LLŶR FLOATING OFFSHORE WIND PROJECT

Llŷr 1 Floating Offshore Wind Farm

Environmental Statement

Volume 6: Appendix 27A – Aviation Risk Assessment Technical Report

August 2024

Prepared by: Llŷr Floating Wind Ltd

FLOVENTIS ENERGY

Document Status

Version	Authored by	Reviewed by	Approved by	Date
FINAL	Pager Power Limited	Pager Power Limited	AECOM	August 2024

Approval for Issue

Prepared by	Pager Power Limited
Prepared for	Llŷr Floating Wind Limited
Approved by	Jay Hilton-Miller

Glossary of project terms

Term	Definition
The Applicant	The developer of the Project, Llŷr Floating Wind Limited.
Array	All wind turbine generators, inter array cables, mooring lines, floating sub-structures and supporting subsea infrastructure within the Array Area, as defined, when considered collectively, excluding the offshore export cable(s).
Array Area	The area within which the wind turbine generators, inter array cables, mooring lines, floating sub-structures and supporting subsea infrastructure will be located.
Floventis Energy	A joint venture company between Cierco Ltd and SBM Offshore Ltd of which Llŷr Floating Wind Limited is a wholly owned subsidiary.
Landfall	The location where the offshore export cable(s) from the Array Area, as defined, are brought onshore and connected to the onshore export cables (as defined) via the transition joint bays.
Llŷr 1	The proposed Project, for which the Applicant is applying for Section 36 and Marine Licence consents. Including all offshore and onshore infrastructure and activities, and all project phases.
Marine Licence	A licence required under the Marine and Coastal Access Act 2009 for marine works which is administered by Natural Resources Wales (NRW) Marine Licensing Team on behalf of the Welsh Ministers.
Offshore Development Area	The footprint of the offshore infrastructure and associated temporary works, comprised of the Array Area and the Offshore Export Cable Corridor, as defined, that forms the offshore boundary for the S36 Consent and Marine Licence application.
Offshore Export Cable	The cable(s) that transmit electricity produced by the WTGs to landfall.
Offshore Export Cable Corridor (OfECC)	The area within which the offshore export cable circuit(s) will be located, from the Array Area to the Landfall.
Onshore Development Area	The footprint of the onshore infrastructure and associated temporary works, comprised of the Onshore Export Cable Corridor and the Onshore Substation, as defined, and including new access routes and visibility splays, that forms the onshore boundary for the planning application.
Onshore Export Cable(s)	The cable(s) that transmit electricity from the landfall to the onshore substation.
Onshore Export Cable Corridor (OnECC)	The area within which the onshore export cable circuit(s) will be located.
proposed Project	All aspects of the Llŷr 1 development (i.e. the onshore and offshore components).
Onshore Substation	Located within the Onshore Development Area, converts high voltage generated electricity into low voltage electricity that can be used for the grid and domestic consumption.
Section 36 consent	Consent to construct and operate an offshore generating station, under Section 36 (S.36) of the Electricity Act 1989. This includes deemed planning permission for onshore works.

Acronyms and abbreviations

Acronym or abbreviation	Definition	Acronym or abbreviation	Definition
ACOMS	Airspace Coordination and Obstacle Management Service	IFR	Instrument Flight Rules
AD	Air Defence	km	Kilometre
ADR	Air Defence Range	LARS	Lower Airspace Radar Service
AIP	Aeronautical Information Publication	LOS	Line-of-Sight
AMS	Air Modernisation Strategy	m	Metre
ANO	Air Navigation Order	MCA	Maritime and Coastguard Agency
ASACS	Air Surveillance and Control System	MOD	Ministry of Defence
ATC	Air Traffic Control	nm	Nautical Miles
ATS	Air Traffic Services	NPS	National Policy Statement
ATSU	Air Traffic Service Unit	NSIP	Nationally Significant Infrastructure Project
CAA	Civil Aviation Authority	OES	Obstacle Evaluation Surfaces
CAP	Civil Aviation Publication	OFS	Obstacle Free Surfaces
CNS	Communications, Navigation, and Surveillance	OLS	Obstacle Limitation Surfaces
DIO	Defence Infrastructure Organisation	OS	Ordnance Survey
DTM	Digital Terrain Model	PAR	Precision Approach Radar
FIR	Flight Information Region	PDA	Project Development Area
FIS	Flight Information Services	PSR	Primary Surveillance Radar
FL	Flight Level	RAF	Royal Air Force
ft	Feet	SAR	Search and Rescue
ICAO	International Civil Aviation Organization	VFR	Visual Flight Rules
IFP	Instrument Flight Procedure		

Table of Contents

List of Figures

List of Tables

27-A AVIATION RISK ASSESSMENT

27.1 Introduction

1. Pager Power has been retained by Llŷr Floating Wind Limited (hereafter referred to as 'the Applicant') to identify the key aviation and radar impacts associated with the Llŷr 1 Floating Offshore Wind Farm (the proposed Project) located off the Pembrokeshire coast, Wales.
2. The proposed Project comprises an Array Area with Wind Turbine Generators (WTGs) having a maximum tip height of 325.5 m above sea level.
3. The scope of this technical report includes:
    - Identification of relevant aviation infrastructure including:
        - Surrounding airspace;
        - Aerodromes (licensed, unlicensed and military);
        - Radar; and
        - Radio navigation aids.
    - Approach to the assessment;
    - Impact assessment for identified infrastructure;
    - Radar mitigation measures;
    - Cumulative assessment considering nearby projects; and
    - Overall conclusions.
4. The aim of this technical report is to identify and assess the potential risks and impacts of the proposed Project associated with civil and military aviation assets; search and rescue operations; and on the Air Traffic Control (ATC) and Air Defence (AD) capabilities, with reference to radar interference and operational safety.
5. The purpose of the report is to provide the necessary aviation and radar information required to support the necessary Marine Licence and Section 36 consent applications to construct and operate the proposed Project. The assessments of significance of effects from the potential impacts identified in this report are provided in **Chapter 27: Aviation and Radar**.
6. The assessment has been undertaken by Pager Power Limited. Further details of the proposed Project Team's competency are provided in **Appendix 1A: Statement of Competence**.

27.2 Proposed Project Details

27.2.1. Indicative WTGs

7. A WTG layout is yet to be determined and therefore this assessment has considered indicative WTG locations, based on a worst-case scenario of maximal spatial spread of the overall infrastructure within the Array Area, to determine the potential aviation constraints. The indicative WTG locations are shown in **Figure 27A-1[1].**

[1] These indicative WTGs locations reliably capture the risks across the array area and changes in the locations will not alter the conclusions of the report.

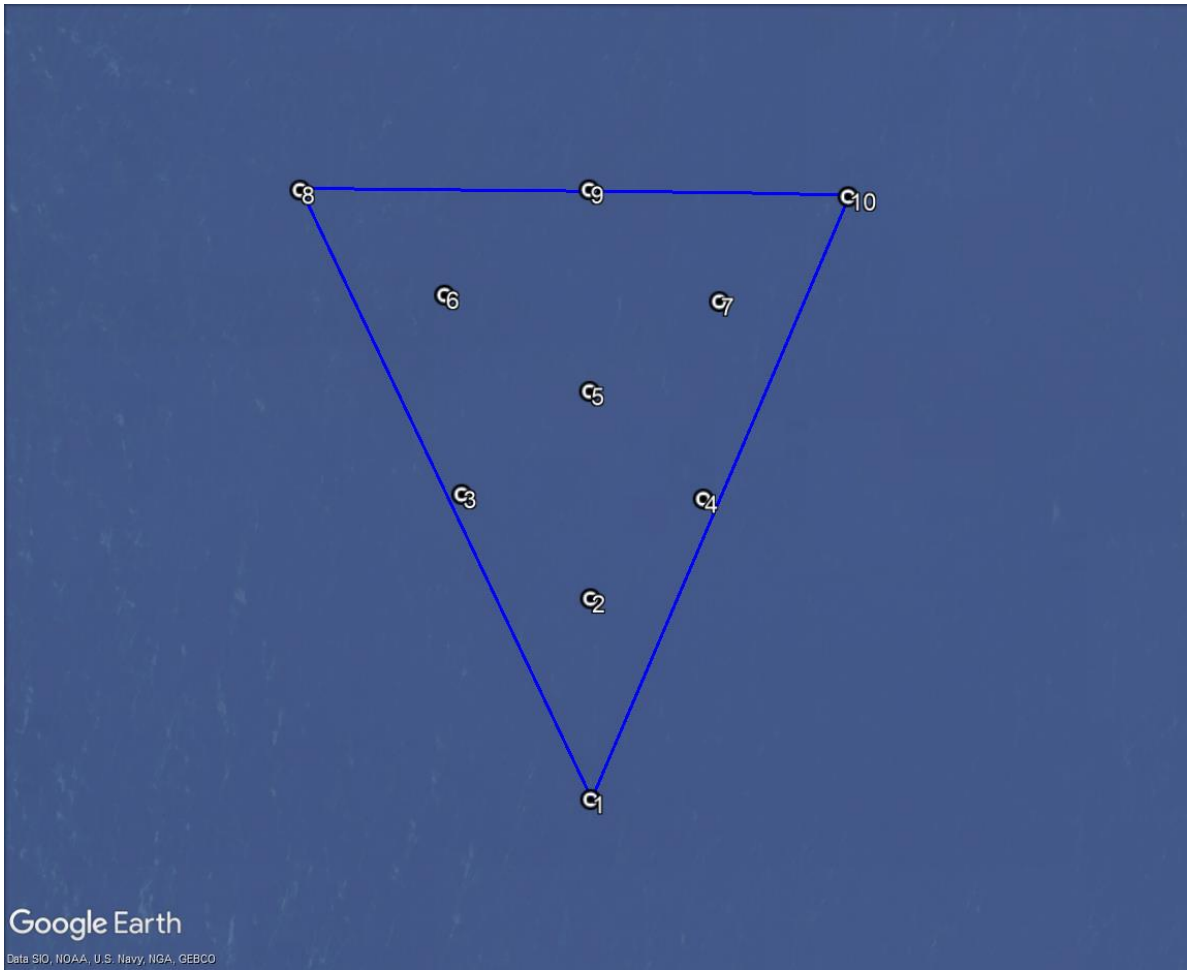


Figure 27A-1. Indicative WTG positions

27.2.2. WTG Dimensions

8. The WTG dimensions used for this assessment are presented in **Table 27A-1.**

Table 27A-1. Indicative WTG dimensions

Maximum rotor diameter (m)	Minimum hub height (m above water level)	Maximum hub height (m HAT above sea level)	Maximum tip height (m HAT above sea level)
285	122	177	325.5

27.3 Identification of Aviation and Radar Infrastructure

27.3.1. Airspace

9. The Array Area is located in the London Flight Information Region (FIR), which covers England and Wales. FIR are managed by a controlling authority that ensures air traffic services are provided to the aircraft flying within it. The CAA is the controlling authority of the London FIR and NATS provide Air Traffic Services (ATS) on behalf of the CAA in the region.

