



Arklow Bank Wind Park 2

Environmental Impact Assessment Report

Volume III, Appendix 25.6: Lighting and Marking Plan (Revised
March 2026)



Arklow Bank Wind Park 2 Lighting and Marking Plan

Prepared by Anatec Limited
Presented to Sure Partners Limited
Date 7th January 2026
Version Number 2.1
Document Reference A4984-SPL-LMP-1
Volume III, Appendix 25.6,
Lighting and Marking Plan
(Revised March 2026)

Aberdeen Office
Address 10 Exchange Street, Aberdeen, AB11 6PH, UK
Tel 01224 253700
Email aberdeen@anatec.com

Cambridge Office
Braemoor, No. 4 The Warren, Witchford Ely, Cambs, CB6 2HN, UK
01353 661200
cambs@anatec.com

This study has been carried out by Anatec Ltd on behalf of Sure Partners Limited (SPL). The assessment represents Anatec’s best judgment based on the information available at the time of preparation. Any use which a third party makes of this report is the responsibility of such third party. Anatec accepts no responsibility for damages suffered as a result of decisions made or actions taken in reliance on information contained in this report. The content of this document should not be edited without approval from Anatec. All figures within this report are copyright Anatec unless otherwise stated. No reproduction of these images is allowed without written consent from Anatec.

Version	Date	Status	Author	Reviewed by	Approved by
1.0	14/05/2024	Final (External)	Anatec Ltd.	GoBe Consultants	Sure Partners Ltd
2.0	07/01/2026	Final (External)	Anatec Ltd.	GoBe Consultants	Sure Partners Ltd

Statement of Authority

Experts	Qualifications	Relevant Experience
Sam Westwood	<ul style="list-style-type: none"> BSc (Hons) 2:1 Shipping and Port Operations, Southampton Solent University. NEBOSH Level 3 General Certificate in Health and Safety (Distinction). Post Graduate Certificate in Shipping, Ports and Environment, Southampton Solent University. NVQ 2 and 3 in Marine Operations as part of Deck Officer Cadetship. Offshore Search and Rescue Management for Renewables – HM Coastguard. Lloyds Diploma in Small Craft Surveying (Specialising in Small Commercial Craft) – Distinction. Vessel Traffic Services V103-1 Qualified – South Tyneside College. 	<p>Sam has over 25 years’ experience within the maritime industry dealing with port and vessel operations as well as offshore installations. Whilst working for the Maritime and Coastguard Agency within the Navigation Safety Branch, Sam gained a unique understanding of marine spatial planning including assessment of offshore developments and their impacts on marine navigation. Since joining the marine consultancy industry, Sam has been actively involved in the majority of offshore renewable projects in Ireland, the UK, project in the US and European sites as well other offshore developments from both marine operations and HSE aspects. Sam has extensive experience in both pre and post consent developments including providing marine guidance to developers</p>

Adam Foster	<ul style="list-style-type: none">• B.Sc. (Hons) in Mathematics, University of Aberdeen	Adam Foster is a Senior Risk Analyst at Anatec Ltd, and has over 10 years experience in shipping and navigation and marine risk assessment. He has been involved in numerous Navigation Risk Assessment processes including for successfully consented UK projects, and has experience in all associated assessment components including stakeholder liaison, leading hazard workshops, and risk modelling.
John Beattie	<ul style="list-style-type: none">• M.Sc. in Information Technology Systems, University of Strathclyde, UK.• B.Eng (Hons) 2:1 Chemical Engineering, University of Strathclyde, UK.	John is a Director and Principal Risk Analyst with Anatec with over 25 years of experience managing risk assessments for the renewables, oil & gas and marine industries. In offshore renewables, John has worked on numerous UK wind farm Navigation Risk Assessments.

Table of Contents

1	Introduction	1
2	Guidance and Consultation.....	2
2.1	Marine	2
2.2	Aviation.....	2
2.3	Consultation.....	3
3	Construction Phase.....	5
3.1	Marine	5
3.2	Aviation.....	8
4	Operational Phase	9
4.1	Marine	9
4.1.1	Failure of Marine Lighting.....	9
4.2	Aviation.....	16
4.2.1	Failure of Aviation Lighting.....	16
5	References	25

Table of Figures

Figure 25.6.1: Overview of the Proposed Development showing Array Area and Cable Corridor and Working Area.....	7
Figure 25.6.2: Marine Operational Lighting and Marking, Project Design Option 1	14
Figure 25.6.3: Marine Operational Lighting and Marking, Project Design Option 2	15
Figure 25.6.4: Aviation Operational Lighting and Marking, Project Design Option 1	23
Figure 25.6.5: Aviation Operational Lighting and Marking, Project Design Option 2	24

Table of Tables

Table 25.6.1: Construction Phase Lighting and Marking	6
Table 25.6.2: Operational Phase WTGs' Marine Lighting and Marking Summary	10
Table 25.6.3: Operational Phase Substations Marine Lighting and Marking Summary	12
Table 25.6.4: Operational Phase WTGs Aviation Lighting and Marking Summary	17
Table 25.6.5: Operational Phase Substation Aviation Lighting and Marking Summary.....	21

Abbreviations Table

Abbreviation	Definition
ABWP2	Arklow Bank Wind Park 2
AIS	Automatic Identification System
ASAM	Aeronautical Services Advisory Memorandum
AtoN	Aids to Navigation
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CIL	Commissioners of Irish Lights
DoD	Department of Defence
DoT	Department of Transport
EU	European Union
FL. Y. 2.5s	Yellow 2.5 Second Flash
HAT	Highest Astronomical Tide
IAA	Irish Aviation Authority
IALA	International Association of Marine Aids to Navigation and Lighthouse Authority
IR	Infra-Red
IRCG	Irish Coastguard
LMP	Lighting and Marking Plan
MCA	Maritime and Coastguard Agency
MGN	Marine Guidance Note
MSO	Marine Survey Office
NOTAM	Notice to Airmen
NVE	Night Vision Equipment
NVIS	Night Vision Imaging System
OREI	Offshore Renewable Energy Installation
OSP	Offshore Substation Platform
Radar	Radio Detection and Ranging
RAL	Colour matching system (Reichsausschuß für Lieferbedingungen und Gütesicherung)

