Spiorad na Mara Offshore Wind Farm

Offshore Project

Environmental Impact Assessment Report

Outline Lighting and Marking, Volume 3

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1 INTRODUCTION

1.1 OVERVIEW

1.1.1.1 This Outline Lighting and Marking Plan (LMP) has been produced along with the Environmental Impact Assessment Report (EIAR) for the proposed Spiorad na Mara Offshore Wind Farm Project (hereafter referred to as 'the Offshore Project') and aims to address the specific requirements of an LMP of the Section 36 Consents granted by the Scottish Ministers to Spiorad na Mara Limited (referred to as "the Applicant") under section 36 of the Electricity Act 1989 (s.36).

1.1.1.2 The Outline LMP outlines the approach and detail around lighting and marking, ensuring environmental compliance and minimising impacts on marine receptors.

1.1.2 PROJECT BACKGROUND

1.1.2.1 The Applicant is proposing to develop the Project. The Project is an offshore wind farm (OWF) that will consist of up to 60 fixed-bottom wind turbine generators (WTGs).

1.1.2.2 The Project will include both offshore and onshore infrastructure. This Management Plan supports the application for the offshore components of the Project as outlined in **Chapter 1: Introduction, Volume 1a** of the EIAR. The offshore components of the Project (the Offshore Project) includes all infrastructure and activities located seaward of Mean High Water Springs (MHWS) within the Array Area and Offshore Cable Area of Search (OCAS) (**Figure 1.2: Offshore Project Location, Volume 1b** of the EIAR). Further detailed information is provided in **Chapter 3: Project Description, Volume 1a** of the EIAR.

1.1.2.3 The Offshore Project is situated off the northwest coast of Isle of Lewis/*Eilean Leòdhais* and the Array Area is located approximately 5-13 kilometres (km) offshore and is approximately 161 square kilometres (km^2) in size. It will comprise WTGs, foundations, Offshore Cables, Offshore Substation Platform (OSP) (if required), and Landfall. The Array Area combined with the OCAS is defined as the Offshore Project Boundary. The water depths across the Array Area range from 37 metres (m)-67 m with the southwest corner of the Array Area reaching 72 m. The proposed WTGs and fixed foundations will be located within a Turbine Area of approximately 140 km^2, within the Array Area.

1.1.2.4 The EIAR accompanies applications for offshore consents, licences and permissions for the Offshore Project to Marine Directorate - Licensing Operations Team (MD-LOT) under s.36 of the Electricity Act 1989 and the Marine (Scotland) Act 2010, for the offshore infrastructure seaward of MHWS.

1.1.2.5 There are 2 sets of Environmental Impact Assessment (EIA) regulations applicable to the Offshore Project: the Electricity Works (EIA) (Scotland) Regulations 2017 for offshore generating stations

requiring s.36 consent; the Marine Works (EIA) (Scotland) Regulations 2017 for marine licence applications within Scottish territorial waters (0-12 nautical miles (nm)) respectively.

1.2 PURPOSE OF THE OUTLINE LIGHTING AND MARKING PLAN

1.2.1.1 The Outline LMP forms the basis of the Final LMP, which will be developed and submitted post-consent as part of condition discharge prior to construction. The Final LMP will be approved by Scottish Ministers in accordance with the s.36 and associated Marine Licences.

1.2.1.2 This Outline LMP is submitted as part of the Environmental Impact Assessment (EIA) application for the Spiorad na Mara Offshore Wind Farm. The structure and content of this outline plan are designed to address the requirements of both marine licenses associated with the Project:

- Generation Marine License: Covering the offshore wind generation assets, as required under Section 36 of the Electricity Act 1989;
- OFTO Marine License: Covering the Offshore Transmission Owner (OFTO) assets, specifically the offshore substation platform (OSP) and export cable infrastructure.

1.2.1.3 The outline plan provides a unified framework that encompasses both the generation and transmission elements of the Project. Following submission of the EIA and determination of consent, the outline plan will be split into separate, final management plans tailored to the specific requirements of each marine license application. Each final plan will be developed in accordance with the relevant license conditions and will be submitted for approval to MD-LOT.

1.2.1.4 This approach ensures that all outline management plans submitted as part of the EIA application are comprehensive, consistent, and capable of being adapted to meet the specific regulatory requirements of the generation and OFTO marine licenses once these are issued.

1.2.1.5 The broad objectives of the Outline LMP are as follows:

- To detail marine and aviation navigational lighting and marking of the Offshore Project during the construction and O&M phases;
- To discharge the offshore consent conditions relevant to the LMP in the s.36 consent and associated conditions in the Marine Licences which requires the submission of an LMP detailing how the Offshore Project will be lit and marked.

1.2.1.6 This document will be further developed post-consent, once the final design and construction methods are confirmed. This Outline LMP should also be read in conjunction with:

- **Chapter 3: Project Description, Volume 1a**;
- **Chapter 16: Shipping and Navigation, Volume 2a** (due to consideration of marine lighting and marking of the Offshore Project);
- **Chapter 17: Military and Civil Aviation, Volume 2a** (due to consideration of aviation lighting and marking of the Offshore Project);

- **Chapter 18: Seascape, Landscape and Visual Impact Assessment, Volume 2a** (due to consideration of land-facing lights);
- **Chapter 20: Other Sea Users and Recreation, Volume 2a** (due to consideration of marine lighting and marking of the Offshore Project);
- **Chapter 25: Summary of Offshore Mitigation/Statement of Offshore EIA Commitments, Volume 2a**.