10. The Array Area is in Class G uncontrolled airspace up to Flight Level (FL) 195 (approx. 19,500 ft). In class G airspace, aircraft may fly when and where they like, subject to a set of simple rules. Although there is no legal requirement to do so, many pilots notify ATC of their presence and intentions and pilots take full responsibility for their own safety.

11. ATC can provide pilots in Class G with Flight Information Services (FIS) to support their safe flying. An Alerting Service is also provided if necessary to notify appropriate organisations regarding aircraft in need of assistance (e.g., search and rescue).

12. The airspace from FL195 (approx. 19,500 ft) to FL245 (approx. 24,500 ft) above the Array Area is Class C controlled airspace. Both Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) flying is permitted in this airspace; however, pilots require clearance to enter and must comply with ATC instructions.

27.3.2. Study Areas

13. A search of aviation and radar infrastructure has been undertaken to identify potential risks. The Study Areas for the assessment of aviation and radar have been defined on the basis of those defined in Chapter 4 of the CAP 764 document (CAA, 2016). The recommended distances for different infrastructure types are as follows:

- Airfield with a surveillance radar – 30 kilometres (km);
- Non radar licensed aerodrome with a runway of more than 1,100 m – 17 km;
- Non radar licensed aerodrome with a runway of less than 1,100 m – 5 km;
- Licensed aerodromes where the WTGs would lie within airspace coincidental with any published Instrument Flight Procedures (IFP);
- Unlicensed aerodromes with runways of more than 800 m – 4 km;
- Unlicensed aerodromes with runways of less than 800 m – 3 km;
- Gliding sites – 10 km; and
- Other aviation activity such as parachute sites and microlight sites within 3 km – in such instances developers are referred to appropriate organisations.

14. CAP 764 goes on to state that these distances are for guidance purposes only and do not represent ranges beyond which all wind developments will be approved, or within which they will always be objected to. These ranges are intended as a prompt for further discussion between developers and aviation stakeholders. On this basis, the following identification criteria was used based on Pager Power's experience:

- UK AIP listed Civil Aerodromes and Heliports within 30 km of the Array Area.
- Unlicensed airfields within 10 km of the Array Area;
- Civil airport ATC radars within 111.12 km (60 nautical miles (nm)) of the Array Area or that are within line of sight to the WTGs;
- NATS en-route radar sites within 200 km of the Array Area or that are within line of sight to the WTGs.
- En-Route radio navigation beacons within 10 km of the Array Area;
- Use of the on-line NATS self-assessment maps;
- Ministry of Defence ASACS radar sites within radio line of sight and within 100 km of the Array Area.
- Military Aerodromes within 60 km of the Array Area.
- Military ATC radar sites within 111.12 km of the Array Area or that are within line of sight to the WTGs;

- Military Precision Approach Radar (PAR) sites within 40 km of the Array Area;
- Ministry of Defence Tactical Training Areas within 10 km of the Array Area;
- Meteorological Radars within 20 km of the Array Area;
- Other significant aviation issues which require consideration.

15. It is not practical to plot all Study Areas listed above and therefore circles at 50 km, 100 km, and 150 km have been presented in **Figure 27A-2** for reference. The aviation and radar infrastructure identified in this report are also shown[2].

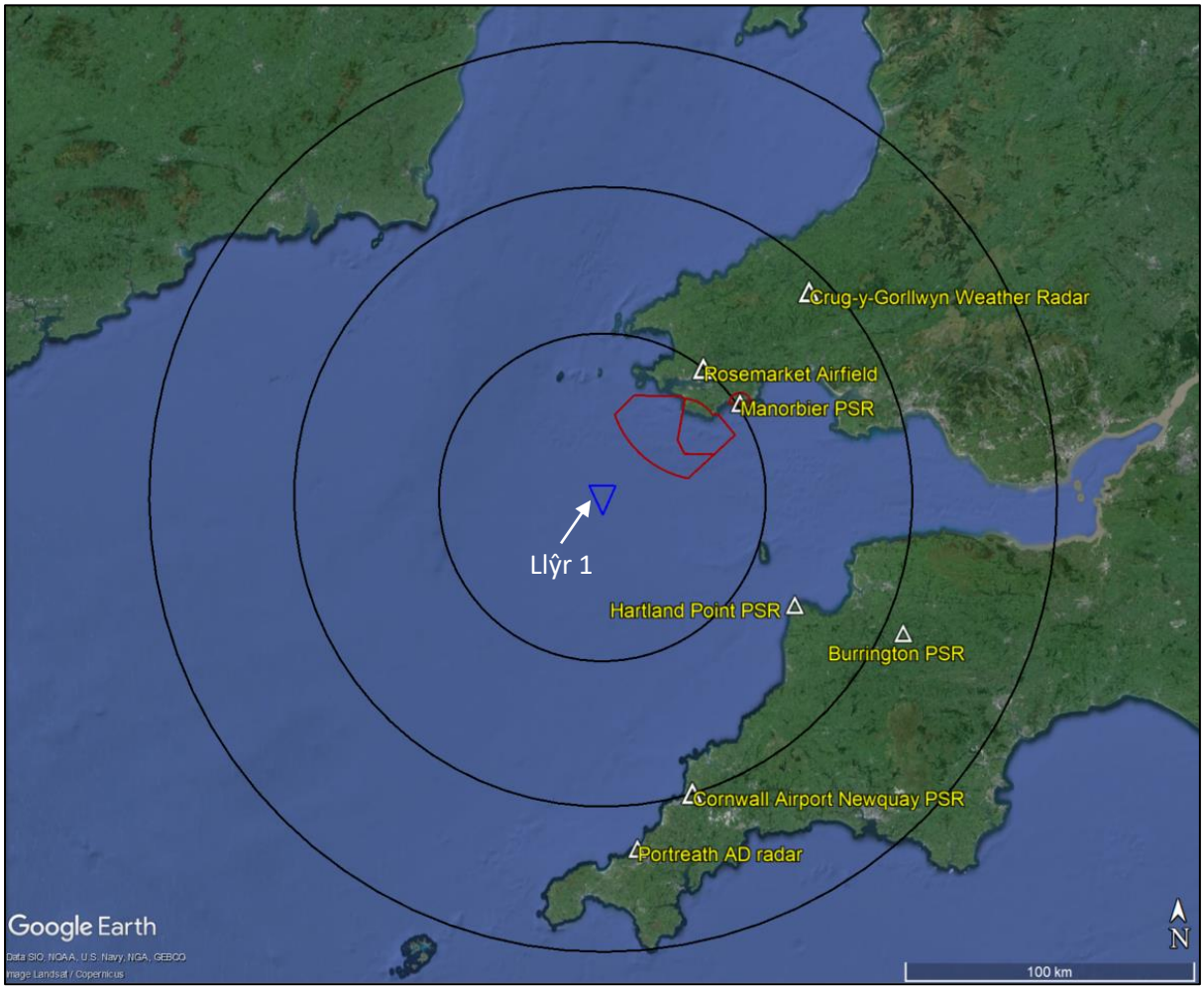


Figure 27A-2. Identified infrastructure and nominal Study Areas

27.3.3. Identified Infrastructure

Aviation Radar Infrastructure

16. The aviation radar installations that were identified in the existing baseline environment are presented in **Table 27A-2**.

[2] *The red polygons are military Danger Areas (**Section 27.3.3**).*

Table 27A-2. Aviation radar infrastructure within the Study Areas

Radar	Stakeholder	Distance from Array Area	Comments
Manorbier PSR	MOD	51.2 km	Military ATC radar at Air Defence Range (ADR) Manorbier used to ensure aircraft do not fly near the ADR danger area
Hartland Point PSR		72.6 km	Watchman radar located at Royal Air Force (RAF) Hartland Point on the north-western tip of the Devon coast, which is used to provide ATC for military aircraft
Cornwall Airport Newquay PSR	Cornwall Airport Newquay	100 km	Civil radar operated by Cornwall Airport Newquay to provide ATC services for aircraft in the airport's airspace and Lower Airspace Radar Services (LARS) to aircraft below FL100 around the Array Area
Burrington PSR	NATS En-Route	110.5 km	A long range en-route radar located in North Devon providing Air Traffic Services (ATS) for civil aircraft outside the proximity of an airport
Portreath Air Defence (AD) radar	MOD	114.7 km	An AD radar located on the north coast of Cornwall, which provides information on aircraft flying in the UK Air Defence Region

17. The location of the Array Area relative to the surrounding aviation radar installations is shown in **Figure 27A-3**.

Figure 27A-3. Aviation radar infrastructure within the Study Areas

Civil and Military Aerodromes

18. The closest civil (unlicensed, licensed, or International airport) or military aerodrome to the Array Area is Rosemarket Airfield. The airfield is located in Milford Haven and approximately 50 km northeast of the Array Area. Larger airports such as Swansea, Cardiff, and Bristol are located approximately 95 km, 142 km, and 194 km from the Array Area, respectively.

19. The location of the Array Area relative to the aforementioned aerodromes is shown in **Figure 27A-4.**

Figure 27A-4. Civil and military aerodromes in the existing baseline

20. The aerodromes are outside all Study Areas associated with civil and military aerodromes and therefore all other aerodromes will also be outside the relevant Study Areas. Civil and military aerodromes are therefore not assessed further in this report.

Military Low Flying

21. Military low flying can take place throughout the UK. The MOD has published a map (Defence Infrastructure Organisation [DIO], 2011) indicating areas within the UK where military low flying activities are the most likely to cause an objection. The map is colour coded as follows:

- Green – Area with no military low flying concerns;
- Blue – Low priority military low flying areas less likely to raise concerns;
- Amber – Regular military low flying area where mitigation may be necessary to resolve concerns;
- Red – High priority military low flying area likely to raise considerable and significant concerns.

22. The Array Area is located offshore and therefore is not within any of the areas defined above. However, military low flying operations can still take place out to sea.

Danger Areas

23. Danger Areas are established around areas where hazardous operations are likely to take place. These include, for example, military exercises involving live firing, parachute dropping, violent and unpredictable aircraft manoeuvres, or the use of unmanned aerial systems.

24. Three danger areas (D113A, D113B, and D115B) have been identified along the south coast of Wales. The closest danger, D113A, is located approximately 13.9 km to the northeast of the Array Area.