Project A4984

Client Sure Partners Limited

Title ABWP2 Volume III Appendix 25.6 Lighting and Marking Plan (Revised March 2026)

Abbreviation	Definition
S.I.	Statutory Instrument
SAR	Search and Rescue
SPL	Sure Partners Limited
SPS	Significant Peripheral Structure
SSE	SSE plc
UK	United Kingdom
UPS	Uninterrupted Power Supply
WGS84	World Geodetic System of 1984
WTG	Wind Turbine Generator

Units Table

Unit	Description
cd	Candela
m	Metre
m ²	Square metre
mm	Millimetre
nm	Nautical mile
s	Second

1 Introduction

Sure Partners Limited (SPL) (hereafter ‘the Developer’), a wholly owned subsidiary of SSE plc (SSE) is the developer of Arklow Bank Wind Park 2 (ABWP2) (hereafter ‘the Project’), a proposed offshore wind farm located in Irish waters and approximately 3.2 -8.1 nautical miles (nm) off the coast of County Wicklow.

This Lighting and Marking Plan (LMP) sets out proposed marine and aviation lighting and marking of the offshore aspects of the Project (hereafter the ‘Proposed Development’). The marine and aviation lighting and marking schemes are based on the relevant guidance and recognised industry standards as set out in Section 2, with schemes proposed for Project Design Options for which consent is sought by the Developer. Further details of the associated layouts are provided in Volume II, Chapter 4: Description of Development, with a summary as follows:

- Project Design Option 1: 53 Wind Turbine Generators (WTG) and two Offshore Substation Platforms (OSP); and
- Project Design Option 2: 47 WTGs and two OSPs.

The Developer notes that the Commissioners of Irish Lights (CIL) suggested in their observation that a condition of consent should be the requirement to agree an LMP at least six months prior to commencement of construction. This LMP will therefore be used as the basis for post consent discussions with CIL and other relevant stakeholders following the selection of a project design option.

2 Guidance and Consultation

This section summarises guidance that has been adhered to in this LMP in relation to both marine and aviation aspects.

Primary guidance for marine lighting and marking is considered to be International Association of Marine Aids to Navigation and Lighthouse Authority (IALA) G1162 (IALA, 2021). Primary guidance for aviation obstruction lighting is considered to be Irish Aviation Authority (IAA) Guidance Material on Off-Shore Wind Farms, Aeronautical Services Advisory Memorandum (ASAM) No 18. Issue 2 (IAA, 2015). Consideration of relevant United Kingdom (UK) guidance where appropriate, notably Maritime and Coastguard Agency (MCA) Marine Guidance Note (MGN) 654 and Annexes (MCA, 2021) has also been made, noting that the Department of Transport (DoT) Guidance on Safety of Navigation & Emergency Response: Offshore Renewable Energy Installations (DoT, 2025) closely resembles this and states that this UK guidance should be applied for Phase 1 windfarm projects.

On this basis industry standards of relevance to lighting and marking of offshore wind farms applied in the UK have also been considered and applied where necessary, noting the guidance detailed below has taken precedence.

2.1 Marine

The marine navigation lighting and marking detailed in Section 3.1 and 4.1 follows the following guidance documents:

- IALA Recommendations O-139 on the Marking of Man-Made Offshore Structures (IALA, 2021) and Guidance G1162 on the Marking of Man-Made Offshore Structures (IALA, 2021);
- IALA R1001 – The IALA Maritime Buoyage System. Edition One. (IALA, 2017); and
- MCA MGN 654 and Annexes – Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021).

2.2 Aviation

The aviation lighting and marking including in relation to Search and Rescue (SAR) detailed in Section 4.2 follows the requirements set out in the following guidance documents:

- IAA Guidance Material on Off-Shore Wind Farms, ASAM No 18. Issue 2 (IAA, 2015);
- Statutory Instrument. (S.I.) No. 215/2005 - IAA (Obstacles To Aircraft in Flight) Order, 2005 (IAA, 2005).
- MCA MGN 654 and Annexes – Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021);
 - In particular, SAR Annex 5: Offshore Renewable Energy Installations: Requirements, guidance and operational considerations for SAR and Emergency Response (MCA, 2024).

Civil Aviation Authority (CAA) guidance has also been referenced where relevant noting it is mentioned within MGN 654 (MCA, 2021), noting the IAA guidance is applied on a primary basis.

2.3 Consultation

It is noted that in addition to consideration and compliance with the relevant guidance, the preparation of this LMP has also been informed by consultation undertaken with the Marine Survey Office (MSO), IAA, CIL, Irish Coastguard (IRCG), and the Department of Defence (DoD) who are considered key stakeholders of relevance to lighting and marking. Key points of relevance raised during the consultation process are summarised as follows:

- **Meeting with IAA, 26th October 2021**
 - IAA noted their current active lighting and marking guidance (IAA, 2015) does not align with the majority of the European Union (EU) or the UK in terms of aviation lighting requirements. In particular, the use of white high intensity lighting is not typical. IAA intend to review this in the near future.
 - In line with S.I.215 (IAA, 2005) all *en-route* obstacles including mobile cranes are required to be reported to IAA at least 30 days in advance, including during construction. There may be a need to issue Notice to Airmen (NOTAMs) based on the information provided.
- **Meeting with IRCG, 10th August 2023.**
 - IRCG requirements for SAR lighting and marking are likely to closely resemble those in MGN 654 (MCA, 2021).
- **Meeting with CIL, 6th September 2023.**
 - In terms of structure paint colours, CIL would be content with UK standards (e.g., RAL code 1023 for the foundation paint colouring).
 - A cardinal mark may be needed between the Array Area and the Codling Wind Park project to the north.
 - Indicatively CIL would be looking for two to three Automatic Identification System (AIS) Aids to Navigation (AtoN) but this will be dependent on the layout.
 - Sound signals are not commonly implemented by CIL.
 - CIL were content with the use of construction buoyage and temporary lighting for construction phase mitigations, noting that final plans would need to be agreed via the LMP.
- **Scoping Response from DoD, November 2020**
 - Advised that all turbines should be illuminated by high intensity obstacle lights.
 - Advised that obstruction lights should be incandescent or of a type visible to night vision equipment.
- **Letter correspondence from the DoD, November 2025**
 - All turbines should be illuminated by the following obstacle lighting:
 - A Type B, Medium Intensity, Flashing Red obstacle light on the wind turbine nacelle, with a minimum output of 2,000 candela (cd), which is

visible in all directions of azimuth and operational H24 / 365 days per year.

