
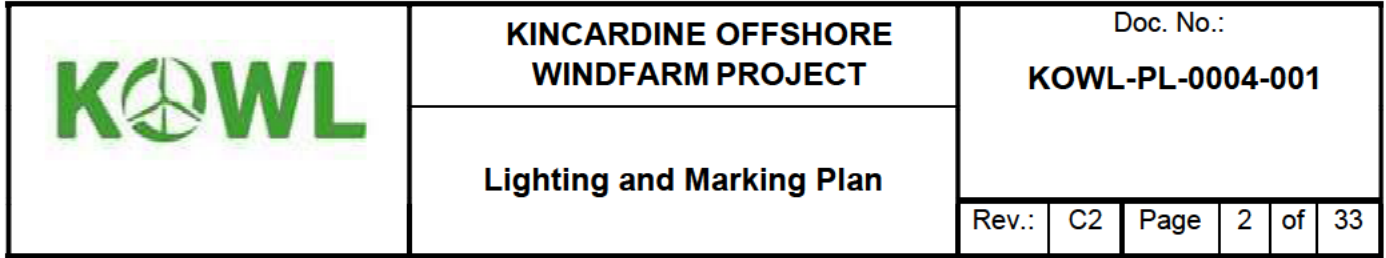


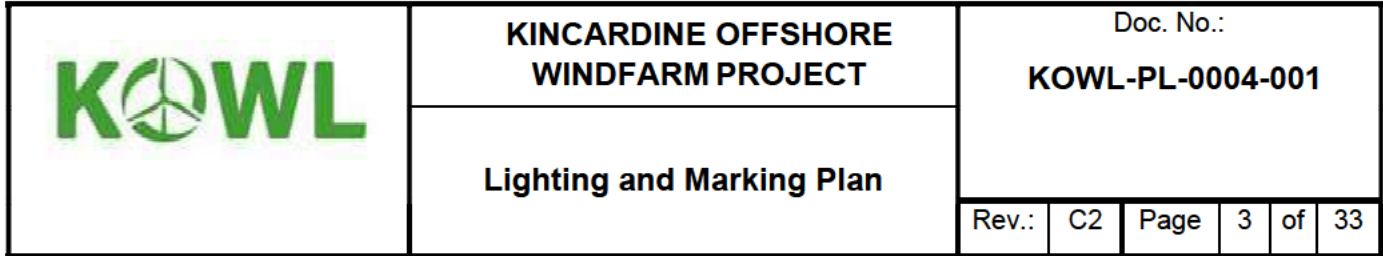
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LIGHTING AND MARKING PLAN KINCARDINE OFFSHORE WINDFARM PROJECT

| Prepared | Checked | Reviewed | Approved | ECoW Approved |
|-------------------------------|---|---|---|---|
| Apr 9, 2019 | Apr 9, 2019 | Apr 9, 2019 | Apr 9, 2019 | Apr 9, 2019 |
| Organisation: KOWL | Organisation: KOWL | Organisation: KOWL | Organisation: KOWL | Organisation: KOWL |
| Name / signature: Redacted | Name / signature: Redacted Redacted | Name / signature: Redacted Redacted | Name / signature: Redacted Redacted | Name / signature: Redacted Redacted |
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***Purpose of Issue: for information, for review, for approval**

[illegible]




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ACRONYMS & ABBREVIATIONS

| | |
|----------|---|
| AIP | UK Aeronautical Information Publication |
| AIS | Automatic Identification System |
| ANO | Air Navigation Order |
| AtoN | Aid to Navigation |
| CAA | Civil Aviation Authority |
| cd | Candela |
| DGC | Defence Geographic Centre |
| HAT | Highest Astronomical Tide |
| IALA | International Association of Lighthouse Authorities |
| IPS | Intermediate Peripheral Structure |
| KIS-ORCA | Kingfisher Information Service – Offshore Renewable & Cable Awareness |
| KOWL | Kincardine Offshore Windfarm Limited |
| LMP | Lighting and Marking Plan |
| MCA | Maritime and Coastguard Agency |
| MGN | Marine Guidance Note |
| MoD | Ministry of Defence |
| MS-LOT | Marine Scotland Licensing Operations Team |
| MW | Mega Watt |
| m | Metre |
| NLB | Northern Lighthouse Board |
| nm | Nautical Mile |