25. The locations of danger areas (red outlined areas) relative to the Array Area (blue outlined area) are shown in **Figure 27A-5.**

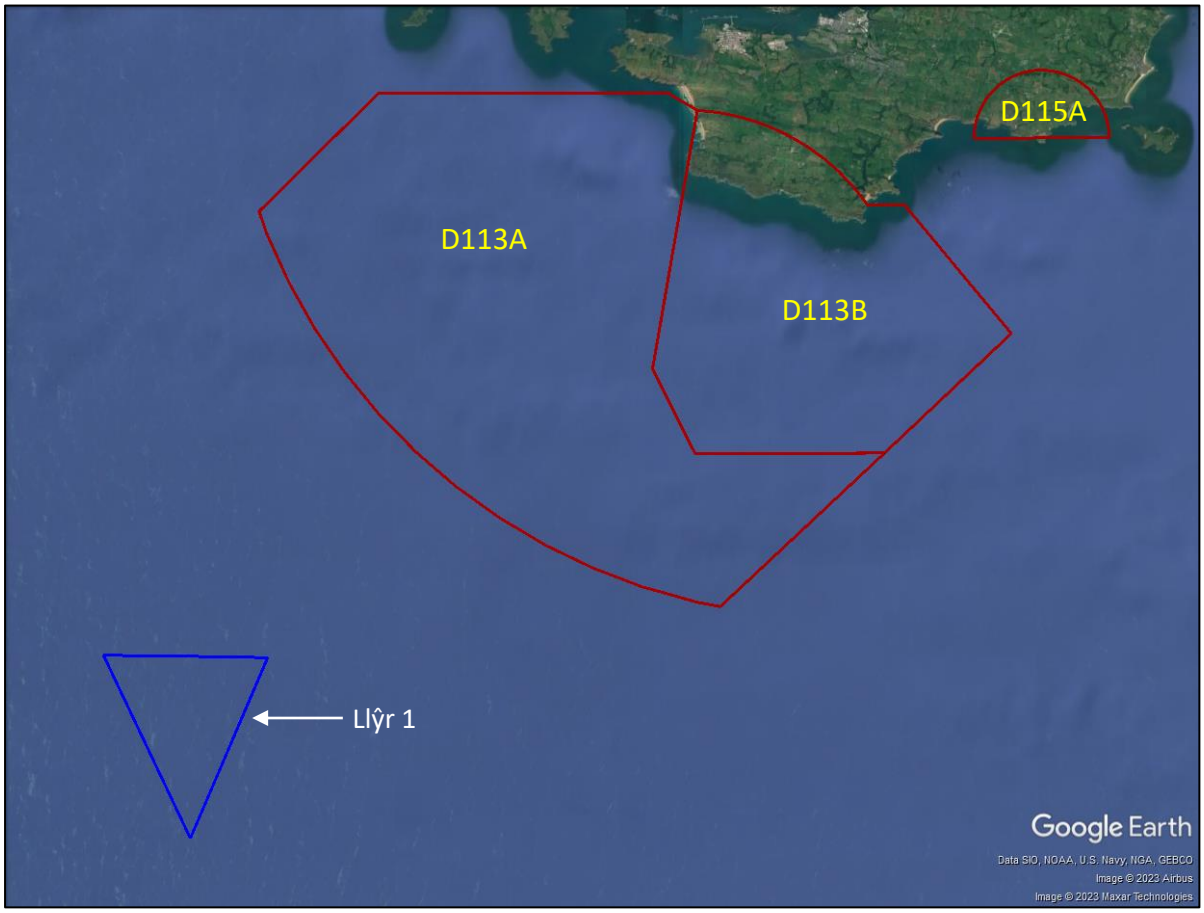


Figure 27A-5. Danger Areas relative to the Array Area

Helicopter Operations

26. Helicopter routes are not formally established over the Array Area. Search and Rescue (SAR) helicopters are likely to operate around the southwest coast; however, there are no formally safeguarded helicopter main routes.

27. A Helicopter Service operates between Lundy and Hartland Point on Mondays and Fridays from the beginning of November until the end of March. The Lundy Helipad, the closest point of the route, is over 57 km from the Array Area and has therefore not been considered further.

Meteorological Radar

28. The closest meteorological radar to the Array Area is the Crug-y-Gorllwyn weather radar station. The radar is located in Carmarthenshire, Wales and approximately 94 km to the northeast of the Array Area. The locations of the Crug-y-Gorllwyn meteorological radar relative to the Array Area (blue outlined area) are shown in **Figure 27A-6**.

29. The Array Area is significantly outside the Study Area and the range in which concerns are raised by the Met Office. Meteorological radar are therefore not assessed further in this report.

Figure 27A-6. Crug-y-Gorllwyn meteorological radar relative to the Array Area

27.4 Approach to Assessment

27.4.1. Assessment Methodology

30. **Chapter 05: EIA Approach and Methodology** provides a summary of the general impact assessment methodology applied in this ES. The following sections provide further detail on the specific methodology used to assess the potential impacts on aviation and radar. The approach to the assessment of cumulative impacts is provided in **Section 27.7.1**.

31. The significance of potential effects has been evaluated using a systematic approach together with the expert judgement of the specialist consultant. The systematic approach is based upon the identification of the importance / value of receptors and their sensitivity to the proposed Project together with the predicted magnitude of the potential impact.

32. The terms used to define receptor sensitivity and magnitude of impact are based on those outlined in **Chapter 05: EIA Approach and Methodology**.

27.4.2. Significance Criteria

Magnitude of Impact

33. The scale or magnitude of potential impacts (both beneficial and adverse) is determined by a combination of three criteria: scale of change, spatial extent of change and duration of change, as outlined in **Chapter 05: EIA Approach and Methodology**, **Section 5.4.9**.

34. In the context of aviation and radar, all potential impacts are classed as adverse and therefore beneficial impacts are not mentioned further in this report.

35. The criteria for defining magnitude of impact for the purpose of the assessment on aviation and radar are provided in **Table 27A-3.**

Table 27A-3. A summary of the magnitude criteria that are associated to specific impacts

Magnitude criteria	Definition
Large	The impact occurs over a large spatial extent resulting in widespread, long-term, or permanent changes in baseline conditions or affects a large proportion of a receptor population. The impact is very likely to occur and / or will occur at a high frequency or intensity. **Adverse:** Loss of resource and / or quality and integrity of resource; severe damage to key characteristics, features or elements
Medium	The impact occurs over a medium spatial extent resulting in medium-term, or partial changes in baseline conditions or partially affects a proportion of a receptor population. The impact is likely to occur and / or will occur at a medium frequency or intensity. **Adverse:** Loss of resource, but not adversely affecting the integrity; partial loss of / damage to key characteristics, features or elements
Small	The impact occurs over a small spatial extent resulting in short-term, or small changes in baseline conditions or partially affects a small proportion of a receptor population. The impact has a low likelihood of occurring and / or will occur at a low frequency or intensity. **Adverse:** Some measurable change in attributes, quality, minor loss of, or alteration to, one or more key characteristics, features or elements.
Negligible	The impact occurs over a minor spatial extent resulting in very short-term, or minor changes in baseline conditions or partially affects a very small proportion of a receptor population. The impact has a very low likelihood of occurring and / or will occur at a very low frequency or intensity. **Adverse:** Very minor loss of detrimental alteration to one or more characteristics, features or elements.

Sensitivity of Receptor

36. Receptor sensitivity is defined as the degree to which a receptor would be affected by an impact. The sensitivity of the receptor is characterised by three factors: vulnerability, recoverability and importance, as outlined in **Chapter 05: EIA Approach and Methodology, Section 5.4.10**.

37. The criteria for defining receptor sensitivity for the purpose of the assessment on aviation and radar are provided in **Table 27A-4.**

Table 27A-4. A summary of the criteria determining a receptor's sensitivity

Receptor sensitivity criteria	Definition
Very High	Very high importance and / or rarity, internationally important receptor with little or no ability to absorb change without fundamentally altering its character. Limited potential for substitution.
High	High importance and / or rarity, nationally important, limited ability to absorb change and limited potential for substitution.
Medium	Medium or high importance and / or rarity, regional scale, limited potential for substitution, with a medium ability to absorb change.

Receptor sensitivity criteria	Definition
Low	Low or medium importance and / or rarity, local scale, with some ability to absorb change.
Negligible	Very low importance and / or rarity, local scale, with good ability to absorb change.

Significance of Effect

38. As set out in **Chapter 05: EIA Approach and Methodology**, an Impact Assessment Matrix (IAM) is used to determine the significance of effect, which is a function of the sensitivity of the receptor and the magnitude of the impact, as shown in **Table 27A-5**.

39. The matrix provides a framework for the consistent and transparent assessment of predicted effects across all receptor topics; however, it is important to note that the IAM acts as a guide and that assessments also allow for the application of expert judgement.

Table 27A-5. Significance matrix

		Value / Sensitivity				
		Very high	**High**	**Medium**	**Low**	**Negligible**
Magnitude	**Large**	Major adverse	Major adverse	Major adverse	Moderate adverse	Minor adverse
	Medium	Major adverse	Major adverse	Moderate adverse	Minor adverse	Negligible
	Small	Major adverse	Moderate adverse	Minor adverse	Minor adverse	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

40. The IAM provides levels of effect significance ranging from major to negligible. Assignment of significance is carried out with consideration of embedded mitigation measures relevant to aviation and radar. Embedded mitigation measures (including project design measures and best practice) are presented within **Section 27.7** of **Chapter 27: Aviation and Radar**. Details on additional mitigation measures and associated definitions can be found in **Section 27.9** of **Chapter 27: Aviation and Radar**. For the purposes of this assessment, Moderate and Major levels of significance are defined as significant, and where relevant additional mitigation measures may be required, whilst Negligible or Minor impacts are defined as not significant.

Table 27A-6. A summary of the definitions of each significant of effect criteria

Significance category	Definitions	Significant / Not significant effect
Major	A large and detrimental change to a valuable / sensitive receptor; likely or apparent exceeding of accepted (often legal) threshold. These effects may represent key factors in the decision-making process. Potentially associated with sites and features of national importance or likely to be important considerations at a regional or district scale. Major effects may relate to resources or features which are unique and which, if lost, cannot be replaced or relocated.	Significant

Significance category	Definitions	Significant / Not significant effect
Moderate	A medium scale change which, although not beyond an acceptable threshold, is still considered to be generally unacceptable. Likely to be in breach of planning policy rather than a legal statute. These effects, if adverse, are likely to be important at a local scale and on their own could have a material influence on decision making.	Significant (unless otherwise specified)
Minor	A small change that, whilst adverse, does not exceed legal or guideline standards. Unlikely to breach planning policy. These effects may be raised as local issues and may be of relevance in the detailed design of a project but are unlikely to be critical in the decision-making process.	Not Significant
Negligible	A very small change that is so small and unimportant that it is considered acceptable to disregard. Effects which are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error. These effects are unlikely to influence decision making irrespective of other effects.	Not Significant

27.5 Impact Assessment Discussion

27.5.1. Ministry of Defence

Portreath AD Radar

41. The radar line of sight analysis showed that all 10 of the indicative WTG locations would be hidden from the Portreath AD radar, based on bare earth terrain.