- A second Type B, Medium Intensity, Flashing Red obstacle light on the nacelle, which serves as an alternate to the primary light described above, in case of failure of the primary operating obstacle light. The primary and alternate lights should be installed to assure that the output of either light is not blocked by the other.
- At least three Type E, Low Intensity, Flashing Red obstacle lights at an intermediate level of half the nacelle height, that are configured to flash at the same rate as the light on the nacelle.
- Obstacle lighting may be incandescent or LED. If LED lights are used, they should be a type visible to Night Vision Equipment (NVE). NVE obstacle lighting should emit light at the near Infra-Red (IR) range of the electromagnetic spectrum, specifically at or near 850 nanometres of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light.

3 Construction Phase

This section describes the marine (Section 3.1) and aviation (section 3.2) lighting and marking to be implemented during the construction phase.

3.1 Marine

The marine lighting and marking to be implemented during the construction phase is summarised in Table 25.6.1 which also includes a guidance column, listing the relevant guidance / stakeholder for each lighting and marking aspect where appropriate, noting that the guidance provides the full proposed technical specifications.

Construction buoyage shall be established eight weeks prior to the Proposed Development commencing construction to allow time for passing traffic to familiarise with the buoyed construction area, noting this is in accordance with best practice to allow passing vessels time to familiarise with the Proposed Development. The buoyage shall remain in place until the operational marking requirements have been installed, then inspected and passed by CIL. Precise buoyage locations will be as directed by CIL, noting it is anticipated that they will be located within 500 metres (m) of the Array Area and therefore within the Cable Corridor and Working Area (see Figure 25.6.1).

The Developer will seek statutory sanction from CIL in advance of the establishment, alteration, or removal of any AtoN.

Table 25.6.1: Construction Phase Lighting and Marking

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
Temporary construction lighting	All WTGs and OSP	<ul style="list-style-type: none"> ▪ All structures marked with a temporary light during construction and until operational lighting is commissioned. ▪ Yellow 2.5 second (s) flash (FL. Y. 2.5s). ▪ At least 2 nm range. ▪ 360° visibility (multiple lights per structure may be required to achieve this). 	<ul style="list-style-type: none"> ▪ Industry Standard
Construction buoyage – numbers and types	Marking periphery of Array Area	<ul style="list-style-type: none"> ▪ Buoy types as directed by CIL. ▪ At least 5 nm range. ▪ Pillar shaped. ▪ Some buoys may be required to transmit via AIS. ▪ Removed once CIL have confirmed content with operational lighting and marking. ▪ Positions as directed by CIL but anticipated to be within 500 m of the Array Area. ▪ Estimated up to 14 buoys may be deployed. 	<ul style="list-style-type: none"> ▪ UK Industry Standard ▪ IALA R1001 – The IALA Maritime Buoyage System. Edition One. (IALA, 2017)