1.2.1.7 The Outline LMP is supported by the following appendices and figures:

- **Appendix 16.1: Navigational Risk Assessment, Volume 2c;**
- **Outline Navigational Safety and Vessel Management Plan, Volume 3;**
- **Figures 16-1 to 16-5** in **Chapter 16: Shipping and Navigation figures, Volume 2b.**

1.2.1.8 The Final LMP shall state the legislative requirements; current standards of practice and best practice measures that define the standard of construction practice adhered to by the Contractors. However, adhering to the Final LMP does not absolve the Applicant, or its third-party Contractors or Subcontractors from complying with legislation and bylaws relevant to their construction activities.

1.3 LEGISLATION AND GUIDANCE

1.3.1.1 The LMP has been developed with reference to the following key legislation and guidance:

- International Organization for Marine Aids to Navigation (IALA) Recommendation R0139 The Marking of Man-Made Structures (IALA, 2021);
- IALA Guideline G1162 The Marking of Offshore Man-Made Structures (IALA, 2022);
- IALA Recommendation R1001 The IALA Maritime Buoyage System (MBS) (IALA, 2023);
- IALA Guideline G1185 Enhancing the Safety and Efficiency of Navigation Around Offshore Renewable Energy Installations (OREI) (IALA, 2024);
- Marine Guidance Note (MGN) 654 Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response and its annexes (Maritime and Coastguard Agency (MCA), 2021);
- Standard Marking Schedule for Offshore Installations (Department for Business, Energy and Industrial Strategy (BEIS), 2011);
- The Air Navigation Order 2016 (ANO) (Civil Aviation Authority (CAA), 2016(a));
- Civil Aviation Policy (CAP) 393 Regulations made under powers in the Civil Aviation Act 1982 and the Air Navigation Order 2016 (CAA, 2021);
- CAP 437 – Standards for Offshore Helicopter Landing Areas (CAA, 2023);
- CAP 764 – Policy and Guidelines on Wind Turbines (CAA, 2016(b));
- Ministry of Defence (MoD) Obstruction Lighting Guidance (MoD, 2020).

1.4 SCOPE OF LIGHTING AND MARKING PLAN

1.4.1.1 The LMP will cover the following:

- Background to the LMP including the objectives, consent compliance and linkages with other management plans;
- A brief description of the Offshore Project (Section 2.3);
- The outcome of consultation that has been undertaken in relation to lighting and marking (Section 2.4);
- Marine and aviation lighting to be implemented during the construction phase (Section 2.5);
- Marine and aviation lighting to be implemented during the operation and maintenance (O&M) phase, including protocol in the event of marine lighting failure (Section 2.6);
- Maintenance of aids to navigation (AtoNs) including monitoring, testing and availability (Section 2.7);
- Emergency procedures including loss of aids to navigation, the use of guard vessels, and aviation lighting failure (Section 2.8).

1.5 IMPLEMENTATION OF THE OUTLINE LIGHTING AND MARKING PLAN MANAGEMENT PLAN

1.5.1.1 This Management Plan will be submitted for approval to the Scottish Ministers / Licensing Authority and other stakeholders in relation to monitoring compliance with the specific requirements of the relevant consent conditions.

1.5.1.2 During construction activities this Management Plan will be monitored by the Applicant's Construction Manager (or equivalent), Environmental Manager (or equivalent), and MD-LOT.

1.6 OTHER RELATED MANAGEMENT PLAN

1.6.1.1 The Outline LMP and Final LMP will be developed with consideration of the content and requirements of other relevant Management Plans. These are set out in **Table 1-1** with details of the linkages.

Table 1-1 Other related Management Plans to the Outline LMP

Management Plan	Licence / consent conditions	Linkage with LMP
Outline Offshore Operation and Maintenance Plan	'[To be added post-consent]'	The plan provides the overarching framework for environmental management during the operation and maintenance phase of the Offshore Project.
Marine Pollution Contingency Plan	'[To be added post-consent]'	Provides mitigation measures for marine mammals that may be affected by pollution incidents. The MPCP will coordinate with MMMP where relevant.
Marine Mammal Mitigation Plan (MMMP)	'[To be added post-consent]'	Provides mitigation measures for marine mammals that may be affected by pollution incidents. The MPCP will coordinate with MMMP where relevant.
Offshore Invasive Non-Native Species Mitigation Plan	'[To be added post-consent]'	Provides measures to prevent and manage INNS. Pollution incidents will be assessed for potential INNS risks.
Fisheries Mitigation Monitoring and Communication Plan	'[To be added post-consent]'	Outlines communication protocols and mitigation measures for interactions with commercial fisheries. The MPCP will manage and coordinate pollution incidents affecting fisheries with this strategy.
Outline Offshore Written Scheme of Investigation (WSI)	'[To be added post-consent]'	Sets out procedures for marine archaeology. The MPCP will ensure pollution incidents do not compromise archaeological sites.
Outline Navigational Safety and Vessel Management Plan	'[To be added post-consent]'	Outline the approach and detail around navigational safety and vessel management, ensuring environmental compliance and minimising impacts on marine receptors.
Emergency Response and Cooperation Plan (ERCOP)	'[To be added post-consent]'	Will define coordination protocols for multi-hazard emergencies, including fire, collision, and pollution events. It supports compliance with MCA MGN 654 and will be appended to the Safety Zone Application. The MPCP will operate in conjunction with the ERCoP during complex or escalated incidents.
Decommissioning Plan	'[To be added post-consent]'	Will include pollution prevention and response measures during decommissioning. The MPCP will be updated accordingly.