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| NSP | Navigational Safety Plan |
| NOTAM | Notice to Airmen |
| OFCOM | Office of Communications |
| OREI | Offshore Renewable Energy Installation |
| RYA | Royal Yachting Association |
| RYAS | Royal Yachting Association Scotland |
| s | Second |
| SAR | Search and Rescue |
| SCADA | Supervisory control and data acquisition |
| SPS | Significant Peripheral Structure |
| UK-AIS | UK Aeronautical Information Service |
| UKHO | United Kingdom Hydrographic Centre |

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1. INTRODUCTION

1.1. Purpose of the Document

This document has been created to satisfy Condition 18 of the Section 36 Consent issued by the Marine Scotland Licensing Operations Team (MS-LOT) to Kincardine Offshore Wind Ltd (KOWL) for the Kincardine Offshore Windfarm (the Project).

Condition 18 requires the production of a Lighting and Marking Plan (LMP) to manage marine navigational and aviation safety during the construction and operation of the Project. The submission of the LMP has to be no later than six months prior to the Commencement of the Development.

1.2. Scope of Document

This document details the lighting and marking used on the Development, which has been designed to ensure the safety of passing marine and aviation users. The following have been considered within the document:

- Marine lighting;
- Buoyage;
- Other marine Aids to Navigation (AtoN) during operation;
- Painting and signage during operation;
- Aviation lighting during construction and operation;
- Reporting of availability and failure to lighting and marking.

1.3. Amending and Updating of this Document


The nature of the construction process proposed for the Project, means that updates to this document may be required as the project progresses.

Where the need for an update or amendment is identified following approval from Marine Scotland Licensing Operations Team (MS-LOT), either through a consultation response, or due to practicalities arising as the project progresses, KOWL will communicate the suggested update/amendment to MS-LOT prior to editing the approved document.

This revision of the document has been produced to reflect amendments to the principal components of the Project.

1.4. Compliance Tracker

All conditions outlined in Table 4.2 and Table 4.3 will be captured in KOWL compliance tracker.

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2. PROJECT OVERVIEW

2.1. Summary

The Project is considered a commercial demonstrator site, which will utilise Windfloat™ floating wind technology and will be one of the world's first arrays of floating wind turbines. It has been included within the Survey, Deploy and Monitoring scheme for offshore renewable systems (similar to wave and tidal devices).

The Project is located south-east of Aberdeen approximately 8nm (15km) from the Scottish coastline, in a location with water depths of 60-80m.

The project is split into the following areas:

- The Offshore Development Area – the Wind Turbine Generators (WTG) and inter-array cables.
- The Offshore Export Cable Corridor – the area within which export cables will be laid, from the onshore area at Mean High Water Spring (MHWS).
- The Onshore Area – the onshore area above MHWS including the underground cables connecting to the onshore substation at Redmoss.

2.2. Turbine Locations.

The project originally had 8 locations, which has been reduced to 6 locations designated as follows;


Table 2-1 Location designation changes

| Location designation Pre-2019 | New location designation post 2019 |
|----------------------------------|---------------------------------------|
| KIN-01 | KIN-01 |
| KIN-02 | KIN-02 |
| KIN-03 | KIN-03 |
| KIN-04 | n/a |
| KIN-05 | n/a |
| KIN-06 | KIN-04 |
| KIN-07 | KIN-05 |
| KIN-08 | KIN-06 |

The position of the locations 'KIN-01' through to 'KIN-06' together with the key project boundaries are detailed in Appendix A in drawing KOWL-DR-0001-015.

This drawing is a controlled document and shall form the approved source for all coordinates in both UTM and Latitude/Longitude positions.

It must be stressed that the locations are the centre of the turbine and not the centre of the substructure.

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2.3. Project Design Life

The design life for the wind farm is 25 years.

2.4. Principal Components

The maximum generation capacity of the windfarm is capped at 50MW, the main difference between the various stages of the applications have been the number, size and rating of the turbines, together with the substructure type.

The Project will now consist of the following offshore components:

- 1 x 2MW WTG (currently in operation)
- 5 x 9.5MW WTG's (to be installed 2020)
- 5 x 33kv inter-array cables (to be installed 2020)
- 2 x export cables (one currently in operation)

It should be noted that the size of the substructure for the 9.5MW turbines is larger than the 2MW turbine.

2.5. Installed Components

The onshore sub-station has been completed.

The first deployment was a 2MW WTG and associated substructure, anchors and mooring lines in 2018 on location 'KIN-01'.


One export cable was also installed, through a Horizontal Directional Drilling (HDD) hole from landfall to circa 20m water depth and then along the export cable corridor to 'KIN-01' location.

