from one radar, which can detect the WTGs and which experiences interference, to data from a radar which is not affected. Alternatively, given the operational requirement outlined above, it may be possible to 'blank' the clutter[10] on the Perwinnes radar whilst maintaining sufficient radar coverage within the ATC system.

18.54. One other option that might be available is that Raytheon, the manufacturer of the radar, are working to provide a wind farm mitigation system to the radar receiver enabling WTG impacts on radar to be minimised. There is no funding identified at present to install the system in all of the NERL radars but the issue is currently under discussion. Initial results indicate that the 'Raytheon Solution' results in a loss of vertical coverage above the WTGs of 0.7 degrees, which equates to approximately 4,000ft over the Project Alpha site. It will be for NERL to judge the operational impact of the loss of vertical coverage, but it is likely to be acceptable given that the base level of the Condition Route PAPA 18 is Flight Level 115 (approximately 15,500ft).

## Residual Impact

18.55. Following the NERL technical and operational impact assessment and should a mitigation solution be required, a technical radar solution will be identified which is both achievable and acceptable to Seagreen and NERL. The application of this technical solution will result in an acceptable impact which is therefore **not significant** in terms of the EIA Regulations.

### *MOD Air Defence Radar*

18.56. In addition to ATC service provision associated with RAF Leuchars, the MOD maintain air defence radar coverage in the Scottish FIR using a number of radars networked into the UK system, known as UKADGE, to produce a Recognized Air Picture (RAP). There are two MOD radars that provide coverage in this FIR, at Buchan, near Peterhead in Aberdeenshire, and at Brizlee Wood, near Alnwick in Northumberland. Initial radar projections from those radars, illustrated in Figures 18.6 and 18.7, indicate that both may be able to see down to low level within the Project Alpha site under some meteorological conditions.

18.57. There have been numerous studies into the potential effects of WTGs on radar performance; the most recent authoritative MOD studies being in 2005[11] [12]which would appear to have indicated that the two main issues of concern are a combination of clutter and obscuration and/ or a reduction in the probability of detection (PD) of a target over or close a WTG[13] . In both regulatory and operational terms, if it is demonstrated by the MOD that these effects will be created by Project Alpha and affects the overlapping radar coverage, this may present an impact which is outwith acceptable limits and is therefore **significant** in terms of the EIA Regulations.

10 Radar blanking is a generic term which can have several technical definitions but which involves removing the clutter by any one of a series of options such as applying filters or suppressing the radar returns within a defined area. Each option has an operational penalty of some degree.

11 Trial Quixotic Zephyr (The Effects of Wind Turbines on ATC Radars) AWC/ WAD/ 72/ 665/ trials 10 May 05
The Effects Of Wind Turbine Farms On Air Defence Radars AWC/ WAD/ 72/ 652/ Trials 6 JAN 05
Further Evidence Of The Effects Of Wind Turbine Farms On Ad Radar 12 Aug 05.

12 The effects of wind turbine farms on Air Defence Radars – AWC/ WAD/ 72/ 652/ Trials and Further Evidence Report dated 12 August 2005) (Ref 18.11 and 18.12). It should be noted however, that these reports, which are still referenced by the MOD, refer to a previous type of radar not in use in this area, however, some of the basic principles may still apply.

13 A significant reduction in PD may lead to either an inability to provide a full radar service above or near the proposed development, or a loss of situational awareness essential to the surveillance requirement.

18.58. The impact of WTGs on air defence radars has been the subject of considerable study over the past 10 years and recent developments in radar technology demonstrate that the impact may now be capable of being technically mitigated.

18.59. The current radar at Buchan is a Lockheed Martin Type 92 radar which does have some capability in mitigating the impact of WTGs on its performance.

18.60. There are a number of mitigation possibilities; the simplest is based upon the fact that the air defence radars are networked together into a system to provide a RAP. The MOD will have determined what their surveillance requirements are over the Project Alpha site. It will be essential to discuss this with the MOD as the coverage requirements they consider to be essential will determine what type of mitigation will be possible.