2 LIGHTING AND MARKING PLAN

2.1 BACKGROUND

2.1.1.1 This document provides the Outline LMP, which gives an overview of the information which will be included in the LMP with detail provided at the pre-application stage where available. Where specifications are provided, they are indicative only and are subject to change following consent determination, confirmation of final project design and discussions with stakeholders relevant to the LMP. This Outline LMP is based on anticipated consent conditions, based on existing LMP requirements, and will be updated and finalised post-consent once final Offshore Project details are confirmed.

2.1.1.2 The LMP will be produced at the post-consent stage, in advance of the construction of the Offshore Project, and will be agreed with the relevant authorities including the Northern Lighthouse Board (NLB), the MCA, the CAA, and the MoD. The LMP will be produced in accordance with the principles, objectives, and guidance provided in this Outline LMP. This will ensure the safe navigation of vessels and aircraft that operate within and in proximity to the Offshore Project, as well as satisfying regulatory requirements and guidance on the marking of offshore infrastructure.

2.1.1.3 The LMP will be applicable to elements of the Offshore Project seaward of MHWS, with the Onshore Project (landward of Mean Low Water Springs (MLWS)) subject to distinct consent conditions via a separate application. All the construction personnel, contractors, and sub-contractors involved in the Offshore Project will be expected to comply with the LMP. The Applicant will ensure that the through-life aspects of the LMP (i.e. maintenance, availability and emergency procedures) will be audited and monitored for compliance. This will include provision of availability information to the NLB, as per Section 2.7.5.

2.1.1.4 The Applicant will also be required to submit a Decommissioning Programme in accordance with Section 105(2) of the Energy Act 2004 and the 'Decommissioning of Offshore Renewable Energy Installations in Scottish waters or in the Scottish part of the Renewable Energy Zone under The Energy Act 2004: Guidance notes for Industry (in Scotland)' (Scottish Government, 2022). The Applicant has committed to providing a Decommissioning Programme when appropriate for the project, see Commitment M020. The LMP will be updated prior to decommissioning in line with the Decommissioning Programme.

2.2 CONSENT COMPLIANCE

2.2.1.1 At this stage, Marine Licence consent conditions are unknown as these will be agreed with MD-LOT following the application determination stage. The LMP will fulfil the consent conditions required for the Offshore Project. **Table 2-1** provides an indication for where the relevant Marine Licence conditions will be stated within the LMP post-consent. The relevant sections of the LMP will also be

highlighted in **Table 2-1** where the management plan addresses specific requirements of the consent conditions.

Table 2-1: Consent Conditions Relevant to the LMP

Consent Reference	Condition	Relevant Section in LMP
[To be added post-consent]		

2.3 PROJECT DESCRIPTION

2.3.1.1 The Offshore Project is a proposed offshore wind farm located off the northwest coast of the Isle of Lewis/*Eilean Leòdhais* approximately 5-13 km offshore. 2 options are being considered for the transmission assets of the Offshore Project, these are as follows:

- Scenario 1 – Array cables will connect the WTGs to an OSP which is connected to the Onshore Landfall location by up to 2 offshore export cables;
- Scenario 2 – Up to 12 Array Cables to Landfall will connect the WTGs directly to the Onshore Landfall location.

2.3.1.2 The Offshore Project will comprise:

- Up to 60 WTGs with fixed-bottom foundations;
- Up to 1 OSP (under Scenario 1);
- Up to 12 array cables of 160 km in total length (under Scenario 1);
- Up to 2 export cables of 30 km in total length (under Scenario 1);
- Up to 12 Array Cables to Landfall of 350 km in total length (under Scenario 2).

2.3.1.3 The layout to be utilised by the Offshore Project will be determined post-consent. The MCA and NLB will be consulted to ensure the final layout is satisfactory from a navigational safety perspective. The indicative layout utilised for the EIAR will be presented in **Plate 2.1,** this plate will be updated post-consent to present the final array layout in the LMP. It is noted that the final layout of surface piercing infrastructure will be contained entirely within the Offshore Project Boundary and in particular the Turbine Area (i.e. for WTGs and OSP).

[Plate showing final array layout including ID system to be added post-consent]

Plate 2.1: Overview of Final Layout

2.4 GUIDANCE AND CONSULTATION

2.4.1 GUIDANCE

2.4.1.1 The marine navigation lighting and marking to be detailed in Section 2.5.1 and Section 2.6.2 will be discussed in consultation with both NLB and the MCA post-consent, and will apply the guidance documents listed in Section 1.3.

2.4.1.2 The aviation lighting and marking to be detailed in Section 2.5.2 and 2.6.3 follows the requirements set out in the guidance documents listed in Section 1.3.