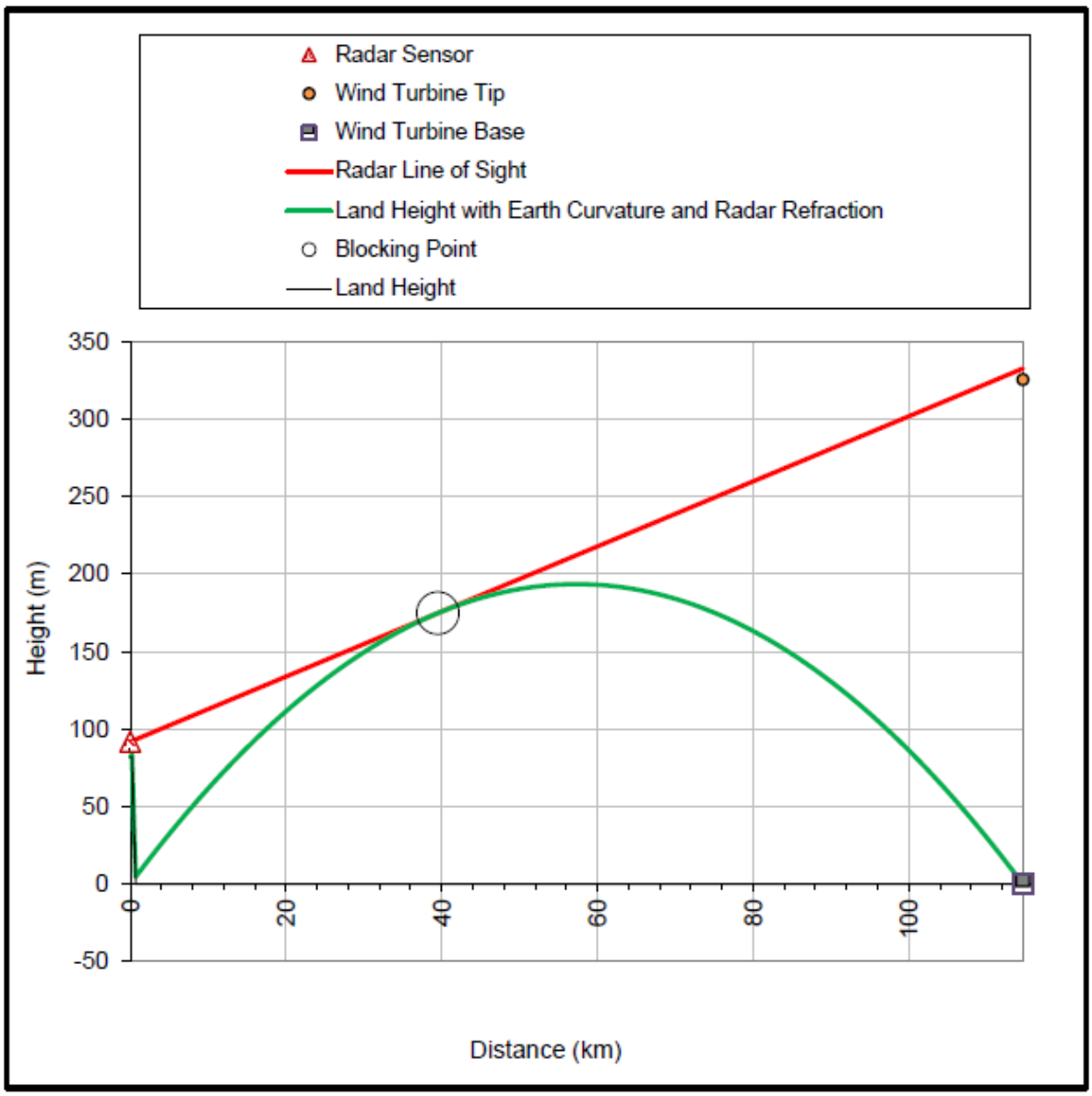
42. **Figure 27A-7** shows the line-of-sight chart to indicative WTG 1, the closest indicative WTG to the radar, for reference.

43. The line-of-sight analysis indicates that all WTGs would be hidden from the radar irrespective of their position within the Array Area. No technical impacts upon the radar are predicted.

Radar Line of Sight Calculation

Portreath ASACS

11274 - The Llyr Project	
Turbine	1
Result	HIDDEN
Certainty	7.2 metres



Turbine Height (m)	325.5
Hub Height (m)	183
Rotor Diameter (m)	285
Turbine Elevation (m)	0.0
Turbine Location	E159153 N160719
Distance to radar (km)	114.6
Blocking Point Location	E164194 N085733
Distance to BP (km)	75.2

Additional Analysis	
Angle (Radar to Tip)	0.270 degrees down
Maximum Tip Height	332.67 metres

Figure 27A-7. Radar line of sight chart for Portreath AD radar

Manorbier PSR

44. The location of the Array Area (blue outlined area) relative to Manorbier PSR (triangular icon) is shown in **Figure 27A-8.**

Figure 27A-8. Location of the Array Area relative to Manorbier PSR

45. The radar line of sight analysis showed that all 10 of the sample WTG locations would be significantly visible to Manorbier PSR, based on bare earth terrain. No meaningful obstructions were identified along the line-of-sight path that could significantly reduce the visibility of the WTGs. No additional screening was therefore incorporated into the profile. The line-of-sight analysis indicates that all WTGs would be visible to the radar irrespective of their position within the Array Area.

46. **Figure 27A-9** shows the line-of-sight chart to sample WTG 10, the closest sample WTG to the radar, for reference.

47. Despite the indicative WTGs being visible to the radar, and technical impacts being predicted, that does not immediately result in a significant operational impact. The radar is understood to be predominantly used by the MOD for ensuring that aircraft do not enter D115A at Air Defence Range (ADR) Manorbier. Considering the substantial distance between the Array Area and D115A, significant operational impacts are not predicted.

48. Overall, it is predicted that the proposed Project can be operationally accommodated by the MOD.

49. Consultation with the MOD will continue as the proposed Project progresses.

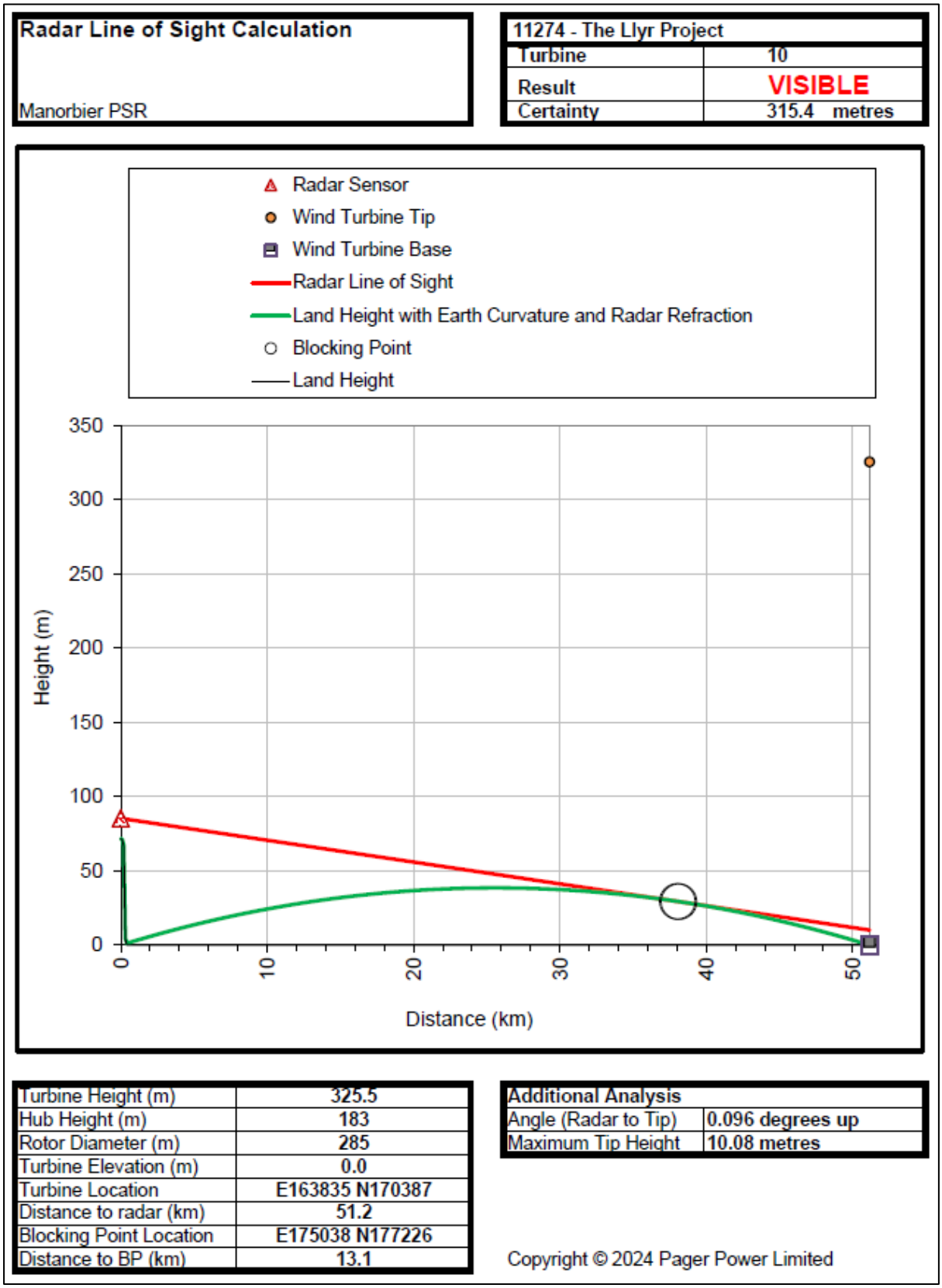


Figure 27A-9. Radar line of sight chart for Manorbier PSR

Hartland Point PSR

50. The location of the proposed Project Array Area (blue outlined area) relative to Hartland Point PSR (triangular icon) is shown in **Figure 27A-10.**