A condition in the existing marine licence requires Third Party Certification or Verification (or suitable alternative as agreed, in writing, with the Licensing Authority) for all WTGs, mooring systems and WTG substructures prior to the commencement of the works.

2.6. Construction Programme Overview

The construction of the Project is anticipated to occur in two 'Tranches' in-line with the Programme outlined in the document "Construction Programme", KOWL-REP-0004-001.

One Tranche has been completed and the Construction Programme for the second tranche will be provided to Scottish Ministers prior to commencement of the construction as a requirement of the consent conditions.

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3. LIGHTING & MARKING SUMMARY

The lighting and marking of the turbine and substructure is summarised below in Figure 3.1

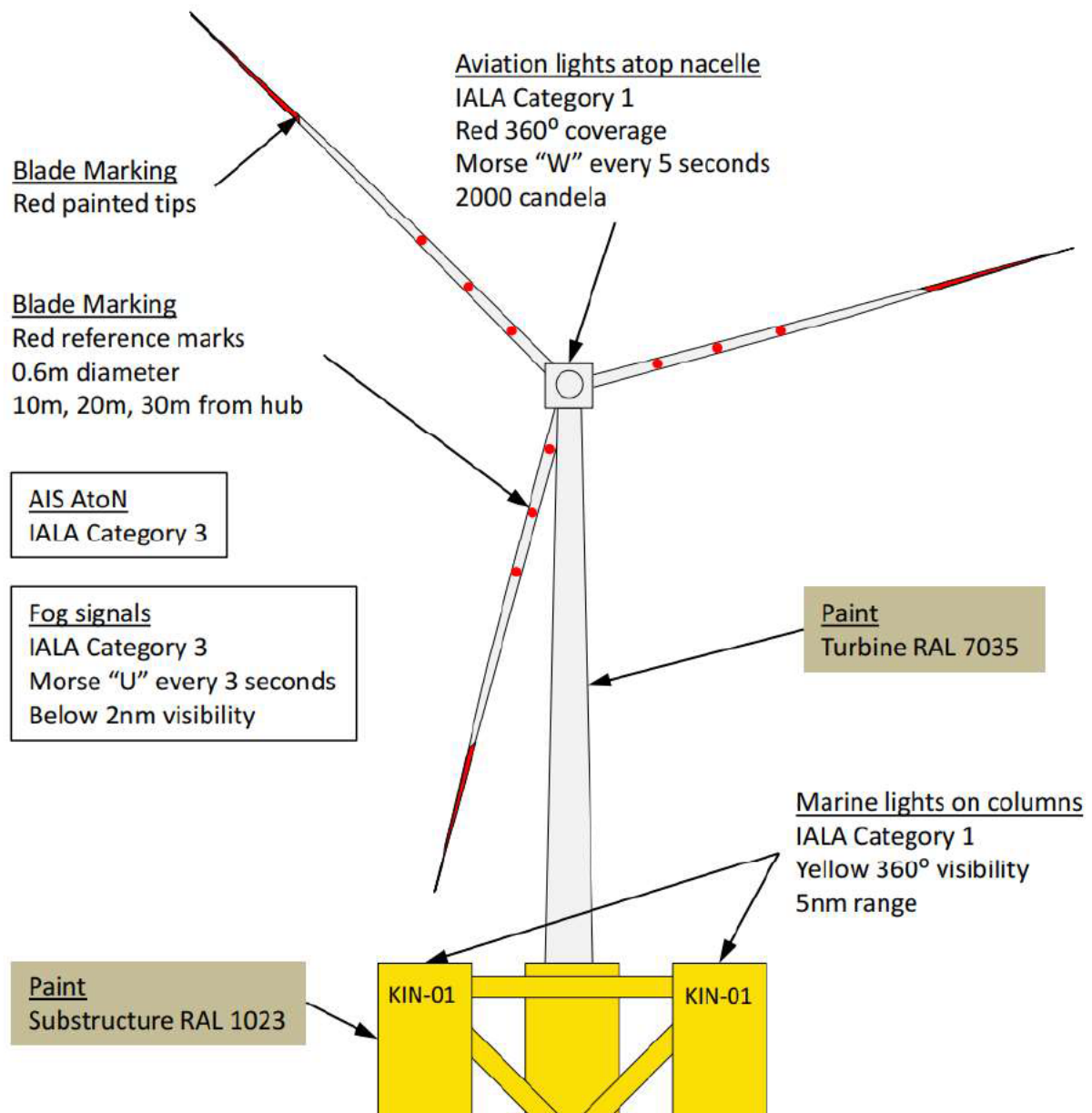



Figure 3.1 Lighting and Marking summary.