18.61. Initial radar coverage calculations undertaken by WPAC Ltd show that there is low level coverage available over the FIR from the radars at Brizlee Wood and Buchan; it may be possible for the MOD to agree that the overlapping coverage is sufficient to fulfil their operational requirement in the same manner as has been agreed at other OWFs, provided they are able to determine that both radars will not be affected simultaneously. The data from those calculations has been determined using classified information regarding the UK Air Defence radar network and cannot be included in this document

## Mitigation

**Mitigation**

Communication with the MOD is required to determine whether mitigation is necessary.

Should the MOD determine that overlapping coverage from within their current radar systems is not sufficient to fulfil the operational requirement, it will be necessary to consider technical mitigation.

18.62. It may be possible to adapt one of the mitigations already discussed for RAF Leuchars in paragraph 18.46, however, there are significant costs and technical risks in taking another, additional radar feed into the air defence system. The existing infrastructure has a limited number of portals; it is not known, and would be subject to security restrictions, if all of the existing capacity has been utilised or if there is any scope to increase the number of radar feeds within the system. In any event, any proposal to increase that utilisation, or to increase capacity within the system, is likely to be difficult and expensive. This issue has already been studied and costed for on a number of other wind farms, so far without success. However, it may be technically feasible within the timescale of Project Alpha development.

18.63. A more likely scenario will be to take advantage of advances in radar processing demonstrated by the Lockheed Martin TPS-77 radar, which is now the MOD Air Defence radar of choice; it has already been trialled by the MOD and accepted by them as a suitable mitigation. It has already been purchased to overcome air defence radar issues at a number of OWFs in the UK including for The Wash area, with two more systems funded by wind farm developers planned for Brizlee Wood and Staxton Wold.

18.64. The TPS-77 would be capable of mitigating the impact of the WTGs sufficient for the MOD to maintain their surveillance requirements in the vicinity of Project Alpha. It may also become necessary to upgrade the Type 92 radar at Buchan to TPS-77 standard, it is understood that this is technically possible and may be financially feasible. This is a key issue for further discussion with the MOD in determining the mitigation required for Project Alpha.

## Residual Impact

18.65. If required, a technical solution will be developed through liaison with the MOD in relation to the operation of Project Alpha with MOD radar. This mitigation will give regard to the options outlined above and give consideration to the existing radar capabilities.

18.66. Application of this technical solution as mitigation would reduce the operational impact of Project Alpha to within acceptable levels resulting in an impact which is **not significant** in terms of the EIA Regulations.

### *MOD Low Flying and Danger Area Operations*

18.67. The initial MOD response to the entire Zone included comment concerning the impact of any OWF development within the Zone on low flying operations and danger area activity. Since the initial MOD response was received, Danger Area EGD609, St Andrews has been dis-established; it is therefore anticipated that the MOD will no longer have an objection in relation to low flying. As such the impact will be within acceptable limits and **not significant** in terms of the EIA Regulations.

18.68. Project Alpha does not impinge on any Danger Areas and should not, therefore, be an issue of concern. The assessment of the impact of the entire Seagreen Project on Danger Areas is considered in Chapter 20: Other Marine Users and Activities and it therefore not considered further in this chapter.

## Mitigation

**Mitigation**

The Project Alpha site is well clear of the existing Danger Areas and the low flying routes to and within these areas.

When developed the Project Alpha site will be clearly defined on all aviation charts in accordance with MOD and CAA requirements.

## Residual Impact

18.69. The potential impact of Project Alpha has been assessed as acceptable and therefore **not significant** in terms of the EIA Regulations. However, continued dialogue with the MOD will be undertaken to ensure all parties are informed.