2.4.2 CONSULTATION

Outline Version

2.4.2.1 This Outline LMP has been informed by consultation undertaken with Shipping and Navigation stakeholders, and in particular a dedicated meeting with the NLB held on 06 August 2025.

2.4.2.2 NLB have agreed that, given the positive benefit in relation to the Seascape, Landscape, and Visual Impact Assessment (SLVIA), shore-facing SPS lights may use a range of 2 nm rather than the nominal range of 5 nm and this will not adversely impact upon the safety of navigation. Other parameters such as flash sequence could also be considered if they serve as mitigation for the SLVIA.

Post-Consent

2.4.2.3 In addition to consideration and compliance with the relevant guidance, the preparation of the LMP post-consent will also be informed by consultation undertaken with the NLB, MCA, CAA, and MoD as key stakeholders of relevance to lighting and marking.

2.4.2.4 Such consultation will involve the issuing of draft proposed layouts with associated lighting and marking proposals, which will be updated following feedback received and amendments to the layout. Following submission to MD-LOT, consultation will be carried out by MD-LOT with stakeholders as described in the consent's conditions listed in **Table 2-1**.

2.5 CONSTRUCTION PHASE

2.5.1 MARINE LIGHTING AND MARKING

2.5.1.1 During the construction phase, temporary lighting and marking of the Offshore Project is required as an industry standard mitigation, noting that G1162 (IALA, 2022) recommends specific consideration of the construction phase. Guidance documents and their general specifications relating to the lighting and marking of offshore structures were identified in Section 1.3. This section specifically highlights lighting and marking requirements to be implemented during the

construction phase, which will be agreed and finalised post-consent with the relevant stakeholders including the NLB, as outlined in Section 2.4.

2.5.1.2 Construction buoyage will be established at least 4 weeks prior to the commencement of construction of the Offshore Project, and will remain in place until the operational lighting and marking requirements have been installed, inspected, and approved by the NLB.

2.5.1.3 **Table 2-2** presents the indicative marine lighting and marking requirements as detailed by industry standards or applicable guidance documents, noting that the guidance provides the full technical specifications required by the relevant stakeholders, and will be updated following final design post-consent. **Table 2-3** will present the positions and specifications of the individual construction buoys, with **Plate 2.2** showing their positions relative to the final layout of the Array Area post-consent.

Table 2-2: Construction Phase Lighting and Marking

Lighting and Marking Aspect	Relevant Structures	Indicative Specifications	Relevant Guidance/Stakeholder Requirements
Temporary construction lighting (WTG and OSP)	All structures	• IALA special mark characteristics (Fl.Y.2.5s); • 360° visibility; • Minimum 2 nm range.	Industry Standard
Construction buoyage – numbers and types	N/A	[Details of construction buoyage required to be added post-consent – expected to be combination of cardinal and special marks]	Standard NLB Requirement IALA R1001
Construction buoyage removal	N/A	• Construction buoyage removed once the NLB have provided written approval of the operational lighting and marking on the structures.	IALA R1001

Table 2-3: Construction Buoyage Positions and Specifications

Buoy	ID	Location		Light and Top Mark Specification
		Latitude (Degrees Decimal Minutes (DDMM.mm)	Longitude (DDMM.mm)	
[Details to be added post-consent]				

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[Plate showing construction buoyage relative to the final array layout to be added post-consent]

Plate 2.2: Construction Buoyage

2.5.2 AVIATION LIGHTING AND MARKING

2.5.2.1 There will be no specific aviation lighting and making implemented during the construction phase, however relevant information relating to the Offshore Project will be promulgated to aviation stakeholders as required under the relevant CAA guidance (see Section 1.3) throughout the construction and O&M phases of the Offshore Project.

2.6 OPERATION AND MAINTENANCE

2.6.1.1 This section of the Outline LMP presents the marine and aviation lighting and marking to be implemented during the O&M phase of the Offshore Project. This will be updated as required post-consent during the finalisation of the LMP.

2.6.2 MARINE LIGHTING AND MARKING

2.6.2.1 The marine operational lighting and making to be implemented for the WTGs and OSP will be summarised in **Table 2-4** and **Table 2-5** respectively, and then illustrated in **Plate 2.3**.

2.6.2.2 As per Section 2.4.2, NLB will be consulted on the marine lighting and marking scheme.

Failure of Marine Lighting

2.6.2.3 A requirement of the management of AtoNs within United Kingdom (UK) waters is to report navigation failures to the NLB (noting this does not include temporary lighting). This is done through a Local Aid to Navigation (LATON) Availability Reporting database. The system is administered by the NLB in order to assist wind farm operators to fulfil their responsibility to maintain records of AtoN availability and to provide summaries of these to the NLB. This should be undertaken in the event of any failure or loss of availability and should be carried out during both the construction and O&M phases as per the required availability standards.

2.6.2.4 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 the NLB and MCA to determine the need for any additional mitigation.