Full details, including consultation processes, are detailed within this document.

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4. CONSENT CONDITIONS

4.1. Consents Application History

This document focuses on the offshore elements only, as per Section 36 Consent and Marine Licences granted.


In April 2016 KOWL submitted applications for consent to construct and operate the Project, which included the Original ES. In September 2016 an addendum (referred to as the ES Addendum) to the Original ES, was also submitted. In March 2017 consent under Section 36 and Section 36A of the Electricity Act 1989 was granted.

Since consent was granted, there have been several necessary changes to the Project. Therefore, an application for a variation of the Section 36 consent granted by the Scottish Ministers under S36C of the Electricity Act 1989 was applied for in December 2017 (the 'Variation Application').

The table below outlines the application dates, relevant ES Documents and the components of the Project as were included in the Original Application and the Variation Application.

Table 4-1 Summary of document timelines

| Original Documents | Addendums | Variation | Variation |
|---|--|--|---|
| Date Submitted: March 2016 | Date Submitted: September 2016 | Date Submitted: November 2017 | Date Submitted: April 2018 |
| Original Application | Original Application | S36C Variation Application | S36C Variation Application |
| Kincardine Offshore Windfarm ES (Original ES) | ES Additional Information Addendum (ES Addendum) | Section 36C Variation ES (Variation ES) | Section 36C Variation ES (Variation ES) |
| Maximum generation capacity: 50MW | Maximum generation capacity: 50MW | Maximum generation capacity: 50MW | Maximum generation capacity: 50MW |
| WTGs: 8 x 6MW | WTGs: 8 x 6MW | WTGs: 1 x 2MW and 6 x 8.4MW | Individual turbine capacity removed. |
| Substructures: semi-submersible | Substructures: semi-spar | Substructures: combination of semi-submersible and semi-spar | Substructures: Semi-submersible. |
| Cables: 33kv inter-array and export cables | Cables: 33kv inter-array and export cables | Cables: 33kv inter-array and export cables | Cables: 33kv inter-array and export cables |

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4.2. Consents Conditions

This section provides the wording of the conditions relevant to the Lighting and Marking Plan, included within the S36 Consent and Marine License, and where they have been addressed within this document.

The relevant conditions within the S36 Consent are summarised in Table 4.2. Additional conditions pertinent to lighting and marking contained within the Marine License are then provided in Table 4.3.

Table 4.2 S36 Consent Condition relevant to Lighting and Marking


| Condition Number | Condition Wording | Where addressed in this document |
|---------------------------------|--|---|
| Condition 18 of the S36 Consent | <i>The Company must, no later than 6 months prior to the Commencement of the Development or at such a time as agreed with the Scottish Ministers, submit a Lighting and Marking Plan ("LMP"), in writing, to the Scottish Ministers for their written approval. Such approval may only be granted following consultation by the Scottish Ministers with the Maritime Coastguard Agency (MCA), Northern Lighthouse Board (NLB), Ministry of Defence (MoD), Civil Aviation Authority (CAA) and any such other advisors or organisations as may be required at the discretion of the Scottish Ministers.</i> | This LMP will be issued to the Scottish Ministers no later than six months prior to the Commencement of the second Tranche. |
| Condition 18 of the S36 Consent | <i>The LMP must provide that the Development be lit and marked in accordance with the current CAA and MoD aviation lighting policy and guidance that is in place as at the date of the Scottish Ministers approval of the LMP, or any such other documents that may supersede said guidance prior to the approval of the LMP. The LMP must also detail the navigational lighting requirements detailed in International Association of Lighthouse Authorities (IALA) Recommendation O-139 or any other documents that may supersede said guidance in place immediately prior to the approval of the LMP.</i> | <p>This LMP has been created in line with CAA, MoD, MCA, and NLB guidance as detailed in Section 5.1, including conformation with IALA O-139.</p> <p>Additional consultation undertaken to date with the relevant authorities has also been considered, as detailed in Section 5.2.</p> |