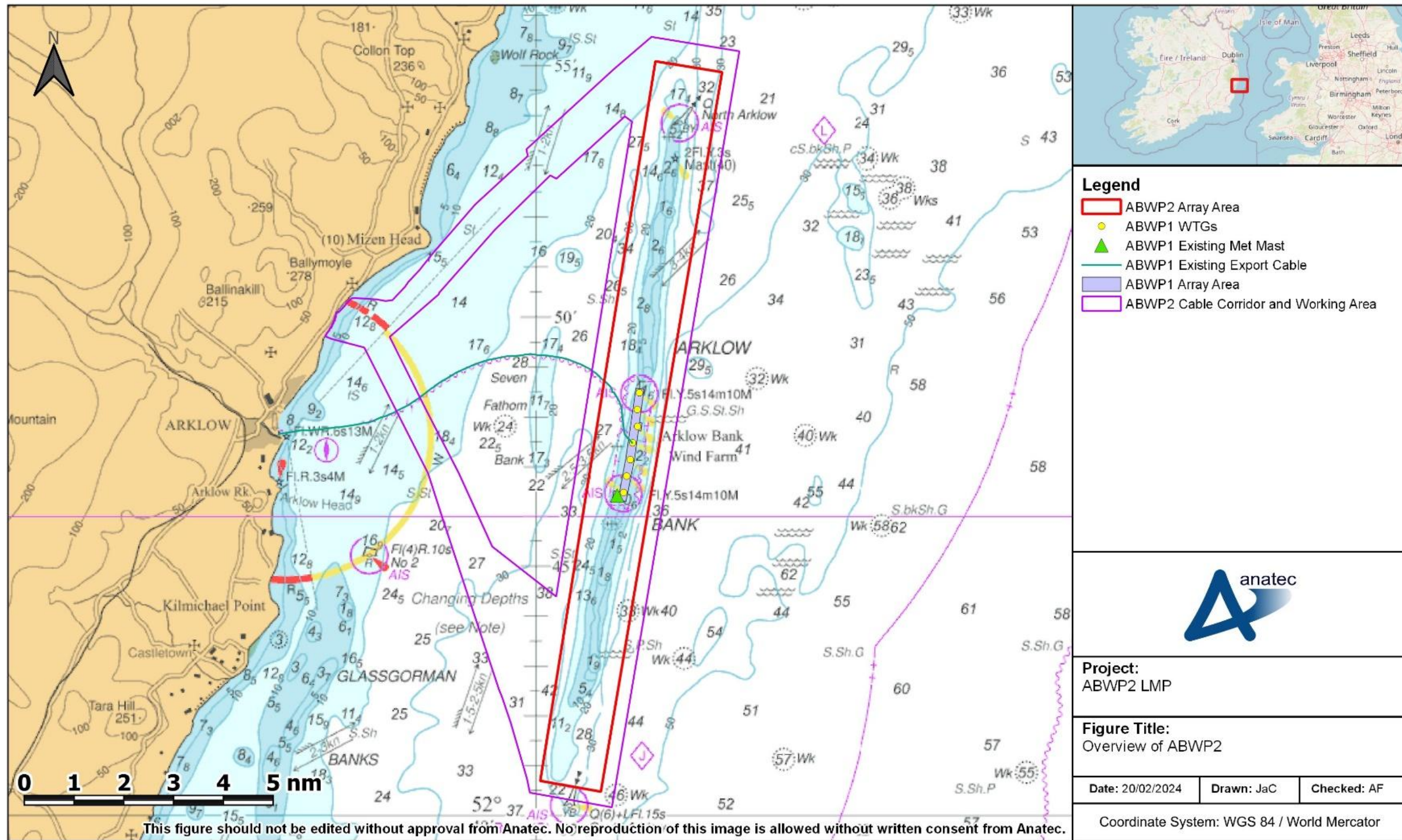


Figure 25.6.1: Overview of the Proposed Development showing Array Area and Cable Corridor and Working Area

3.2 Aviation

There will be no specific aviation lighting and marking implemented during the construction phase, however relevant information on the Proposed Development will be provided to aviation stakeholders. In particular, as required under S.I.215 (IAA, 2005) (see Section 2.22.2), the IAA will be notified of any *en-route* obstacles (including mobile cranes) above 45 m in height, giving at least 30 days' notice.

The following details will be provided:

- Geographic latitude;
- Geographic longitude;
- Elevation; and
- Height.

The IAA indicated during consultation (see Section 2.22.2) that NOTAMs may be issued based on the information provided.

Further, in line with ASAM No 18 (IAA, 2015), at least three months in advance of the installation of the WTGs and OSPs, the following information will be supplied to the IAA:

- Positional data representing the Estimated Position of each machine or structure (WTGs and OSPs) to be erected. The geodetic datum to which all obstructions shall be referred is the World Geodetic System of 1984 (WGS84). Co-ordinates will be provided in degrees, minutes, seconds and decimals of a second, as appropriate;
- The estimated maximum elevation of each structure (WTG and OSP) in feet and metres;
- Proposed lighting details for each structure;
- Proposed marking details for each structure;
- Whether it is proposed that a Radio Detection and Ranging (Radar) Enhancer / Transponder / Reflector or Radar / AIS to be fitted;
- Minimum and maximum spacing between structures (WTGs and OSPs);
- Planned earliest date of erection; and
- Any other information considered relevant for air navigation.

4 Operational Phase

This section presents the marine (Section 4.1) and aviation (Section 4.2) lighting and marking to be implemented during the operational phase.

4.1 Marine

The marine operational lighting and marking to be implemented for the WTGs and OSPs are summarised in Table 25.6.2 and Table 25.6.3 respectively. These include a guidance column listing the relevant guidance / stakeholder for each lighting and marking aspect where appropriate, noting that this guidance will provide the full technical specifications required by the relevant stakeholders. The proposed marine lighting and marking is then illustrated in Figure 25.6.2 for Layout Option 1 and Figure 25.6.3 for Layout Option 2.

The Developer will seek statutory sanction from CIL in advance of the establishment, alteration, or removal of any AtoN.

4.1.1 Failure of Marine Lighting

The Developer will ensure that appropriate redundancy and / or back up capability is utilised to ensure the appropriate IALA availability categories as set out in Table 25.6.2 and Table 25.6.3 are met. In the event of a significant loss of an AtoN such that a significant risk to navigation is considered likely to occur, consultation shall be undertaken with CIL, IRCG, and the MSO to determine the need for any additional mitigation which may include promulgation of navigational warnings, deployment of temporary AtoNs or use of a guard vessel.

Table 25.6.2: Operational Phase WTGs' Marine Lighting and Marking Summary

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
Significant Peripheral Structures (SPS) lighting	Select peripheral structures	<ul style="list-style-type: none"> ▪ Marine lights marking selected periphery WTGs as required under IALA. ▪ Yellow 5s flash; ▪ At least 5 nm range; ▪ 360° visibility; ▪ Synchronised; ▪ Located not less than 6 m and not more than 30 m above Highest Astronomical Tide (HAT), and below the lowest point of any arc of rotor blades; ▪ At least IALA Category 2 (> 99.0%); and ▪ At least 96 hours back up / Uninterrupted Power Supply (UPS) capability. 	<ul style="list-style-type: none"> ▪ IALA G1162 (IALA, 2021).
Hazard Warning Signals	Select peripheral structures	<ul style="list-style-type: none"> ▪ Located not less than 6 m and not more than 30 m above HAT; ▪ Minimum range of two 2 nm; ▪ Character Morse (U) 30s with a minimum duration for the short blast of 0.75s; and ▪ Operated when the meteorological visibility is 2 nm or less. 	<ul style="list-style-type: none"> ▪ IALA G1162 (IALA, 2021). ▪ Use as directed by CIL.

Project A4984

Client Sure Partners Limited

Title Arklow Bank Wind Park 2 Lighting and Marking Plan

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
AIS	Select peripheral structures	<ul style="list-style-type: none">At least IALA Category 3 (>97.0% availability).	<ul style="list-style-type: none">IALA G1162 (IALA, 2021).
ID marker boards	All structures	<ul style="list-style-type: none">ID system will be agreed with CIL and IRCG.ID panels with black letters on yellow background;Letters 1 m high;Visibility in all directions; andUse of either illumination or retroreflective material, noting any illumination will be hooded / baffled to avoid confusion with AtoN.	<ul style="list-style-type: none">IALA G1162 (IALA, 2021).
WTG paint	All structures	<ul style="list-style-type: none">Foundations painted yellow (RAL 1023) all round from HAT to a height of at least above 15 m HAT; andRemainder painted light grey (RAL 7035).	<ul style="list-style-type: none">IALA G1162 (IALA, 2021); andIndustry standard.