Table 2-4: O&M Phase Marine Lighting and Marking – WTGs

Lighting and Marking Aspect	Relevant Structures	Indicative Specifications	Relevant Guidance/Stakeholder Requirement
Significant Peripheral Structure (SPS) lighting	[Relevant structures to be added post-consent when final layout is agreed]	• Synchronised flashing IALA special mark characteristics (Fl.Y.5s); • 360° visibility; • Between 6 m and 30 m above Highest Astronomical Tide (HAT) and below arc of the rotor blades; • Minimum 5 nm range but reduced to 2 nm for shore-facing SPS lights following agreement with NLB; • IALA Category 1 availability (greater than 99.8%); • Uninterrupted Power Supply (UPS) of 96 hours.	IALA R0139 / G1162 and standard requirement
Intermediate Peripheral Structure lighting		• Synchronised flashing yellow lights (distinct characteristic from SPS); • 360° visibility; • Between 6 m and 30 m above HAT and below arc of the rotor blades; • Minimum 2 nm range; • IALA Category 1 availability (greater than 99.8%); • UPS of 96 hours.	IALA R0139 / G1162 and standard requirement
Sound signals		• Located between 6 m and 30 m above HAT; • Minimum range of 2 nm; • Sound signal of the morse character 'U' every 30 seconds (s); • Minimum 0.75 s short blast; • Operational when visibility is 2 nm or less; • IALA Category 3 (at least 97.0% availability).	IALA R0139 / G1162 and standard requirement

Lighting and Marking Aspect	Relevant Structures	Indicative Specifications	Relevant Guidance/Stakeholder Requirement
Visibility meters		• Signal activation when visibility is less than 2 nm.	IALA R0139 / G1162 and standard requirement
Automatic Identification System (AIS)		• IALA Category 3 (at least 97.0% availability).	Regulator Requirement
ID marker boards		• Lit via low-level baffled lighting which can be remotely controlled; • Black letters on yellow background; • 360° visibility; • Readable by an observer stationed 3 m above sea level at 150 m from WTG.	MGN 654
WTG paint		• Painted traffic yellow (RAL 1023) between HAT and a minimum of 15 m above HAT; • Painted light grey (RAL 7035) upwards of the point where traffic yellow ends.	IALA R0139 / G1162 and standard requirement

Table 2-5: O&M Phase Marine Lighting and Marking – OSP

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance/Stakeholder Requirement
ID marker boards	OSP	• Lit via low-level baffled lighting which can be remotely controlled; • Black letters on yellow background; • 360° visibility; • Readable by an observer stationed 3 m above sea level at 150 m from OSP.	MGN 654
OSP paint	OSP	• Painted traffic yellow (RAL 1023) from HAT and for entire structure foundation; • Painted light grey (RAL 7035) for topside, excluding topside structures such as work cabins, cranes, ladders and other working areas.	IALA R0139 / G1162 and standard requirement

[Plate showing marine operational lighting and marking locations for the final array layout to be added post—consent]

Plate 2.3: Marine Operational Lighting and Marking

2.6.3 AVIATION LIGHTING AND MARKING

2.6.3.1 The aviation operational lighting and marking to be implemented for the WTGs and OSP will be summarised in **Table 2-6** and **Table 2-7**, respectively, and then illustrated in **Plate 2.4**. 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.

2.6.3.2 In the event that a spare location is used, and the unviable position is on the periphery (meaning that a peripheral WTG shown in **Plate 2.4** is not installed), consultation would be undertaken with the CAA to determine if any aspects of the aviation scheme require updating.

Table 2-6: Aviation Lighting and Marking for the O&M Phase of the Offshore Project – WTGs for the Outline Lighting and Marking Plan

Lighting and Marking Aspect	Relevant Structures	Indicative Specifications	Relevant Guidance/Stakeholder Requirement
Aviation warning lighting (dual purpose for warning lights and Search and Rescue (SAR) lights)	Peripheral structures	• Red, medium intensity light displayed at night[1]; • 2,000 Candela (cd) when visibility is less than 5 km; • 200 cd when visibility is at least 5 km in all directions; • Located as close to the top of the nacelle as possible; • Simultaneous flash the Morse character 'W'; • Compatible with Night Vision Imaging System (NVIS); • UPS of 8 hours.	ANO (CAA, 2016(a)) CAP 764 (CAA, 2016(b)) MGN 654 SAR Annex 5 (MCA, 2021)
Aviation warning lighting visibility meters	[Relevant structures to be added post-consent when final layout is agreed]	• 2,000 cd when visibility is less than 5 km; • 200 cd when visibility at least 5 km in all directions.	CAA Standard Requirement CAP 764 (CAA, 2016(b))
SAR lights	All WTGs	• Red 200 cd light; • Steady when in use at the MCA's request, switched off otherwise; • 360° visibility; • Compatible with NVIS.	MGN 654 SAR Annex 5 (MCA, 2021)
Green heli-hoist light	All WTGs	• Green, low intensity light; • Steady to indicate WTG is safe for a hoisting operation; • Flashing to indicate WTG is preparing for a hoisting operation;	CAP 437 (CAA, 2023)

[1] Definition of day/night as per ANO (CAA, 2016(a))