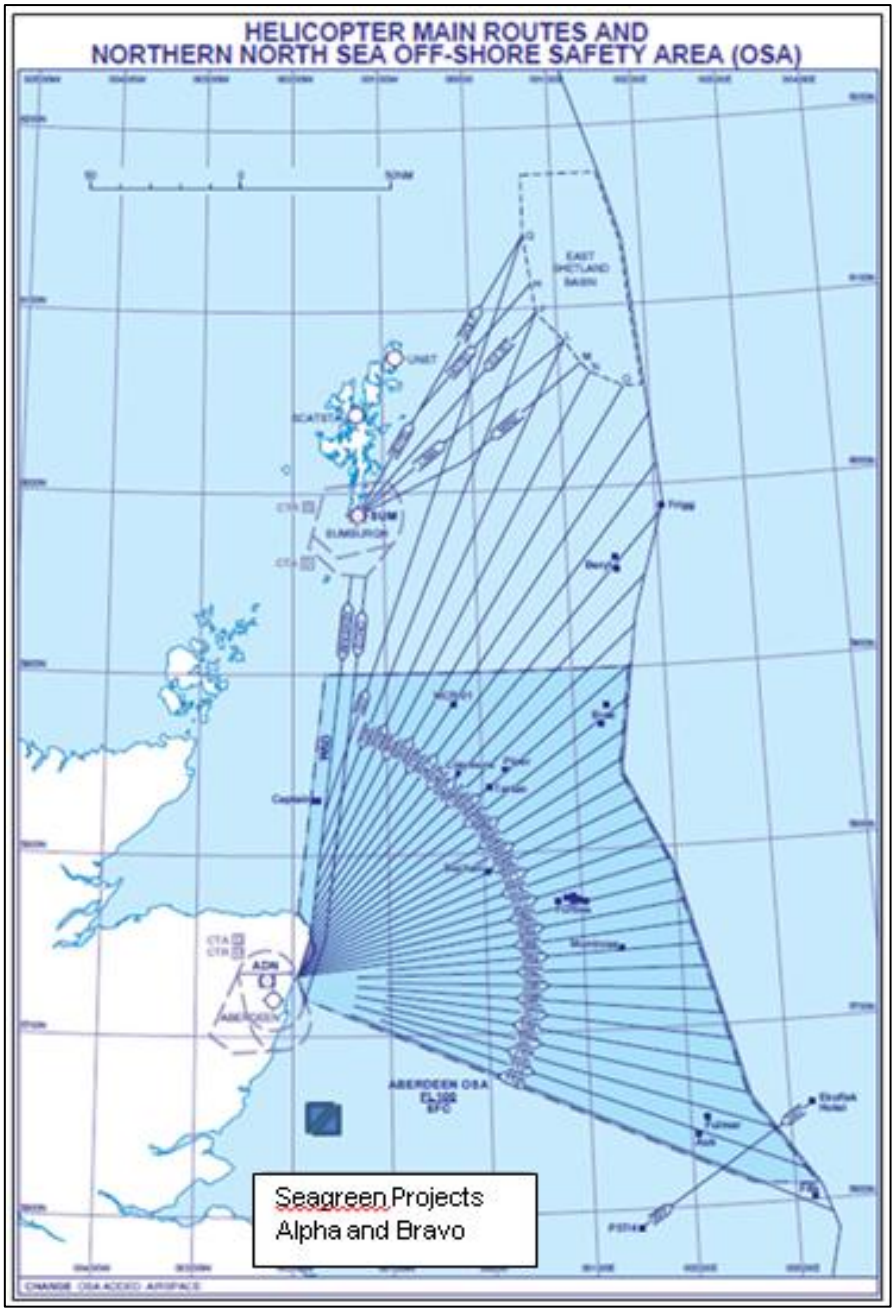
### *Helicopter Main Routes (HMRs)*

18.70. Helicopter Main Routes (HMRs) as defined in the UK AIP, have been established over the North Sea in support of the North Sea Oil industry. Whilst such routes have no lateral dimensions (only route centre-lines are charted) they provide a network of offshore routes utilised by civilian helicopters. There should be no obstacles within 2NM either side of HMRs; that distance is based upon operational experience and the accuracy of navigation systems.

18.71. An examination of the CAA aviation charts (as shown in Plate 18.1) shows that there are no HMRs either crossing or adjacent to Project Alpha, nor are there any Offshore Helicopter Platforms which have to remain free of obstacles, in the vicinity of Project Alpha; consultation with respect to Offshore Helicopter Platforms will be in accordance with CAP 764[14]. The impact on HMR from Project Alpha is therefore acceptable and not significant in terms of the EIA Regulations.

14 CAP 764 CAA Policy and Guidelines on Wind Turbines (January 2012) Chapter 3, Section 6.

**Plate 18.1 Helicopter main route structure**




Open Source; UK Aeronautical Information Publication

## Mitigation

**Mitigation**

Project Alpha is over 40km clear of the existing HMR structure.

When developed the Project Alpha site will be clearly defined on all aviation charts in accordance with MOD and CAA requirements.