Table 25.6.3: Operational Phase Substations Marine Lighting and Marking Summary

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
SPS	All OSPs	<ul style="list-style-type: none"> If directed by CIL, marking of OSP as SPS (see Table 25.6.2) 	<ul style="list-style-type: none"> IALA G1162 (IALA, 2021).
ID marker boards	All OSPs	<ul style="list-style-type: none"> ID system will be agreed with CIL and IRCG. ID panels with black letters on yellow background; Letters 1 m high; Visibility in all directions; and Use of either illumination or retroreflective material, noting any illumination will be hooded / baffled to avoid confusion with AtoN. 	<ul style="list-style-type: none"> IALA G1162 (IALA, 2021).
Substation paint	All OSPs	<ul style="list-style-type: none"> Foundations painted yellow (RAL 1023) all round from HAT to a height of at least above 15 m HAT; and Remainder painted light grey (RAL 7035), excludes topside 	<ul style="list-style-type: none"> IALA G1162 (IALA, 2021); and Industry standard.

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
		structures such as work cabins, cranes etc.	
Operational buoyage	Outside Array Area	<ul style="list-style-type: none"> ▪ Based on consultation input from CIL (see Section 2.3), cardinal marks or special marks may be required during the operational phase, depending on the overarching cumulative picture. ▪ This may be the establishment of new cardinal /special marks, or the alteration of position of currently existing cardinal marks. ▪ Requirements will be discussed with CIL prior to the operational phase. 	<ul style="list-style-type: none"> ▪ IALA R1001 – The IALA Maritime Buoyage System. Edition One. (IALA, 2017) ▪ Potential CIL requirement based on consultation (Section 2.3).