Lighting and Marking Aspect	Relevant Structures	Indicative Specifications	Relevant Guidance/Stakeholder Requirement
		• Off when WTG is not safe for a hoisting operation; • 360° visibility.	
Blade markings	All WTG blades	• Marks placed on each blade side at 10 m, 20 m and 30 m from the blade root, in a contrasting colour; • At least 600 millimetres (mm) with red dot referred; • Placed at trailing edge of the blade.	MGN 654 SAR Annex 5 (MCA, 2021)
Blade tip markings	All WTG blades	• Approximately 2% of total blade length in contrast to rest of blade.	MGN 654 SAR Annex 5 (MCA, 2021)
ID markings (nacelle)	All WTGs	• WTG ID numbers displayed on roof of nacelles; • ID numbers at least 1.5 m height and proportional width.	MGN 654 SAR Annex 5 (MCA, 2021) CAP 764 (CAA, 2016(b))
Heli hoist markings	These are not covered within this plan but should meet the standards set out in the following guidance documents and in consultation with the appropriate authorities: • CAA CAP 764 – Policy and Guidelines on Wind Turbines (CAA, 2016); • CAA CAP 437 – Standards for Offshore Helicopter Landing Areas (CAA, 2021); Consultation with Helicopter Certification Agency (MCA and CAA).		

Table 2-7: Aviation Lighting and Marking for the O&M Phase of the Offshore Project – OSPs

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance/Stakeholder Requirement
SAR lights	OSP	• Red 200 cd light; • Steady when in use at the MCA's request, switched off otherwise; • 360° visibility;	MGN 654 SAR Annex 5 (MCA, 2021)

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance/Stakeholder Requirement
		• Compatible with NVIS.	
Green heli-hoist light	OSP	• Green, low intensity light; • Steady to indicate OSP is safe for a hoisting operation; • Flashing to indicate OSP is preparing for a hoisting operation; • Off when OSP is not safe for a hoisting operation; • 360° visibility.	CAP 437 (CAA, 2023)
ID markings	OSP	• OSP ID numbers displayed on topside; • ID numbers at least 1.5 m height and proportional width.	MGN 654 SAR Annex 5 (MCA, 2021) CAP 764 (CAA, 2016(b))
Hoist area markings	These are not covered within this plan but should meet the standards set out in the following guidance documents and in consultation with the appropriate authorities: • CAA CAP 764 – Policy and Guidelines on Wind Turbines (CAA, 2016); • CAA CAP 437 – Standards for Offshore Helicopter Landing Areas (CAA, 2021). Consultation with Helicopter Certification Agency (MCA and CAA).		

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[Plate showing aviation operational lighting and marking locations for the final array layout to be added post—consent]

Plate 2.4: Aviation Operational Lighting and Marking

2.7 MAINTENANCE OF AIDS TO NAVIGATION

2.7.1.1 The following subsections summarise the maintenance associated with the AtoNs that will be installed at the Offshore Project.

2.7.2 MONITORING OF AIDS TO NAVIGATION ON STRUCTURES

2.7.2.1 Monitoring of AtoNs on structures for both the functionality and availability of AtoNs will be undertaken throughout the construction and O&M phases. Downtime will be monitored remotely during the O&M phase (via the Supervisory Control and Data Acquisition (SCADA) system) and visually during the construction phase (via support vessels). From this, the overall availability will be calculated. Monitoring will include general maintenance to ensure marine growth etc. does not impact functionality.

2.7.3 MONITORING OF AIDS TO NAVIGATION ON BUOYAGE

2.7.3.1 During construction, remote monitoring will alert the operative to failure of a marine AtoN. Upon discovery of an extinguished AtoN, the emergency procedures outlined in Section 2.8 will be initiated.

2.7.4 TESTING

2.7.4.1 Following the commissioning of all marine AtoNs, they will be tested at least once per annum. Sound signals will be equipped with functionality whereby they can be manually overridden in order to undertake annual testing.

2.7.5 AVAILABILITY

2.7.5.1 To assist in meeting the required IALA availability standards of any given marine AtoN, remote monitoring will be used to ensure that any faults can be rectified as soon as possible.

2.7.5.2 The data collected through remote monitoring of AtoN will be used to calculate the overall availability of AtoN to ensure that IALA availability standards are being adhered to. Availabilities will be reported to NLB via their AtoN Reporting Online Portal.