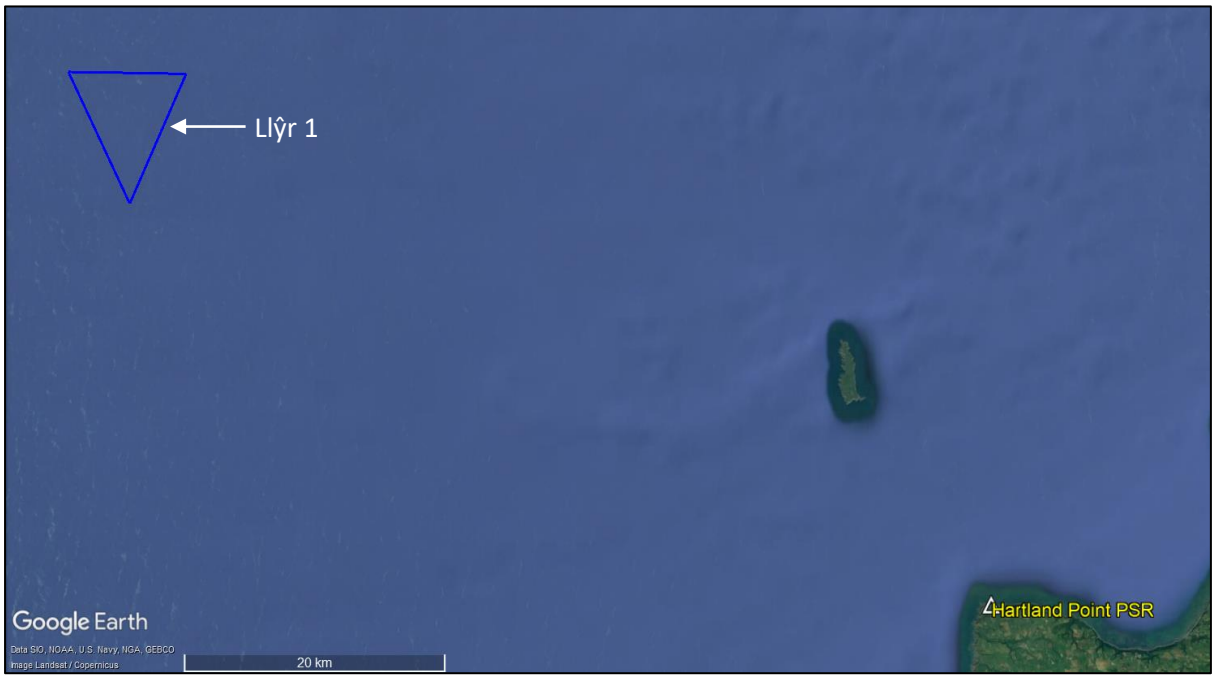


Figure 27A-10. Location of the Array Area relative to Hartland Point PSR

51. The radar line of sight analysis showed that all 10 of the indicative WTG locations would be significantly visible to Hartland Point PSR, based on bare earth terrain. No meaningful obstructions were identified along the line-of-sight path that could significantly reduce the visibility of the WTGs. No additional screening was therefore incorporated into the profile. The line-of-sight analysis indicates that all WTGs would be visible to the radar irrespective of their position within the Array Area.

52. **Figure 27A-11** shows the line-of-sight chart to indicative WTG 1, the closest indicative WTG to the radar, for reference.

53. Despite the indicative WTGs being visible to the radar, the Hartland Point PSR is understood to be a Watchman Radar. The radar has increased performance features for accommodating wind farms such as:

- Automatic windfarm mitigation processing.
- Exploits technology transfer from military air defence radars.
- Improved radar performance in detection, accuracy and resolution.

54. As well as benefitting from the radar features, the proposed Project is also over 70 km from the radar, further increasing the likelihood the radar features can disregard wind farm clutter. Should any technical impacts remain, the proposed Project is not predicted to be in a sensitive location for the MOD and, as such, significant operational impacts are not predicted.

55. Overall, the proposed Project may not cause a technical impact upon the radar, and it is predicted that any technical impacts can be operationally accommodated by the MOD.

56. Consultation with the MOD will continue as the proposed Project progresses.

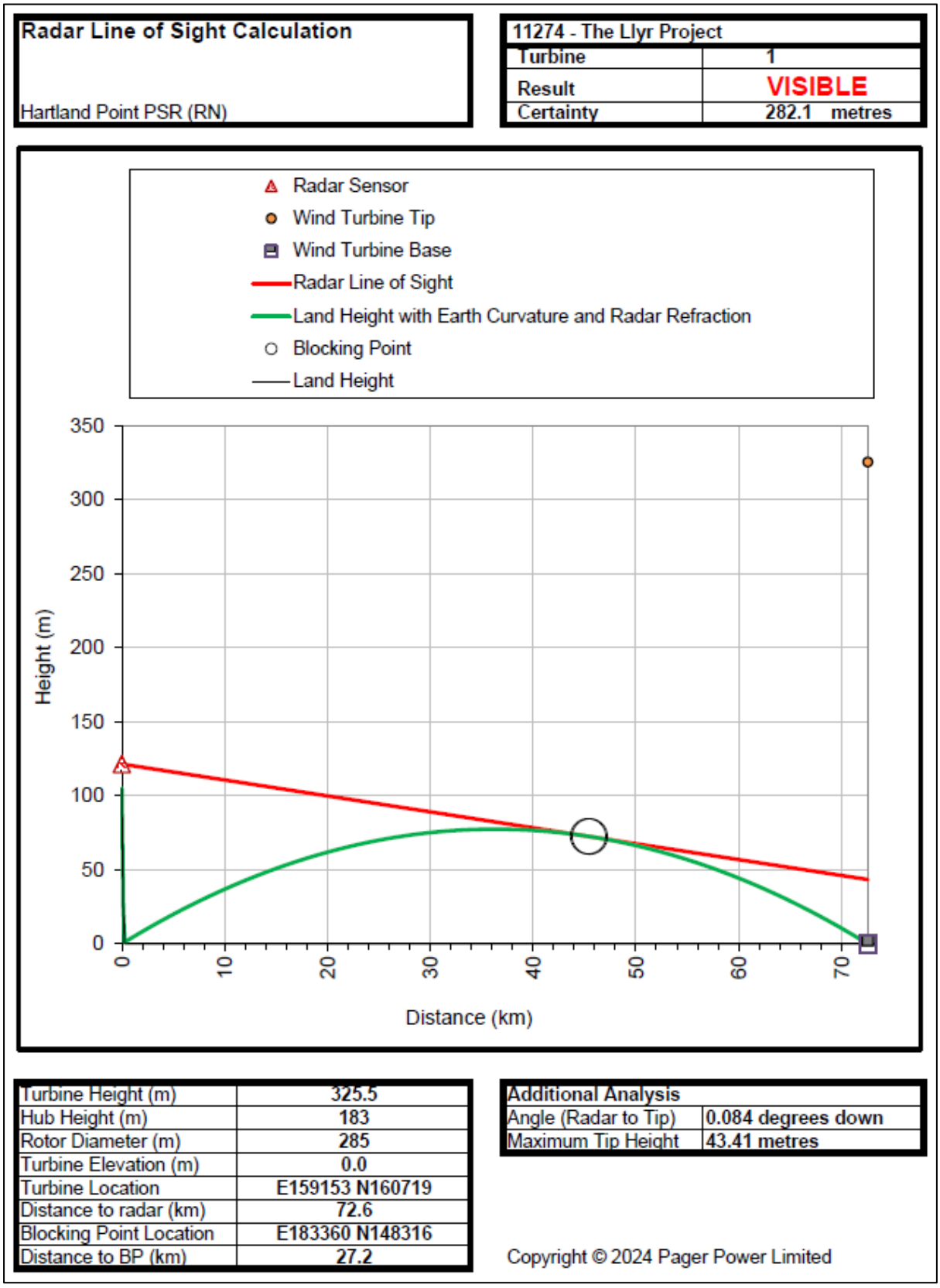


Figure 27A-11. Radar line of sight chart for Hartland Point PSR

27.5.2. NATS En-Route

Burrington PSR

57. The location of the Array Area (blue outlined area) relative to Burrington PSR is shown in **Figure 27A-12.**

Figure 27A-12. Location of the Array Area relative to Burrington PSR

58. The radar line of sight analysis showed that seven of the 10 indicative WTG locations would be visible to Burrington PSR, based on bare earth terrain. No meaningful obstructions were identified along the line-of-sight path that could significantly reduce the visibility of the WTGs. No additional screening was therefore incorporated into the profile.

59. The locations within the Array Area where WTGs would be visible to the radar (red icons) and hidden from the radar (green icons) are shown in **Figure 27A-13**. The specific indicative WTGs that are hidden from the radar are presented in **Annex B**.

60. **Figure 27A-14** shows the line-of-sight chart to indicative WTG 1, the closest indicative WTG to the radar, for reference.

61. Despite most of the indicative WTGs being hidden from the radar, based on bare-earth terrain, technical impacts cannot be ruled out due to over the horizon detection. NATS has objected to the proposed Project on the basis of a significant operational impact from increased workload of an air traffic controller.

62. It is recommended by NATS that radar blanking as described in **Section 27.6.2** is implemented due to the impacts upon Burrington PSR. This is based on the insensitive location of the Array Area in the context of Swanwick Centre ATC operations, which means a more complex solution like radar in-fill would not be necessary. This solution has been preliminarily agreed with NATS, who are at time of writing, is drafting a mitigation contract.