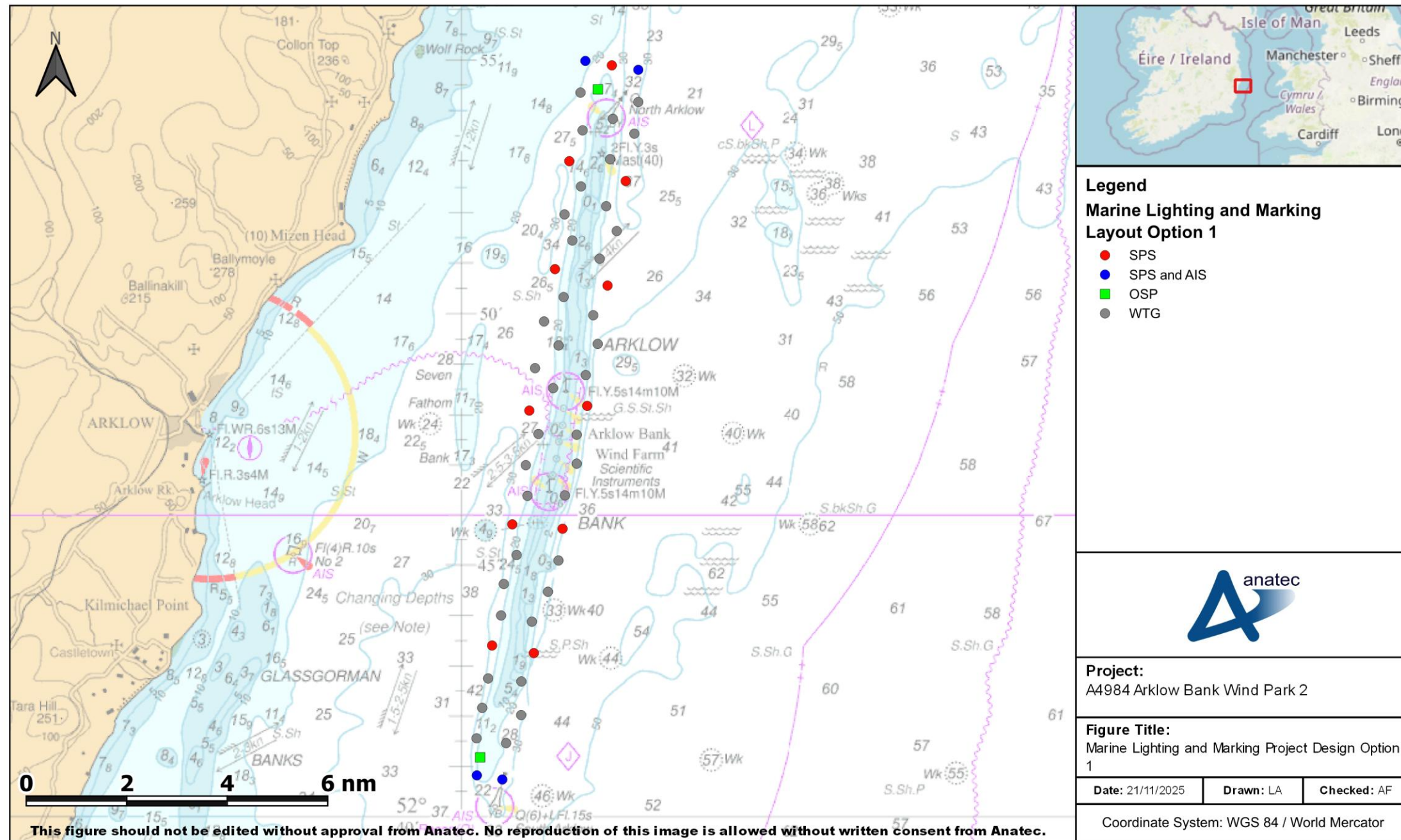


Figure 25.6.2: Marine Operational Lighting and Marking, Project Design Option 1

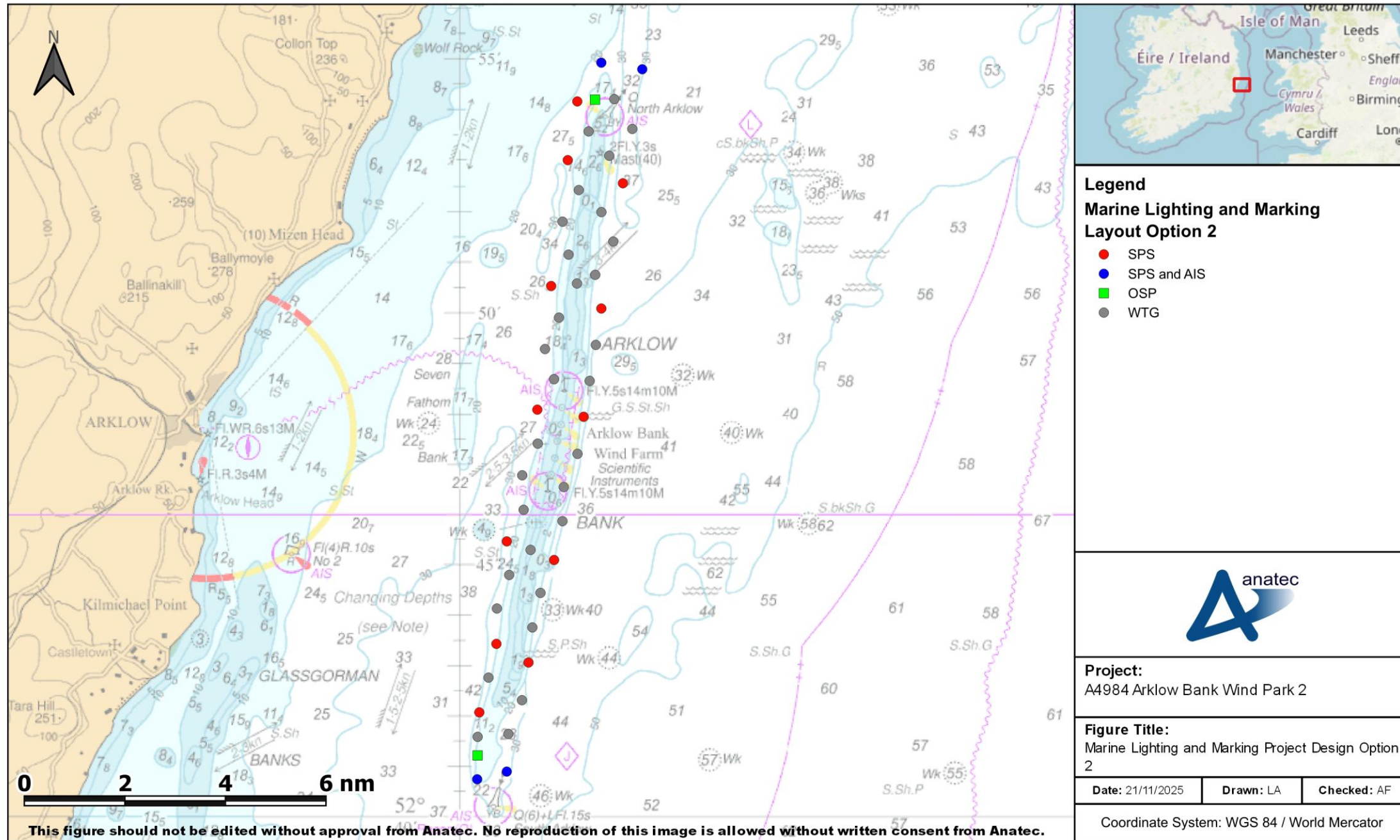


Figure 25.6.3: Marine Operational Lighting and Marking, Project Design Option 2

4.2 Aviation

The aviation operational lighting and marking to be implemented for the WTGs and OSPs are summarised in Table 25.6.4 and Table 25.6.5, respectively. These include a guidance column listing the relevant guidance / stakeholder for each lighting and marking aspect where appropriate, noting that this guidance provides the full technical specifications required by the relevant stakeholders. The proposed aviation lighting and marking is then illustrated in Figure 25.6.4 for Layout Option 1 and Figure 25.6.5 for Layout Option 2.

The key IAA guidance is ASAM No 18 (IAA, 2015), which provides aviation lighting requirements for offshore wind farms that are not located:

- within 8 nm of publicly licensed aerodromes;
- within 32 nm of Air Navigation Services Radar and other radio navigation facilities; or
- within 4 nm of any permanent offshore helipads.

The Array Area satisfies these criteria and therefore IAA guidance is ASAM No 18 (IAA, 2015) applies.

4.2.1 Failure of Aviation Lighting

ASAM No 18 (IAA, 2015) states that *“any light which fails shall be repaired or replaced as soon as is reasonably practicable. An alerting system for light failure will be put in place, such as remote monitoring or other suitable method agreeable to the IAA”*. Appropriate maintenance and reporting procedures will therefore be discussed and agreed with the IAA.

Table 25.6.4: Operational Phase WTGs Aviation Lighting and Marking Summary¹

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
Aviation warning lighting – IAA requirements	All SPS (select peripheral structures)	<p>In accordance with the International Civil Aviation Organisation Annex 14 standards, on a 24-hour basis, for High Intensity Type A lighting will be required. The hazard warning lights will have the following specification:</p> <ul style="list-style-type: none"> ▪ Mounted on the highest point practicable of the structure; <p>White with flash rate of 40-60 flashes per minute;</p> <ul style="list-style-type: none"> ▪ Effective intensity of: <ul style="list-style-type: none"> ▪ 200,000 cd ± 25% when background luminance above 500 cd per square metre (m²); 	<p>ASAM No 18 (IAA, 2015)</p> <p>It is noted that as per Section 2.3, IAA have indicated during consultation that there are potential intentions to align with the approach taken in the wider EU or in the UK.</p>

¹ It is noted that IAA and DoD have differing colour, intensity and characteristic requirements for aviation lights (rows 1 and 2 of Table 25.6.4 respectively). Both sets of requirements have been included for reference, however it is expected that the final lighting and marking scheme will use just one of these sets of requirements for aviation lighting in consultation with IAA and DoD given the potential for confusion should both be utilised.

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
		<ul style="list-style-type: none"> ▪ 20,000 cd \pm 25% when background luminance between 50 and 500 cd/m²; and ▪ at least 2,000 cd when background luminance below 50 cd/m². ▪ Light fittings baffled so that practically no light will be emitted below the horizontal, or as otherwise agreed with the IAA; ▪ All lights across the array should flash in synchronisation and reductions in light intensity should occur simultaneously if practicable; and ▪ Visible through 360° in azimuth. ▪ Incandescent or compatible with Night Vision Imaging System (NVIS). 	
Aviation warning lighting – DoD requirements	All WTGs	<ul style="list-style-type: none"> ▪ Type B, Medium Intensity, Flashing Red obstacle light on the wind turbine nacelle, with a minimum output of 2,000 cd, which is visible in all directions of azimuth and operational 24 hours for 365 days per year. 	DoD Correspondence November 2025

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
		<ul style="list-style-type: none"> ▪ A second Type B, Medium Intensity, Flashing Red obstacle light on the nacelle, which serves as an alternate to the primary light described above, in case of failure of the primary operating obstacle light. The primary and alternate lights should be installed to assure that the output of either light is not blocked by the other. ▪ Three Type E, Low Intensity, Flashing Red obstacle lights at an intermediate level of half the nacelle height, that are configured to flash at the same rate as the light on the nacelle. ▪ Incandescent or compatible with NVIS. If NVIS, obstacle lighting should emit light at the near IR range of the electromagnetic spectrum, specifically at or near 850 nanometres of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light. 	