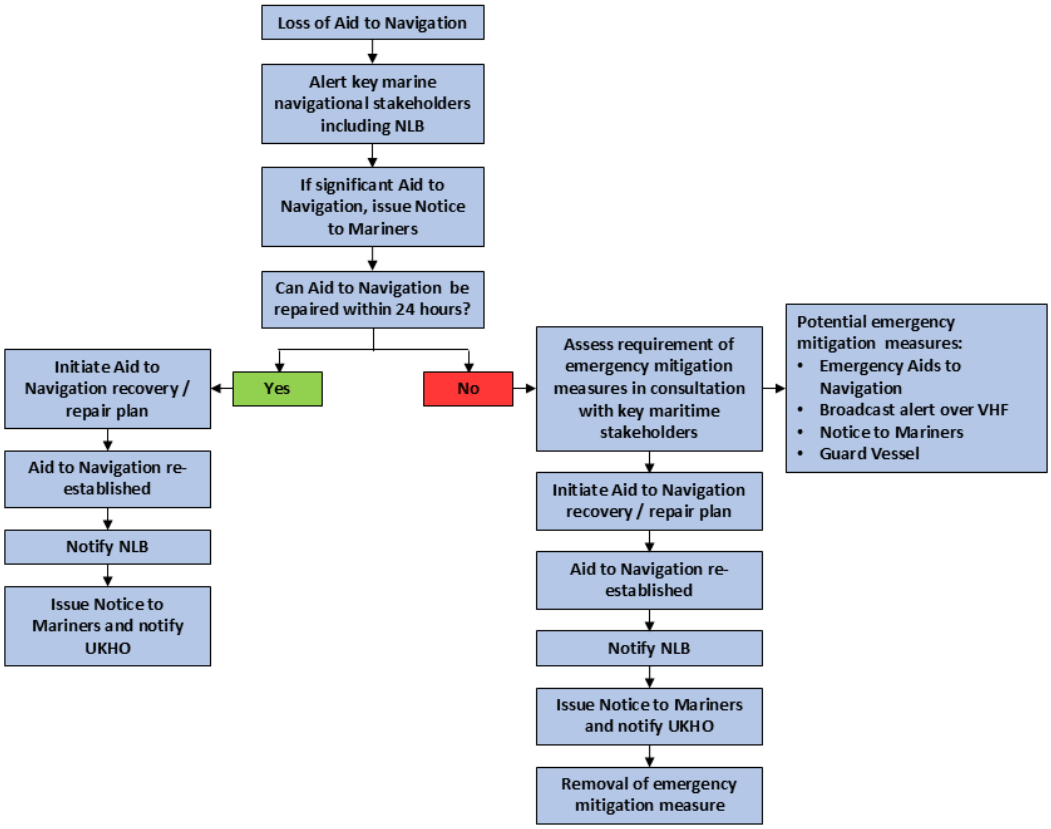
2.8 EMERGENCY PROCEDURES

2.8.1 LOSS OF AIDS TO NAVIGATION

Marine Aids to Navigation

2.8.1.1 Upon discovery of the loss of an AtoN which included marine navigation lights, fog signals or buoys (or part thereof), the protocol illustrated in **Plate 2.5** will be initiated.

Plate 2.5: Protocol for the Loss of an AtoN



2.8.1.2 A requirement of AtoN management within UK waters is to report navigational failures to NLB. This is done through the AtoN Reporting Online Portal (see Section 2.7.5). This is an online database administered by NLB in order to assist wind farm operators (as the local authority for the wind farm AtoN) to fulfil their responsibility to maintain records of AtoN availability and to provide summaries of these to NLB. This should be undertaken by the Applicant's marine coordination centre in the event of any failures or loss of availability. Additionally, the United Kingdom Hydrographic Office (UKHO) should be notified of remedial works through the Notice to Mariners process.

2.8.1.3 In the rare event of a significant loss of one or more AtoN, a guard vessel may be required to maintain navigational safety. Section 2.8.2 provides an indicative list of trigger points that would require the Applicant to liaise with NLB and potentially implement additional emergency mitigations which may also require informing the MCA.

2.8.2 GUARD VESSEL TRIGGER POINTS

2.8.2.1 It is the responsibility of the wind farm operator to maintain the AtoN and provide any backup solutions in case of an AtoN failure. This will include repair of a broken AtoN, replacement of lost AtoN, and provision of a guard vessel. **Table 2-8** will summarise the emergency mitigation measure provision agreement in place, including the party that will be responsible for the repair or replacement of AtoN (including those on structures and navigational buoys).

Table 2-8: Summary of Emergency Mitigation Measures

Emergency Mitigation Measure	Organisation Responsible for Provision	Relevant Contact Details			Service Provision
		Address	Phone	Fax	
[Details to be added post-consent]					

2.8.3 AVIATION LIGHTING

2.8.3.1 The ANO states that "*in the event of the failure of any light which is required by this article to be displayed by night the person in charge must repair or replace the light as soon as reasonably practicable.*"

2.8.3.2 It is accepted that there may be occasions when meteorological or sea conditions prohibit the safe transport of personnel for repair tasks. Furthermore, there may be fault conditions that are wider ranging and would take longer to diagnose or repair. In such cases, international standards and recommended practices require the issue of a Notice to Airmen (NOTAM).

2.8.3.3 The CAA's Directorate of Airspace Policy considers the operator of an offshore wind farm as an appropriate person for the request of a NOTAM relating to the lighting of their wind farm. Should the anticipated outage be greater than 36 hours, the Applicant will request a NOTAM to be issued by informing the NOTAM section of the UK Aeronautical Information Service as soon as possible via the CAA's Airspace Regulation (AROps@caa.co.uk / 0207 453 6599).

2.8.3.4 Upon completion of the remedial works, the Aeronautical Information Service will be notified as soon as possible to enable a cancellation to be issued.

2.8.3.5 If an outage is expected to last longer than 14 days, then the CAA will also be notified directly to discuss any issues that may arise and longer-term strategies.

2.8.3.6 In order to expedite the dissemination of information during active aviation operations, the Applicant may also establish a direct communication method with aviation operators in the area. The information provided will be the same as the information provided in the NOTAM and where possible include a NOTAM reference.

2.9 COMPLIANCE WITH THE APPLICATION

2.9.1.1 In addition to the offshore consent conditions presented in Section 2.2, other consent conditions which have also been considered will be outlined in **Table 2-9**, including where they will be addressed within the LMP.