## Residual Impact

18.72. Project Alpha has been assessed as acceptable and not significant in terms of the EIA Regulations.

### *Civil Aviation Authority (CAA)*

18.73. The CAA were consulted in relation to OWF development within the Zone; they stated that there were no consultation requirements in accordance with the guidance in CAP 764 but provided advice on lighting requirements as laid down in Article 220 of the UK Air Navigation Order 2009, which requires that each WTG is fitted with medium intensity (minimum 2,000 candela) steady red lighting on the top of the nacelle such that the light or lights are visible from all directions and that such lighting is displayed at night.

18.74. With the permission of the CAA only those WTGs on the perimeter of a wind farm will be fitted with such lighting.

18.75. The CAA response provided additional detail in relation to lighting requirements, however, lighting requirements for OWFs are currently under review in order to harmonise the lighting requirements for both aviation and maritime regulators and ensure that aviation lighting does not lead to confusion by maritime operators. This issue will need to be tracked as the legislation and guidance evolves during the planning process. This potential impact is acceptable and therefore not significant in terms of the EIA Regulations.

#### Mitigation

**Mitigation**

As states above Project Alpha will operate according to Article 220 of the UK Air Navigation Order 2009 and will be lit in accordance with CAA and MOD requirements.

No further mitigation is required.

#### Residual Impact

18.76. This potential impact is acceptable and therefore **not significant** in terms of the EIA Regulations.

## Project Bravo

18.77. As with Project Alpha, radar coverage calculations have been undertaken by WPAC Ltd to determine the baseline situation. These calculations demonstrate that low level radar coverage is possible at the Project Bravo site, to the same degree as it was for the Project Alpha site, using a variety of existing radars, both civil and military, which are utilised for a number of different purposes, the assessment against which is presented as follows.

18.78. It is assumed that the radar operators will undertake their own modelling to verify those results and, consequently, it is not intended to present any explanatory data in this document.

### *Terminal Radar*

#### Civil

18.79. The Project Bravo site is not visible to any civil terminal aerodrome radars, there is no coverage in this FIR and none is required; the radar line of sight illustration for Edinburgh is at Figure 18.9. Therefore, with respect to civil terminal radar the operation of Project Bravo is acceptable and **not significant** in terms of the EIA Regulations.

## Military

18.80. The Project Bravo site is located further east than the Project Alpha site however the assessment presented in paragraph 18.38 – 18.45 for Project Alpha is directly relevant for Project Bravo. The ATC radar at RAF Leuchars has line of sight at low level across the entire Project Bravo site; radar projections by WPAC Ltd, illustrated in Figure 18.9 and confirmed by the initial generic MOD response indicate that all of the WTGs may be visible to the radar at RAF Leuchars.

18.81. If it is assumed that the radar is to be retained and the MOD conclude that, even with the closure of RAF Leuchars, that they have an operational requirement to provide an unlimited air traffic control radar service using the Leuchars radar. In this situation the operation of Project Bravo would present an impact on aviation outwith acceptable limits which would be **significant** in terms of the EIA Regulations.

18.82. In the event RAF Leuchars radar is not maintained after 2013, associated with the closure of the base, the operation of Project Bravo would not occur during the operation of RAF Leuchars and thus the impact would be acceptable and **not significant** in terms of the EIA Regulations.

### *Mitigation*

**Mitigation**

It is anticipated the RAF Leuchars base will close in 2013. It is not yet known if this closure will result in the removal of the radar in this location. If this radar is removed the impact of the operational Project Bravo will be acceptable and therefore no mitigation will be required.

In the event the radar is maintained after 2013, a technical radar solution will be implemented. The technical solutions possible for Project Bravo have been outlined in Project Alpha and are presented in paragraph 18.46 above in relation to the mitigation for the operation of Project Alpha.

### *Residual Impact*

18.83. If RAF Leuchars closes in 2013 and the radar is not retained there will no impact on the radar as it will no longer be in existence. The impact will therefore be acceptable and **not significant** in terms of the EIA Regulations.

18.84. In the event the radar is retained, a technical solution will be found through liaison between Seagreen and the relevant aviation consultees. This is likely to utilise one of the mitigation options identified above which will ensure the operation of Project Bravo is acceptable in terms of the operation of this radar and thus is **not significant** in terms of the EIA Regulations.