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
SAR lights	All structures	SAR lighting is an MCA requirement for UK projects under MGN 654. Specifications shown as per MGN 654: <ul style="list-style-type: none"> ▪ 200 cd red light, steady when in use off otherwise; ▪ 360° visibility; and ▪ Compatible with NVIS. 	MGN 654 (MCA, 2021)
Blade markings	All WTGs	Specification under MGN 654: <ul style="list-style-type: none"> ▪ Red marks (preferably dots) at 10, 20 and 30 m from hub end; ▪ Displayed near trailing edge of blades; ▪ Contrasting colour to blades, recommended red (RAL 3020); ▪ Minimum 600 millimetres (mm) in diameter however may need to be larger dependent on overall size, shape of turbine and blades; and ▪ Blade tip also marked in red (RAL 3020), approximately 2% of blade length. 	MGN 654 (MCA, 2021)

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
ID markings	All WTGs	<ul style="list-style-type: none"> ID numbers will be marked on the WTG nacelle roofs. ID system will be agreed with CIL and IRCG. Not less than 1.5 m in height, with proportional width. 	MGN 654 (MCA, 2021)
Hoist area lighting and markings	UK standards under CAP 437 (CAA, 2023) will be applied, subject to agreement with IAA.		

Table 25.6.5: Operational Phase Substation Aviation Lighting and Marking Summary

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
SAR Lights	All OSPs	SAR lighting is an MCA requirement for UK projects under MGN 654. Specifications shown as per MGN 654: <ul style="list-style-type: none"> 200 cd red light, steady when in use off otherwise; 	MGN 654 (MCA, 2021)

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
		<ul style="list-style-type: none"> ▪ 360° visibility; and ▪ Compatible with NVIS. 	
ID Markings	All OSPs	<ul style="list-style-type: none"> ▪ ID numbers will be marked on the WTG nacelle roofs. ▪ ID system will be agreed with CIL and IRCG. ▪ Not less than 1.5 m in height, with proportional width. 	MGN 654 (MCA, 2021)
Hoist Area Markings	UK standards under CAP 437 (CAA, 2023) will be applied, subject to agreement with IAA.		

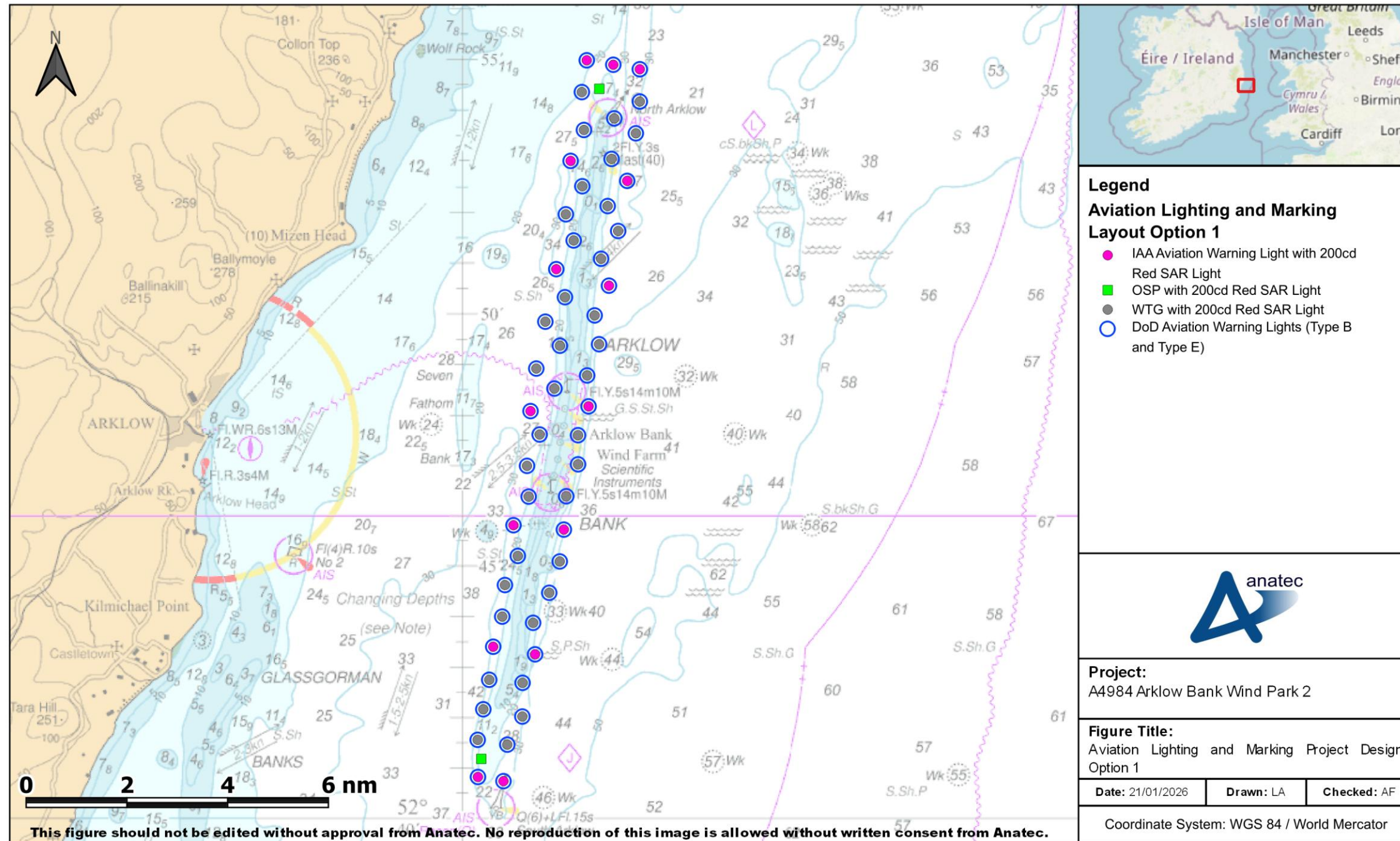


Figure 25.6.4: Aviation Operational Lighting and Marking, Project Design Option 1²

² It is noted that IAA and DoD have differing colour, intensity and characteristic requirements for aviation lights. Both sets of requirements have been included in the LMP for reference, however it is expected that the final lighting and marking scheme will use just one of these sets of requirements for aviation lighting in consultation with IAA and DoD given the potential for confusion should both be utilised.