63. Once the mitigation is implemented, the residual impact upon Burrington PSR would be negligible.

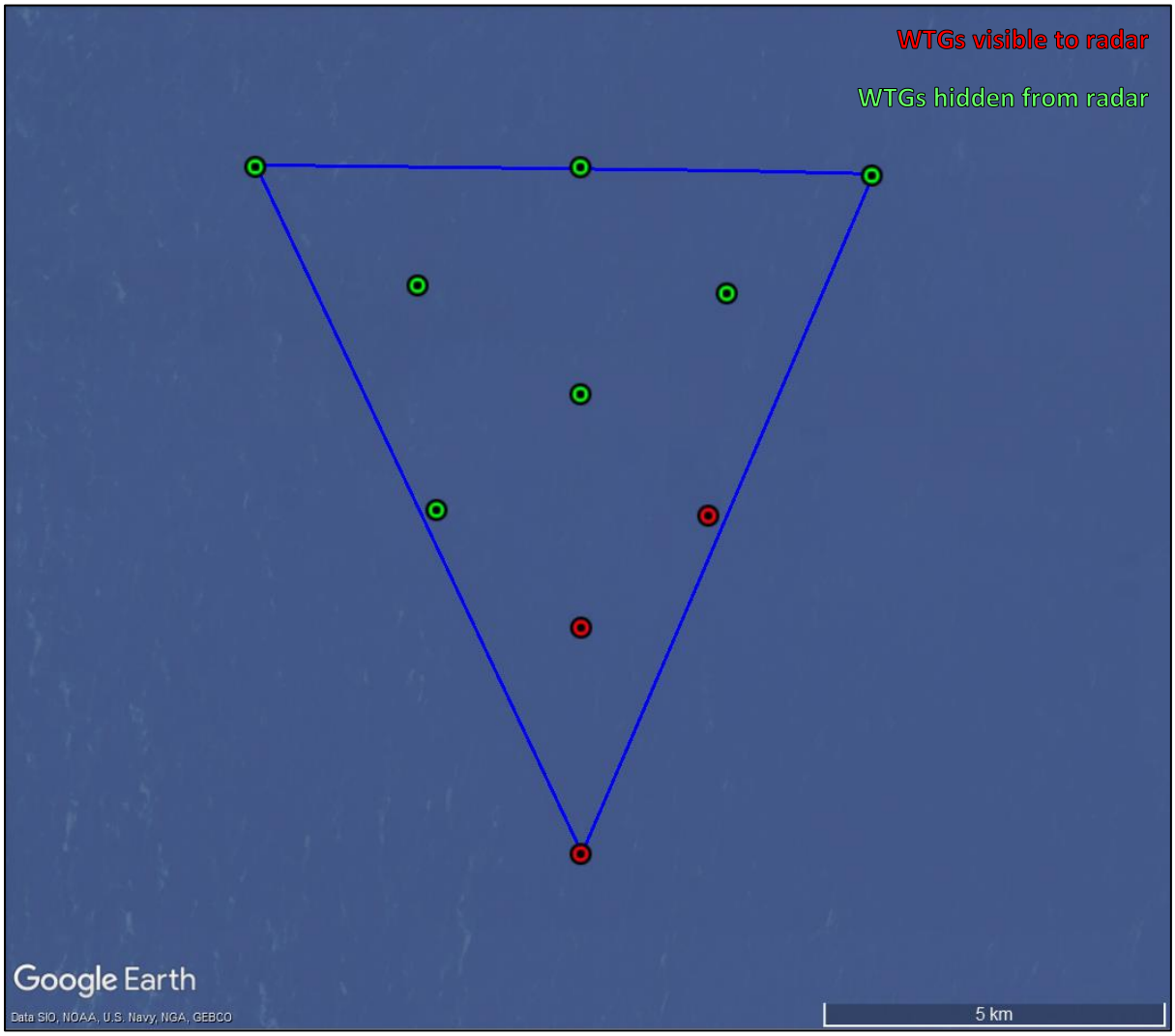


Figure 27A-13. Visibility of indicative WTGs for Burrington PSR

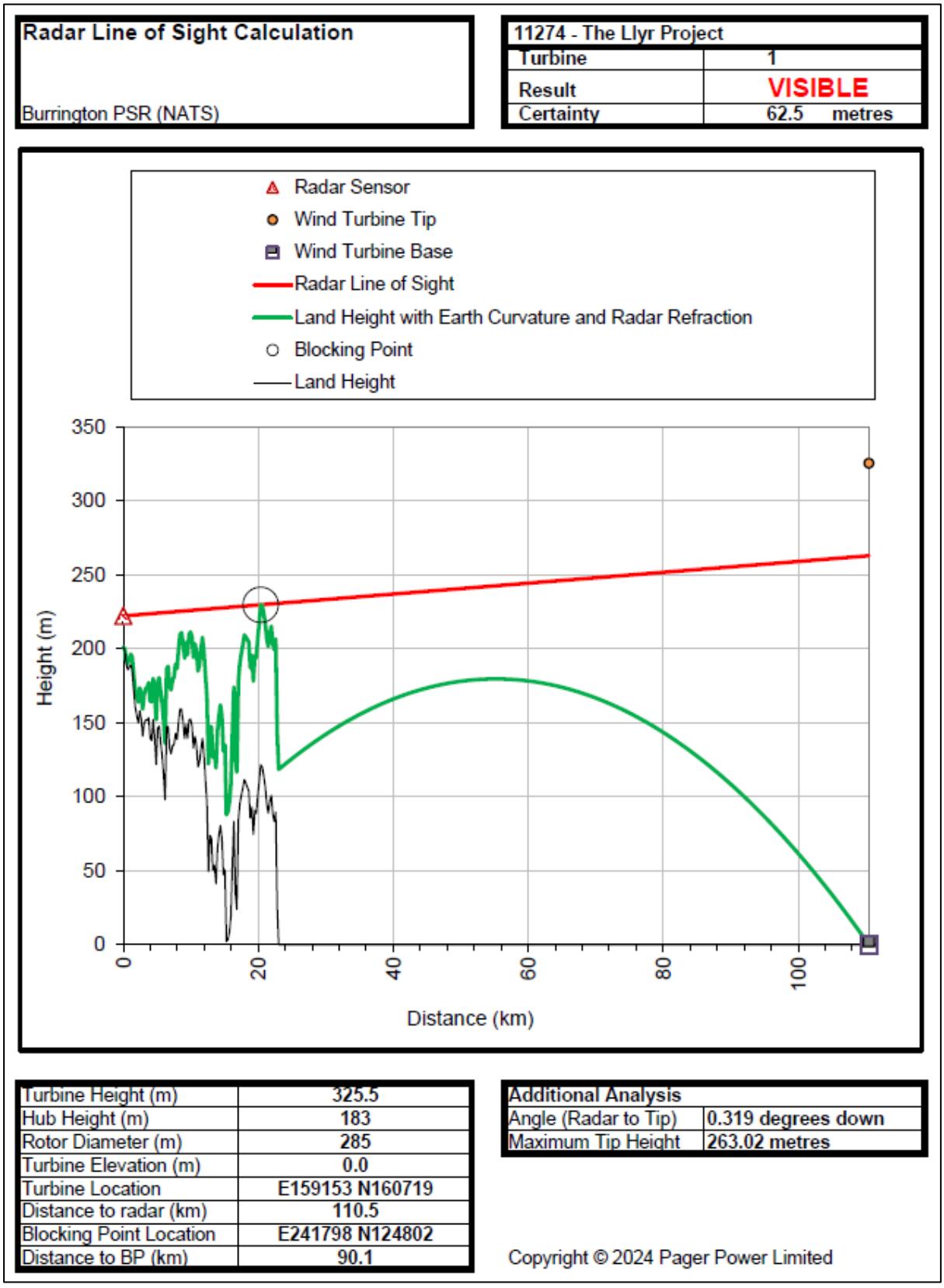


Figure 27A-14. Radar line of sight chart for Burrington PSR

27.5.3. Airport Radar

Cornwall Airport Newquay PSR

64. The location of the Array Area (blue outlined area) relative to Cornwall Airport Newquay PSR (triangular icon) is shown in **Figure 27A-15.**

Figure 27A-15. Location of the Array Area relative to Cornwall Airport Newquay PSR

65. The radar line of sight analysis showed that all 10 of the indicative WTG locations would be significantly visible to Cornwall Airport Newquay PSR, based on bare earth terrain. No meaningful obstructions were identified along the line-of-sight path that could significantly reduce the visibility of the WTGs. No additional screening was therefore incorporated into the profile. The line-of-sight analysis indicates that all WTGs would be visible to the radar irrespective of their position within the Array Area.

66. **Figure 27A-16** shows the line-of-sight chart to indicative WTG 1, the closest indicative WTG to the radar, for reference.

67. Despite the indicative WTGs being visible to the radar, and technical impacts being predicted, the Array Area is predicted to be over 60 km outside of the sector in which ATC personnel would be providing services for aircraft associated with Cornwall Airport Newquay.

68. The Cornwall Airport Newquay PSR also provides Lower Airspace Radar Services (LARS) out to 60 nm from the radar. LARS could therefore, in theory, be provided to aircraft in the airspace around the Array Area below FL100.

69. If civil aircraft are flying in the area and request FIS from Cornwall Airport Newquay whilst an air traffic controller is experiencing radar interference from the proposed Project, they can choose not to provide the services at that particular moment. Cornwall Airport Newquay are not obliged to provide FIS and it is also common practice for air traffic controllers to provide services to aircraft through non-radar derived services.

70. FIS can also be provided by air traffic controllers at Swanwick Centre ATC by NATS in this location, and therefore an aircraft can request FIS from an alternative Air Traffic Service Unit (ATSU) if Cornwall Airport Newquay are not able to provide services at that particular moment.

71. Overall, it is predicted that the proposed Project can be operationally accommodated by Cornwall Airport Newquay. Consultation with Cornwall Airport Newquay is progressing, and further assessment is being undertaken, to confirm their position.

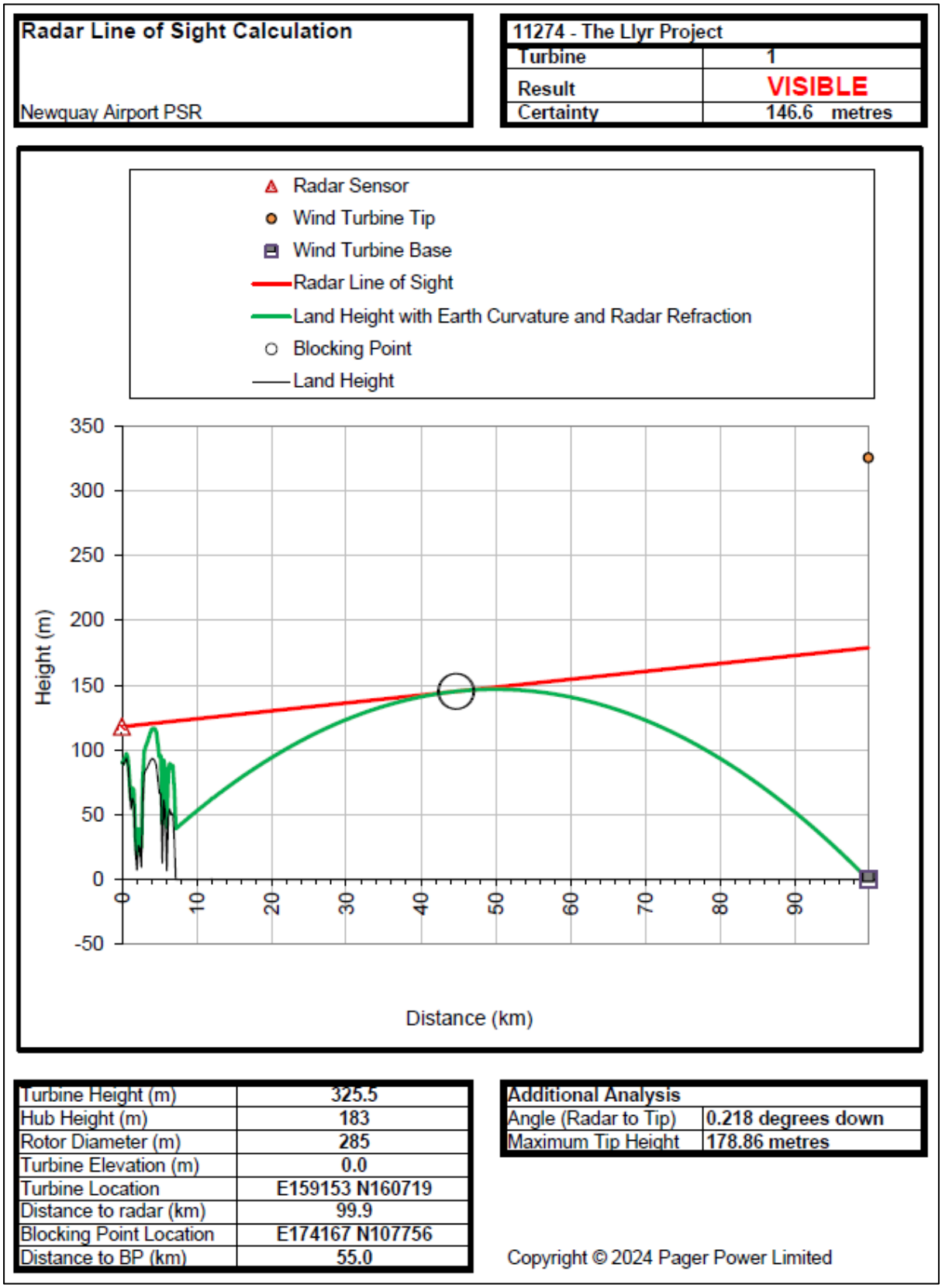


Figure 27A-16. Radar line of sight chart for Cornwall Airport Newquay PSR

27.5.4. Physical Obstruction

Civil Aircraft

72. The WTGs will present significant obstructions into the environment for civil aircraft due to their height, particularly when flying at night.