### *En Route Radar*

18.85. Initial examination of radar coverage conducted by WPAC Ltd has identified that the radar located at Perwinnes, near Aberdeen, will have line of sight of all or part of the Project Bravo site as illustrated in Figure 18.10.

18.86. As with Project Alpha, Project Bravo could therefore effect NERL operations resulting in an impact outwith acceptable limits which is **significant** in terms of the EIA Regulations.

## Mitigation

**Mitigation**

Seagreen will seek a formal technical and operational impact assessment with NERL.

Following that, consideration of the available technical mitigation solutions and their acceptability to both Seagreen and NERL for use within the existing Multi-Radar Tracking System, will be undertaken to identify an acceptable mitigation solution for Project Bravo.

Potential technical mitigation solutions for Project Bravo are as discussed in relation to Project Alpha in paragraph 18.53 – 18.75 of this chapter.

## Residual Impact

18.87. Following the NERL technical and operational impact assessment and should a mitigation solution be required, a technical radar solution will be identified which is both achievable and acceptable to Seagreen and NERL. The application of this technical solution will result in an acceptable impact which is therefore **not significant** in terms of the EIA Regulations.

### *MOD Air Defence Radar*

18.88. Initial radar projections from the two MOD radars that provide coverage in this FIR, at Buchan, near Peterhead in Aberdeenshire, and at Brizlee Wood, near Alnwick in Northumberland, are illustrated in Figures 18.11 and 18.12. The projections indicate that, as with Project Alpha, both radar may be able to see down to low level within the Project Bravo site under some meteorological conditions.

18.89. There have been numerous studies into the potential effects of WTGs on radar performance; the most recent authoritative MOD studies being in 2005[15] would appear to have indicated that the two main issues of concern are a combination of clutter and obscuration and/ or a reduction in the probability of detection (PD) of a target over or close a WTG[16]. In both regulatory and operational terms, if it is demonstrated by the MOD that these effects will be created by Project Bravo and affects the overlapping radar coverage, this may present an impact which is outwith acceptable limits and is therefore **significant** in terms of the EIA Regulations.

## Mitigation

**Mitigation**

As with Project Alpha, if the operation of Project Bravo is found to be outwith acceptable limits on MOD radar then a technical mitigation solution will need to be identified, agreed and implemented.

Potential solutions relating to MOD radar are as those identified in paragraph 18.46 of this chapter.

15 The effects of wind turbine farms on Air Defence Radars – AWC/ WAD/ 72/ 652/ Trials and Further Evidence Report dated 12 August 2005) (Ref 18.11 and 18.12). It should be noted however, that these reports, which are still referenced by the MOD, refer to a previous type of radar not in use in this area, however, some of the basic principles may still apply.

16 A significant reduction in PD may lead to either an inability to provide a full radar service above or near the proposed development, or a loss of situational awareness essential to the surveillance requirement.

## Residual Impact

18.90. A technical solution will be developed through liaison with the MOD in relation to the operation of Project Bravo with MOD radar. This mitigation will give regard to the options outlined in paragraph 18.47 of this chapter and will give consideration to the existing radar capabilities.

18.91. Application of this technical solution as mitigation would reduce the operational impact of Project Bravo to within acceptable levels resulting in an impact which is **not significant** in terms of the EIA Regulations.

### *MOD Low Flying and Danger Area Operations*

18.92. The initial MOD response to the entire Zone included comment concerning the impact of any OWF development within the Zone on low flying operations and danger area activity. Since the initial MOD response was received, Danger Area EGD609, St Andrews has been dis-established; it is therefore anticipated that the MOD will no longer have an objection in relation to low flying. As such the impact will be within acceptable limits and **not significant** in terms of the EIA Regulations.

18.93. Project Bravo no longer impinges on Danger Area EGD609 and should not, therefore, be an issue of concern. The assessment of the impact of the entire Seagreen Project on Danger Areas is considered in Chapter 20: Other Marine Users and Activities and it therefore not considered further in this chapter.

## Mitigation

**Mitigation**

Project Bravo no longer impinges on Danger Area EGD609 which has been dis-established.

When developed the Project Bravo site will be clearly defined on all aviation charts in accordance with MOD and CAA requirements.