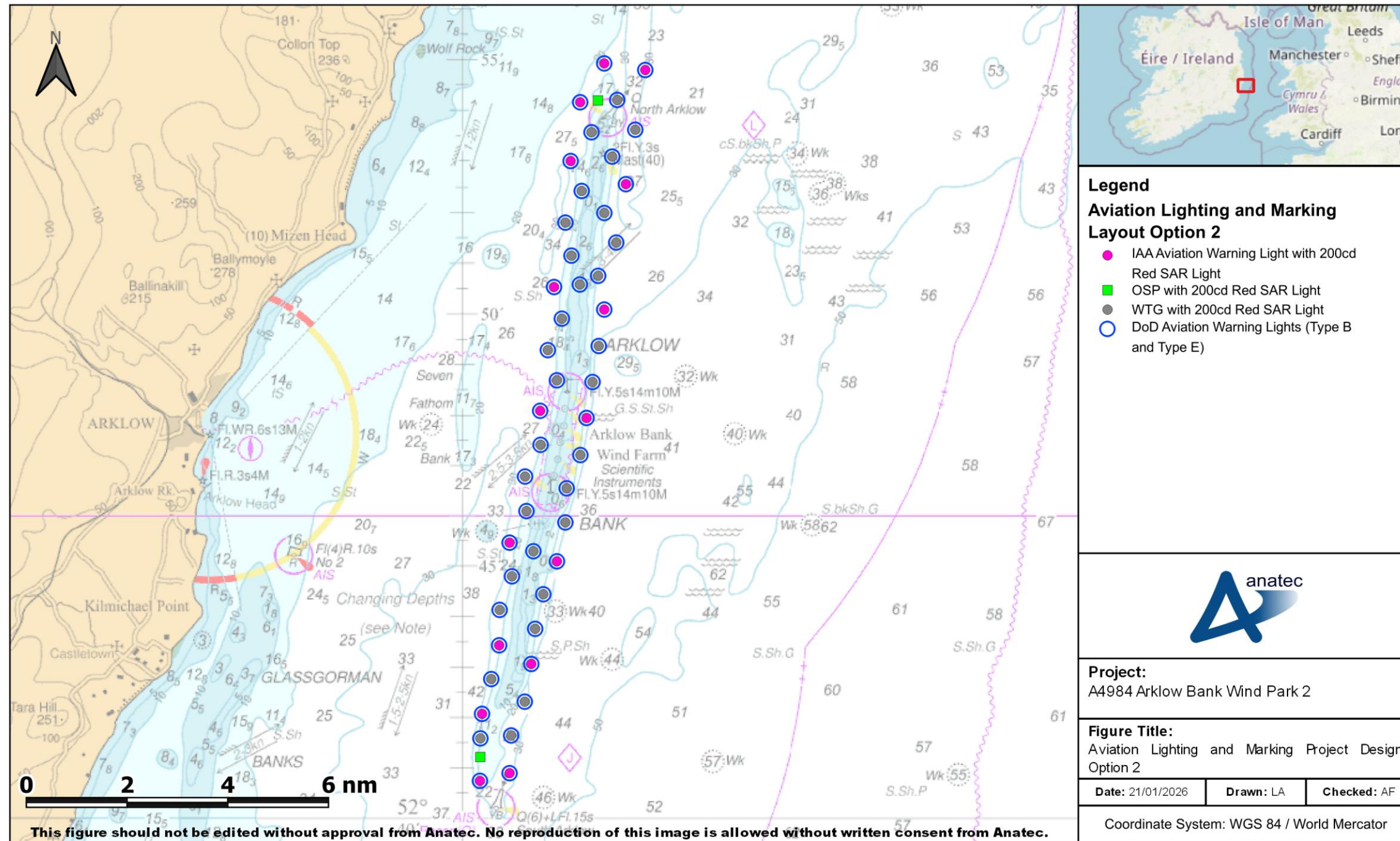


Figure 25.6.5: Aviation Operational Lighting and Marking, Project Design Option 2³

³ It is noted that IAA and DoD have differing colour, intensity and characteristic requirements for aviation lights. Both sets of requirements have been included in the LMP for reference, however it is expected that the final lighting and marking scheme will use just one of these sets of requirements for aviation lighting in consultation with IAA and DoD given the potential for confusion should both be utilised.

5 References

CAA (2023). CAP 437. Standards for Offshore Helicopter Landing Areas.

DoT (2025). Guidance on Safety of Navigation & Emergency Response: Offshore Renewable Energy Installations.

IAA (2005). S.I. No. 215/2005 - IAA (Obstacles To Aircraft in Flight) Order, 2005.

IAA (2015). IAA Guidance Material on Off-Shore Wind Farms, ASAM No 18, Issue 2.

IALA (2017). IALA R1001 – The IALA Maritime Buoyage System. Edition One.

IALA (2021). Recommendations O-139 on the Marking of Man-Made Offshore Structures.

IALA (2021). Guidance G1162 on the Marking of Man-Made Offshore Structures.

MCA (2021). MGN 654 (M+F) Offshore Renewable Energy Installations safety response. Southampton: MCA.

MCA (2024). MGN 654 SAR Annex 5: Offshore Renewable Energy Installations: Requirements, guidance and operational considerations for SAR and Emergency Response. Southampton: MCA.