Table 2-9: Compliance with the Offshore Project EIAR

Commitments	**Where Addressed**
M010 – Compliance with MGN 654 and its annexes including development and implementation of a SAR Checklist, ERCoP and guard vessels as required by risk assessment.	[Details to be added post-consent]
M011 – The Offshore Project inclusive of surface piercing structures and subsea cables will be appropriately charted on Admiralty and aeronautical charts, and information on structure positions and heights will be provided to the UKHO.	
M014 – Marking and lighting of the Array Area in agreement with NLB and as per the requirements of IALA Recommendation O-139 (IALA, 2021a) and Guidance G1162 (IALA, 2021b). This will include a buoyed construction area.	
M016 – Wind turbines blade clearance of at least 28.33 m above Mean High Water Springs (MHWS) (30 m above Mean Sea Level (MSL)).	
M017 – Information regarding construction to be provided to the CAA in accordance with ANO Article 225A at least 8 weeks in advance of the erection or removal of the en route obstacle (whether an anemometer mast, turbine or installation crane/vessel, etc). Data to include location, height (of all structures over 100 m), date of erection, date of removal and lighting type; changes to the planned works must also be notified to the CAA in accordance with ANO Article 225A. The CAA co-ordinates dispersion of the	

Commitments	Where Addressed
information to NATS and the MOD for inclusion as required in the UK AIP and the UK Military AIP.	

2.10 GLOSSARY OF TERMS AND ABBREVIATIONS

2.10.1.1 A list of key terms and acronyms used in this appendix are provided in **Table 2-10** and **Table 2-11**.

Table 2-10 Acronyms and abbreviations

Term	Definition
AIS	Automatic Identification System
ANO	The Air Navigation Order 2016
AtoN	Aid to Navigation
BEIS	Department for Business, Energy and Industrial Strategy
CAA	Civil Aviation Authority
CAP	Civil Aviation Policy
cd	Candela
DDMM.mm	Degrees Decimal Minutes
EIAR	Environmental Impact Assessment Report
ERCoP	Emergency Response Cooperation Plan
HAT	Highest Astronomical Tide
IALA	International Organization for Marine Aids to Navigation
ID	Identification
IPS	Intermediate Peripheral Structure
km	Kilometres
km^2	Square Kilometre
LATON	Local Aid to Navigation Availability Reporting database
LMP	Lighting and Marking Plan
m	Metre
MBS	Maritime Buoyage System
MCA	Maritime and Coastguard Agency
MD-LOT	Marine Directorate – Licensing Operations Team
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
mm	Millimetre
MoD	Ministry of Defence
NLB	Northern Lighthouse Board
nm	Nautical Mile
NOTAM	Notice to Airmen
NSVMP	Navigational Safety and Vessel Management Plan
NVIS	Night Vision Imaging System
O&M	Operation and Maintenance

Term	Definition
OCAS	Offshore Cable Area of Search
OREI	Offshore Renewable Energy Installation
OSP	Offshore Substation Platform
OWF	Offshore Wind Farm
s	Second
s.36	Section 36
SAR	Search and Rescue
SCADA	Supervisory Control and Data Acquisition
SLVIA	Seascape, Landscape, and Visual Impact Assessment
SPS	Significant Peripheral Structure
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
UPS	Uninterrupted Power Supply
WTG	Wind Turbine Generator

Table 2-11 Glossary

Term	Meaning
Applicant	Spiorad na Mara Limited (the Project owner)
Array Area	Total area within which offshore wind turbine generators, associated foundations, array cables and offshore substations platform Offshore Substation Platform (OSP) (if required) will be located.
Array Cables	The offshore cables that connect the Wind Turbine Generators (WTGs) to each other and terminate at the Offshore Substation Platform (OSP), (if required)
Automatic Identification System	A system by which vessels automatically broadcast their identity, key statistics including location, destination, length, speed, and current status, e.g., under power. Most commercial vessels and United Kingdom (UK)/European Union (EU) fishing vessels over 15 metre (m) length are required to carry AIS.
Export Cables	The offshore cables connecting the Offshore Substation Platform (OSP) to Landfall
Landfall	This consists of works from offshore Horizontal Directional Drill (HDD) exit pits to onshore at the Transition Joint Bays (TJB). The infrastructure and installation methods associated with the Landfall involves both onshore and offshore components.
Marine Guidance Note	A system of guidance notes issued by the Maritime and Coastguard Agency (MCA) which provide significant advice relating to the improvement of the safety of shipping at sea, and to prevent or minimise pollution from shipping.
Offshore Project	Components of the Project seaward of Mean High Water Springs (MHWS). Includes Array Area plus Offshore Cable Area of Search.

Term	Meaning
Offshore Substation Platform (OSP)	The optional offshore substation located within the Array Area. Includes the platform and associated components which allows the voltage to be increased to meet onward transmission requirements.
Project	To describe the Project as a whole, this includes all offshore and onshore components of the Project.
Turbine Area	A reduced area within the Array Area where above water surface infrastructure would be located i.e. Wind Turbine Generators (WTG) or Offshore Substation Platform (OSP). Developed and refined through environmental assessment.
Wind Turbine Generator (WTG)	The wind turbines that generate electricity consisting of tubular towers and blades attached to a nacelle housing mechanical and electrical generating equipment.

2.11 REFERENCES

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