## Residual Impact

18.94. The potential impact of Project Bravo has been assessed as acceptable and therefore **not significant** in terms of the EIA Regulations. However, continued dialogue with the MOD will be undertaken to ensure all parties are informed.

### *Helicopter Main Routes (HMRs)*

18.95. An examination of the CAA aviation charts (as shown in Figure 18.1) shows that there are no HMRs either crossing or adjacent to Project Bravo, nor are there any obstacle free zones associated with Offshore Helicopter Platforms. The impact on HMR from Project Bravo is therefore acceptable and **not significant** in terms of the EIA Regulations.

## Mitigation

**Mitigation**

Project Bravo is over 40km clear of the existing HMR structure.

When developed the Project Bravo site will be clearly defined on all aviation charts in accordance with MOD and CAA requirements.

### Residual Impact

18.96. Project Bravo has been assessed as acceptable and **not significant** in terms of the EIA Regulations.

#### *CAA*

18.97. The CAA were consulted in relation to OWF development within the Zone; they stated that there were no consultation requirements in accordance with the guidance in CAP 764 but provided advice on lighting requirements as laid down in Article 220 of the UK Air Navigation Order 2009.

18.98. The CAA response provided additional detail in relation to lighting requirements, however, lighting requirements for OWFs are currently under review in order to harmonise the lighting requirements for both aviation and maritime regulators and ensure that aviation lighting does not lead to confusion by maritime operators. This issue will need to be tracked as the legislation and guidance evolves during the planning process. This potential impact is acceptable and therefore **not significant** in terms of the EIA Regulations.

### Mitigation

| **Mitigation** |
| --- |
| Project Bravo will operate according to Article 220 of the UK Air Navigation Order 2009 and will be lit in accordance with CAA and MOD requirements. |
| No further mitigation is required |

### Residual Impact

18.99. This potential impact is acceptable and therefore **not significant** in terms of the EIA Regulations.

## IMPACT ASSESSMENT – DECOMMISSIONING PHASE

### Project Alpha

18.100. As stated in paragraph 18.31 of this chapter, impacts on aviation radar will only occur when the WTGs are moving, thus during decommissioning when the blades are no longer rotating and the WTGs are removed, the impacts reduce accordingly to the point where there is no impact.

18.101. The control of impacts during decommissioning is the same as that presented for the construction phase in paragraphs 18.31 – 18.34 of this chapter.

18.102. Decommissioning will not result in any impacts which are outwith acceptable working limits and as such the impact is not significant in terms of the EIA Regulation

### Project Bravo

18.103. The impact of the decommissioning phase of Project Bravo will be identical to that of Project Alpha; therefore the assessment for Project Alpha of an acceptable impact which is **not significant** in terms of the EIA Regulations is applicable to Project Bravo.

### Mitigation

**Mitigation**

No additional mitigation will be required during decommissioning.

As with construction publication of the decommissioning details through the mandated and accepted Aeronautical Information procedures will be undertaken to ensure complete dissemination of all necessary information to all air users.

### Residual Impacts

18.104. The potential impact of Project Alpha and Project Bravo has been assessed as acceptable during construction and hence **not significant** in terms of the EIA Regulations.

## SUMMARY OF IMPACTS

18.105. A summary of the radar and aviation residual impacts of Project Alpha and Project Bravo are presented in Table 18.7. The residual impacts are identical for both projects and can be divided into two main areas, those that affect the MOD and those that affect NERL; there are no civil airport impacts.

18.106. There are neither radar nor aviation impacts associated with the Transmission Asset Project and as a result no assessment of the Transmission Asset Project has been undertaken as part of this chapter.