73. Aviation lighting will be implemented in accordance with Civil Aviation Publication (CAP) 764 (Civil Aviation Authority [CAA], 2016) and the *Offshore Renewable Energy Installations: Requirements, guidance and operational considerations for SAR and Emergency Response* (MCA, 2024). The proposed Project will also be marked on the relevant aeronautical charts.

74. Methods of reducing aviation lighting effects in relation to other topics (e.g., landscape and visual) will be applied where possible and with permission from the CAA and MCA.

75. Once mitigation has been implemented, no significant residual impacts upon civil aircraft are predicted.

Military Low Flying

76. The proposed Project is located offshore and therefore is not within any of the defined military low flying areas. Nevertheless, military low flying operations can still take place in this location and therefore the proposed Project could pose a significant physical obstruction for military aircraft.

77. The MOD is expected to request that WTGs be fitted with MOD accredited aviation safety lighting in addition to any requirements set out under the Air Navigation Order (ANO) 2016. This is likely to involve omni-directional red lighting or infrared COMBI lighting and can be discussed with the MOD , and presented within the Lighting and Marking Plan post consent.

78. The MOD will also require that sufficient information is submitted to ensure accurate marking of the WTGs on aeronautical charts. This includes the finalised WTG locations and heights above sea level.

79. Following the implementation of the appropriate aviation lighting and the WTGs being marked on aeronautical charts, no significant residual impacts to military low flying are predicted.

Helicopter Operations

80. The WTGs will present significant obstructions into the environment for helicopter operations, particularly for SAR helicopters when flying at night.

81. Aviation lighting will be implemented in accordance with the *Offshore Renewable Energy Installations: Requirements, guidance and operational considerations for SAR and Emergency Response*, produced by the MCA. The proposed Project will also be marked on the relevant aeronautical charts.

82. Methods of reducing aviation lighting effects in relation to other topics (e.g., landscape and visual) will be applied where possible and with permission from the MCA.

83. Once mitigation has been implemented, no significant residual impacts upon helicopter operations are predicted.

27.6 Radar Mitigation Measures

27.6.1. Mitigation Requirement

84. Mitigation measures are required due to the identified impacts upon the Burrington PSR operated by NATS at Swanwick Centre ATC. No further mitigation is expected to be required; however, this should be confirmed by the MOD and Cornwall Airport Newquay.

85. The recommended mitigation measure for technical impacts upon the Burrington PSR is presented below.

27.6.2. Burrington PSR Mitigation Measure

Radar Blanking

86. Radar blanking is a solution for unwanted radar returns. A zone is defined around the source of reflections, in this case the wind farm, within which radar returns are suppressed. The advantage of this solution is that the false returns are removed from the radar display. The drawback is that genuine returns from the blanked area are also suppressed. This means that an aircraft which overflies the proposed Project would not be detected within the blanked zone by the PSR.

87. The optimal blank will be the minimum size that encompasses the source of clutter without extending beyond this to maximise the level of coverage that is retained.

88. The dimensions of the blanked zone should be defined in terms of range (minimum and maximum) and bearing (minimum and maximum). These can be defined based on the position of the WTGs themselves – without the need for bespoke modelling beyond this. Implementation should be coordinated with the radar operator / servicing team.

27.7 Cumulative Assessment

89. The cumulative impacts considering the identified surrounding projects are assessed in the following subsections. The impacts have been split into radar clutter effects and physical obstruction effects.

90. Impacts upon Burrington PSR (NATS) have not been assessed due to the mitigation measures reducing the residual impact of the proposed Project in isolation to negligible. Portreath RRH has also not been assessed because it will not be affected by the proposed Project in isolation.

27.7.1. Approach to Assessment

91. PINS Advice 17: Cumulative Effects Assessment (CEA) (PINS, 2019) suggests that CEA follows a four-stage process. The aim of this approach is to accurately determine relevant projects and associated relationships with scoped in receptors identified in the ES, to be included within the interproject CEA.

92. The approach to the assessment of cumulative effects is detailed in **Appendix 5A: Approach to Cumulative Effects Assessment** and is also summarised in **Table 27A-7**.

Table 27A-7. PINS advice 17 stages of the CEA process

CEA stage	Activity
Stage 1	Determine a zone of influence (ZoI) via desk study for each topic receptor scoped into the ES. This will establish a *long list* of projects within each ZoI that will be shortlisted in Stage 2. This list of plans and projects / activities is drawn up through a desk study of planning applications, development plan documents, relevant development frameworks and any other available sources to identify 'other development' within the ZoI. Information on each project (location, development

CEA stage	Activity
	type, status, etc.) is documented, along with the certainty or tier assigned to the 'other development' (i.e. confidence it will take place in the current form and when it will take place in relation to the project). PINS notes that the project should then consult with the relevant planning authority / authorities and statutory consultees regarding the long list.
Stage 2	Screening of the long list identified in Stage 1, to establish a short list for the CEA. Screening is based on the criteria presented in the scoping report and subsequent comments by the regulator and statutory consultees. PINS has provided inclusions / exclusion threshold criteria, against which the potential for 'other developments' to give rise to significant cumulative effects by virtue of overlaps in temporal scope, the scale and nature of the 'other developments' and / or receiving environment, or any other relevant factors is assessed. From this assessment, a shortlist of 'other developments' to be included in the CEA is produced. It is noted that documented information on each of the 'other developments' is likely to be high level at this stage, outlining the key issues to take forward.
Stage 3	Gathering of all information available on short listed projects generated in Stage 2. At this stage all available data and information about the shortlisted projects that will be included in the CEA is collected to inform the assessment. This should utilise the most current information for each project in the public domain, and assess the assumptions and limitations of the information collected on each shortlisted project.
Stage 4	Each of the shortlisted projects are reviewed in turn by the different topics to assess whether cumulative effects may arise and the nature of those effects (i.e. beneficial or adverse). The significance of the effects on environmental receptors is established within each ES technical chapters. Where significant adverse cumulative effects are identified, mitigation measures are also considered within the CEA alongside the mechanism to secure that mitigation, e.g. consent condition requirements.

27.7.2. Surrounding Projects

93. Existing, and / or reasonably foreseeable projects have been identified in the area surrounding the Array Area as part of the CEA. **Table 27A-8** presents the short list of projects identified and included within the CEA for aviation and radar. These projects were shortlisted due to being offshore wind farms, which could also impact upon aviation and radar, and their proximity to the Array Area.

Table 27A-8. List of projects considered for the aviation and radar cumulative effects assessment

Project name / developer	Project type	Tier and status	Approx. distance from the proposed Project	Construction timeframe
Llŷr 2 Floating Offshore Wind Project – Floventis	Offshore Wind Farm	Tier 2 – Scoping submitted	0 km east	2027 / 2028
Erebus – Blue Gem Wind	Offshore Wind Farm	Tier 1 - Consented	5 km northwest	June 2026 – October 2026
Crown Estate Project Development Area (PDA) 1	Offshore Wind Farm	Tier 3 – Leasing Round 5	0 km west	TBC
Crown Estate PDA 2	Offshore Wind Farm	Tier 3 – Leasing Round 5	14 km southwest	TBC
Crown Estate PDA 3	Offshore Wind Farm	Tier 3 – Leasing Round 5	29 km south	TBC
White Cross	Offshore Wind Farm	Tier 1 – Application submitted	17 km southeast	Between 2025 - 2027

94. The location of the projects listed in **Table 27A-8** are shown in

95. **Figure** 27A-17.Cumulative projects considered for the aviation and radar cumulative effects assessment

96. .

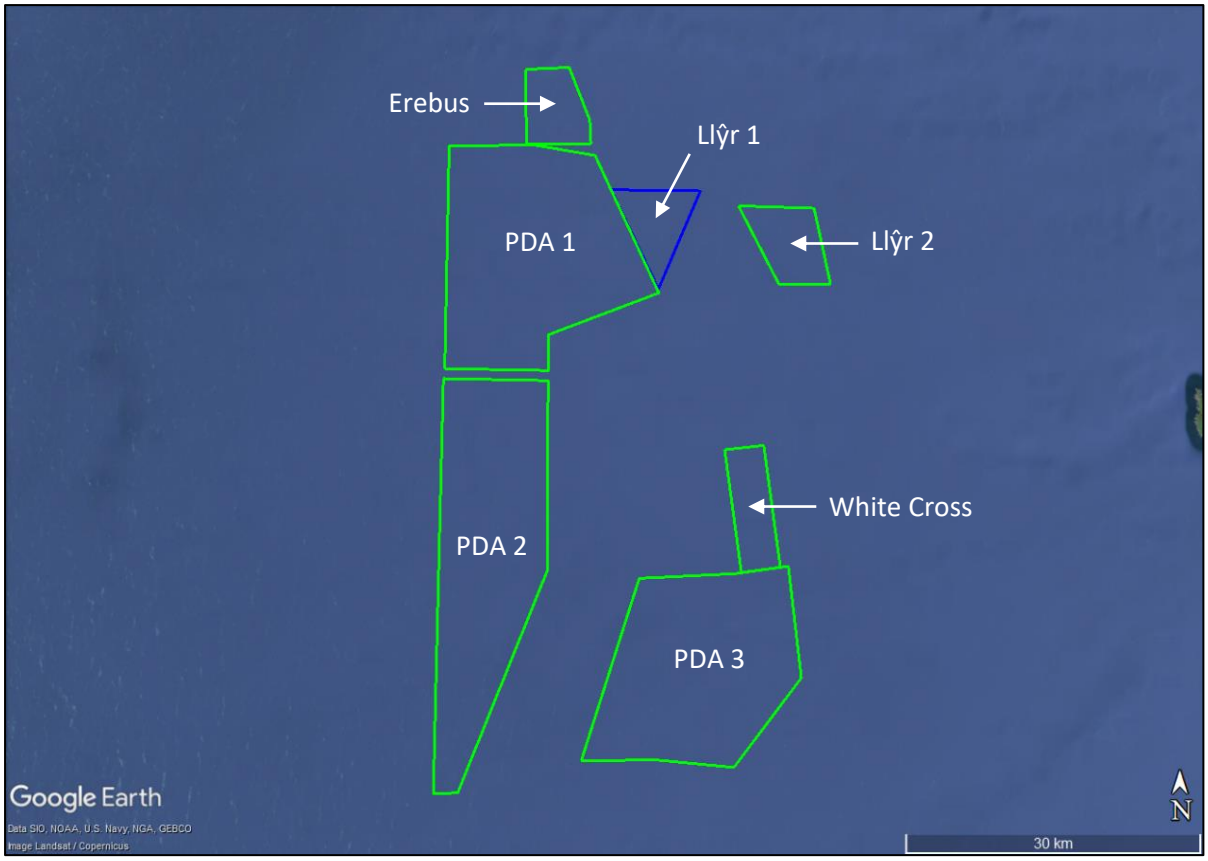


Figure 27A-17.Cumulative projects considered for the aviation and radar cumulative effects assessment

27.7.3. Radar Clutter

97. The Array Area is in a similar location to the six surrounding offshore wind farms relative to both radars. The potential cumulative effect will be the cumulative radar clutter and possibly desensitise the radar's receiver to wanted returns through an increase in the demands of the radar system through multiple sectors of clutter.