**Table 18.5 Summary of Impacts**

| Description of Effect | Effect | Potential Mitigation Measures | Residual Impact |
|---|---|---|---|
| **Project Alpha** | | | |
| **Construction Phase** | | | |
| Presence of cranes and stationary WTGs | Acceptable | None required | **Not significant** |
| **Operation Phase** | | | |
| Civil radar | Acceptable | None required | **Not significant** |
| Military radar | If RAF Leuchars and associated radar is decommissioned – Acceptable<br>If RAF Leuchars radar is retained - Unacceptable | In the event the RAF Leuchars radar is retained a technical mitigation solution will be developed and implemented | **Not significant** |
| En-route radar | Acceptable | None required | **Not significant** |
| MOD air defence radar | Unacceptable | A technical mitigation solution will be developed and implemented | **Not significant** |
| MOD low flying and danger area operations | Acceptable | None required | **Not significant** |

| Description of Effect | Effect | Potential Mitigation Measures | Residual Impact |
|---|---|---|---|
| HMR | Acceptable | None required | **Not significant** |
| CAA | Acceptable | None required | **Not significant** |
| **Decommissioning Phase** | | | |
| Presence of cranes and stationary WTGs | Acceptable | None required | **Not significant** |
| **Project Bravo** | | | |
| **Construction Phase** | | | |
| Presence of cranes and stationary WTGs | Acceptable | None required | **Not significant** |
| **Operation Phase** | | | |
| Civil radar | Acceptable | None required | **Not significant** |
| Military radar | If RAF Leuchars and associated radar is decommissioned – Acceptable<br>If RAF Leuchars radar is retained - Unacceptable | In the event the RAF Leuchars radar is retained a technical mitigation solution will be developed and implemented | **Not significant** |
| En-route radar | Acceptable | None required | **Not significant** |
| MOD air defence radar | Unacceptable | A technical mitigation solution will be developed and implemented | **Not significant** |
| MOD low flying and danger area operations | Acceptable | None required | **Not significant** |
| HMR | Acceptable | None required | **Not significant** |
| CAA | Acceptable | None required | **Not significant** |
| **Decommissioning Phase** | | | |
| Presence of cranes and stationary WTGs | Acceptable | None required. | **Not significant** |

## CUMULATIVE IMPACT ASSESSMENT

18.107. Cumulative aviation impacts will occur where a number of wind farm developments all show on a specific radar and where the overall ability of the air traffic control service provider or MOD Air Defence System to maintain a surveillance and control service is likely to suffer additional operational and technical impacts.

18.108. The Seagreen Project, focused exclusively on the cumulative impacts of Project Alpha and Project Bravo as the Transmission Asset Project will not generate any radar or aviation impacts, as a cumulative scheme could magnify the impacts assessed and discussed in the project assessments above. The two projects would create a contiguous area of clutter or obscuration over an area of approximately 390km$^2$.

18.109. The main cumulative impact however relates to the development of the OWFs proposed in STW in the Firth of Forth and Tay, namely Neart na Gaoithe and Inch Cape (see Figure 6.1 in Volume II of this ES). The reason being that the area within which a full radar service would not potentially be available increases substantially with Neart na Gaoithe being approximately 27km south west from Project Alpha and 30km south west from Project Bravo, and Inch Cape being 9km west from Project Alpha and 12km west from Project Bravo.

18.110. Cumulative assessment of the wider area indicates that there is no cumulative impact on the Buchan Type 92 radar or the NERL Perwinnes radar. There may however, be an impact on the radar at Brizlee Wood which will need to be assessed by the MOD.

18.111. The cumulative impact on both air defence radars in as much as a larger and possibly contiguous area of clutter or obscuration could be created; this would have an impact outwith acceptable limits and would be significant in terms of EIA Regulations.

18.112. The only other radar where cumulative impacts will occur is the radar at RAF Leuchars and as already reported in the project assessments of this chapter; this issue may not be sustained. However, if the radar is retained during the operational phase, a joint or combined mitigation strategy may be required.

18.113. The RAF will not accept any impact, resultant from the development of the WTGs, on their ability to provide an unrestricted air traffic service in the area. In the event a cumulative impact is identified the wind farm developers will aim to work in collaboration to ensure there are no unacceptable impacts on the safeguarding of aviation operations and thus resulting in impacts which are not significant in terms of the EIA Regulations.

**Mitigation**

Initial assessment indicates that cumulative impact may be an issue only on the Brizlee Wood Air Defence radar and on the RAF Leuchars ATC radar. The full impact on the latter can only be determined when the RAF radar requirements in the area are determined.

The MOD will need to assess the cumulative impact on the Brizlee Wood radar and Project Bravo will accentuate any cumulative impact experienced as a result of Project Alpha. It is highly unlikely that the RAF will accept the developments without mitigation.

To this end mitigation will be an on-going process of negotiation and communication.

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