98. On the basis that proposed Project would not be detected by the radar, any impacts can be operationally accommodated, or if assessed to result in significant effects will be mitigated, it is predicted that the Erebus offshore wind farm and White Cross offshore wind project (Tier 1) will have been accepted on the same basis. Significant cumulative effects are not predicted to be experienced under any of the three scenarios.

99. Radar operators are not predicted to consider the effect of proposed projects (Tier 2 and Tier 3) when determining the cumulative impact upon their infrastructure, and will only consider cumulative effects for Tier 1 and operational sites. The Llŷr 2 and Crown Estate PDAs have therefore not been considered further with respect to radar clutter.

100. No significant cumulative effects are therefore predicted with respect to Manorbier PSR, Hartland Point PSR, and Cornwall Airport Newquay PSR.

27.7.4. Physical Obstruction

101. The WTGs would introduce obstructions into the surrounding environment and reduce the airspace available for surrounding aviation activity. Multiple offshore wind farms in a given sector would introduce further obstructions and further reduce the available airspace for surrounding aviation activity.

102. On the basis that the proposed Project and the six surrounding wind farms comply with appropriate lighting requirements and are marked on the relevant aeronautical charts; civil aircraft, military aircraft, and SAR helicopters will be able to discern the WTGs and evade them accordingly.

103. No significant cumulative effects are therefore predicted with respect to civil aircraft, military aircraft, or SAR helicopters.

27.8 Overall Conclusions and Recommendations

27.8.1. Assessment Results – Ministry of Defence

104. Technical impacts upon Manorbier PSR are predicted irrespective of the position of any WTG within the Array Area. However, it is predicted that the technical impacts can be accommodated following consideration of the proposed Project in an operational context (see **Section 27.5.1**).

105. Technical impacts upon the Hartland Point PSR may not materialise due to the radar's increased performance, features for accommodating wind farms (see **Section 27.5.1**), and distance of over 70 km which will increase the likelihood the radar features can disregard WTG clutter. Should any technical impacts remain, the proposed Project is not predicted to be in a sensitive location for the MOD and, as such, significant operational impacts are not predicted.

106. Pager Power is awaiting a response from the MOD to confirm their position with respect to their radar infrastructure.

27.8.2. Assessment Results – NATS En-Route

107. Despite most of the indicative WTGs being hidden from the radar, based on bare-earth terrain, technical impacts upon the Burrington PSR cannot be ruled out due to over the horizon detection. NATS has objected to the proposed Project on the basis of a significant operational impact from increased workload of an air traffic controller at Swanwick Centre ATC.

108. Technical mitigation in the form of radar blanking (see **Section 27.5.2**) will be implemented to ensure no residual impacts upon the Burrington PSR. This solution has been preliminarily agreed with NATS, who are currently drafting a mitigation contract.

27.8.3. Assessment Results – Airport Radar

109. Technical impacts upon the Cornwall Airport Newquay PSR are predicted irrespective of the position of any WTG within the Array Area. However, it is predicted that the technical impacts can be accommodated when air traffic controllers are providing both ATC and LARS (see **Section 27.5.3**).

110. Consultation with Cornwall Airport Newquay is progressing, and further assessment is being undertaken, to confirm their position.

27.8.4. Assessment Results – Physical Obstruction

111. The proposed Project is predicted to cause a significant physical obstruction for civil aircraft, military aircraft, and SAR helicopter operations.

112. To mitigate this, aviation lighting will be implemented in accordance with CAP 764, produced by the CAA, and the *Offshore Renewable Energy Installations: Requirements, guidance and operational considerations for SAR and Emergency Response*, produced by the MCA. Methods of reducing aviation lighting effects in relation to other topics (e.g., landscape and visual) will be applied where possible and with permission from the CAA and MCA.

113. The MOD are expected to request that the proposed Project WTGs are fitted with MOD accredited aviation safety lighting in addition to any requirements set out under the ANO 2016. This is likely to involve omni-directional red lighting or infrared COMBI lighting and can be discussed with the MOD post consent.

114. The MOD is also expected to require that sufficient information is submitted to ensure accurate marking of the proposed Project on aeronautical charts. This includes the finalised WTG locations and heights above sea level. The proposed Project will be marked on all relevant aeronautical charts.

115. Once mitigation has been implemented, no significant residual physical obstruction impacts are predicted.

27.8.5. Overall Conclusions

116. Technical impacts upon the Manorbier military ATC radar and Cornwall Airport Newquay ATC PSR are predicted irrespective of the WTG layout. However, it is predicted that the technical impacts can be accommodated following consideration of the proposed Project in an operational context (see **Sections 27.5.1 and 27.5.3**).

117. Technical impacts upon the Portreath military AD radar are not predicted due to the WTGs being hidden by the terrain (see **Section 27.5.1**).

118. Technical impacts upon a Hartland Point military ATC radar are not predicted due to the radar features for accommodating wind farms (see **Section 27.5.1**).

119. Significant operational impacts are predicted upon the Burrington NATS En-Route radar due to the increase in workload of air traffic controllers at Swanwick Centre ATC. Technical mitigation in the form of radar blanking (see **Section 27.6.2**) is being progressed in agreement with NATS. This solution has been preliminarily agreed with NATS, who are currently drafting a mitigation contract.

120. No additional limiting aviation impacts are predicted if the WTGs are appropriately lit and marked on aeronautical charts. The lighting and marking will be progressed in accordance with the requirements of the MOD, CAA, and MCA.

121. Engagement with the MOD, NATS and Cornwall Airport Newquay will continue as the proposed Project progresses to confirm their positions and to ensure any mitigation is implemented prior to installation of the proposed Project.

27.9 References

Civil Aviation Authority (CAA), 2016. CAP 764: CAA Policy and Guidelines on Wind Turbines [Online]. Available at: https://www.caa.co.uk/publication/download/14561. [Accessed: 03 April 2024].

Defence Infrastructure Organisation (DIO), 2011. Low Flying Consultation Zones [Online]. Available at: https://webarchive.nationalarchives.gov.uk/ukgwa/20140711161134/https:/restats.decc.gov.uk/cms/aviation-safeguarding-maps/. [Accessed: 03 April 2024].

Marine and Coastguard Agency (MCA), 2024. Offshore Renewable Energy Installations: Requirements, guidance and operational considerations for SAR and Emergency Response [Online]. Available at: https://www.gov.uk/guidance/offshore-renewable-energy-installations-impact-on-shipping. [Accessed: 03 April 2024].

Planning Inspectorate, 2019. Nationally Significant Infrastructure Projects - advice note seventeen: Cumulative effects assessment relevant to Nationally Significant Infrastructure Projects [Online]. Available at: https://www.gov.uk/government/publications/nationally-significant-infrastructure-projects-advice-note-seventeen-cumulative-effects-assessment-relevant-to-nationally-significant-infrastructur/nationally-significant-infrastructure-projects-advice-note-seventeen-cumulative-effects-assessment-relevant-to-nationally-significant-infrastructur. [Accessed: 03 April 2024].

ANNEX A – WTG COORDINATE DATA

Indicative WTG locations

Number	Easting	Northing	Number	Easting	Northing
1	159152.6	160718.7	6	157139.3	169084.4
2	159303.0	164005.6	7	161643.8	168768.2
3	157270.3	165808.8	8	154846.8	170913.4
4	161231.0	165550.6	9	159590.8	170696.7
5	159445.2	167397.7	10	163835.3	170386.6

ANNEX B – LINE-OF-SIGHT RESULTS

Portreath AD Radar

The indicative WTG visibility from the Portreath AD radar is presented in the table below.

Indicative WTG visibility from Portreath ASACS

Indicative WTG	WTG visibility	Visible / hidden
1	-7.2	Hidden
2	-36.7	Hidden
3	-54.9	Hidden
4	-50.1	Hidden
5	-68.6	Hidden
6	-86.6	Hidden
7	-80.8	Hidden
8	-106.7	Hidden
9	-100.9	Hidden
10	-96.0	Hidden

Manorbier PSR

The indicative WTG visibility from the Manorbier PSR is presented in the table below.

Indicative WTG visibility from Manorbier PSR

Indicative WTG	WTG visibility	Visible / hidden
1	296.0	Visible
2	301.1	Visible
3	299.4	Visible
4	306.6	Visible
5	305.6	Visible
6	303.1	Visible
7	310.8	Visible
8	300.3	Visible
9	309.3	Visible
10	315.4	Visible

Hartland Point PSR

The indicative WTG visibility from the Hartland Point PSR is presented in the table below.

Indicative WTG visibility from Hartland Point PSR

Indicative WTG	WTG visibility	Visible / hidden
1	282.1	Visible
2	277.4	Visible
3	268.1	Visible
4	280.3	Visible
5	271.9	Visible
6	261.3	Visible
7	275.7	Visible
8	249.4	Visible
9	265.8	Visible
10	278.7	Visible

Burrington PSR

The indicative WTG visibility from the Burrington PSR is presented in the table below.

Indicative WTG visibility from Burrington PSR

Indicative WTG	WTG visibility	Visible / hidden
1	62.5	Visible
2	19.1	Visible
3	-25.5	Hidden
4	5.2	Visible
5	-13.9	Hidden
6	-36.5	Hidden
7	-42.1	Hidden
8	-71.1	Hidden
9	-76.9	Hidden
10	-84.0	Hidden

Cornwall Airport Newquay PSR

The indicative WTG visibility from the Cornwall Airport Newquay PSR is presented in the table below.

Indicative WTG visibility from Cornwall Airport Newquay PSR

Indicative WTG	WTG visibility	Visible / hidden
1	146.6	Visible
2	125.8	Visible
3	109.8	Visible
4	118.8	Visible
5	102.9	Visible
6	86.5	Visible
7	97.1	Visible
8	68.2	Visible
9	79.5	Visible
10	89.0	Visible