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| Condition Number | Condition Wording | Where addressed in this document |
|---------------------------------|---|--|
| Condition 18 of the S36 Consent | <i>The Company must provide the LMP, for information, to Aberdeen City Council, Scottish Natural Heritage, the Defence Geographic Centre (DGC) and any other bodies as may be required at the discretion of the Scottish Ministers.</i> | KOWL will provide a copy of this LMP to the relevant bodies if requested to do so by the Scottish Ministers. |

Table 4.3 Marine License Conditions relevant to Lighting and Marking


| Condition Number | Condition Wording | Where Addressed in this document |
|-------------------|---|--|
| Condition 3.1.13 | <p><i>If the assistance of a Government Department (to include departments of Administrations other than the Scottish Government) is required to deal with any emergency arising from:</i></p> <p><i>a) the failure to mark and light the Works as required by this licence;</i></p> <p><i>b) the maintenance of the Works; or</i></p> <p><i>c) the drifting or wreck of the Works,</i></p> <p><i>to include the broadcast of navigational warnings, then the Licensee is liable for any expenses incurred in securing such assistance.</i></p> | KOWL will ensure the Development is marked and lit as set out in the final, approved LMP, and accept liability for any expenses arising as a result of the failure to do so. |
| Condition 3.2.2.3 | <i>The Licensee must, no later than 7 days prior to Commencement of the Works, notify the UK Hydrographic Office ("UKHO") of the proposed Works to facilitate the promulgation of maritime safety information and updating of Admiralty charts BA741 and BA743 and publications through the national Notice to Mariners system.</i> | Details of the promulgation of information to marine stakeholders which will be undertaken are provided in Section 6.2, including notification to the UKHO. |

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| Condition Number | Condition Wording | Where Addressed in this document |
|-------------------|---|---|
| Condition 3.2.2.3 | <p><i>The Licensee must, no later than 14 days prior to Commencement of the Works and prior to any turbines being towed to the site, ensure that airmen are aware of the Works through local Notice to Airmen ("NOTAM") or by any other appropriate means.</i></p> <p><i>The Licensee must notify the DGC (mail to dvof@mod.uk) of the locations, heights and lighting status of the turbines, the estimated dates of construction and the maximum height of any construction equipment to be used, no later than 10 weeks prior to the Commencement of the Works, to allow for the appropriate notification to the relevant aviation communities. The DGC must be updated when the actual dates of construction are known.</i></p> | The information that will be provided to aviation stakeholders is detailed in Section 6.2. |
| Condition 3.2.2.3 | <i>The Licensee must, prior to Commencement of the Works, complete an "Application for Statutory Sanction to Alter / Exhibit" form and submit this to the NLB for the necessary sanction to be granted.</i> | As stated in Section 6.1, KOWL will request Statutory Sanction as appropriate prior to the Commencement of the Works. |
| Condition 3.2.3.3 | <i>The Licensee must notify the UKHO of the progress of the Works to facilitate the promulgation of maritime safety information and updating of Admiralty charts BA741 and BA743 and publications through the national Notice to Mariners system.</i> | Details of the promulgation of information to marine stakeholders which will be undertaken are provided in Section 6.1, including notification to the UKHO. |

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| Condition 3.2.3.3 | <i>The Licensee must, in the case of damage to, or destruction or decay of, the Works, notify the Licensing Authority, in writing, as soon as reasonably practicable following such damage, destruction or decay. The Licensee must carry out any remedial action as required by the Licensing Authority, and intimated to the Licensee in writing, which may include any requirement to display aids to navigation, following consultation with the MCA, the NLB or any such advisers as required by the Licensing Authority.</i> | KOWL will agree all planned lighting and marking with the NLB and MCA prior to the finalisation of this LMP. KOWL will comply with any additional requests for AtoNs from the NLB and MCA arising from any damage, destruction, or decay associated with Project. |
| Condition 3.2.3.3 | <i>The Licensee must ensure that any vessels permitted to engage in the Works are marked in accordance with the International Rules for the Prevention of Collisions at Sea whilst under way and in accordance with the UK Standard Marking Schedule for Offshore Installations if the vessel is secured to the seabed.</i> | All vessels associated with the construction or operation of Project will comply with marking requirements as adopted by the Flag State, most notably the International Rules for the Prevention of Collisions at Sea (COLREGS 1972), as stated in Section 6.3. |
| Condition 3.2.3.3 | <i>The Licensee must ensure that no radio beacon or radar beacon operating in the marine frequency bands is installed or used on the Works without the prior written approval of the Office of Communications ("OfCom").</i> | Applications for the use of transmission equipment as AtoNs will be issued to OfCom prior to their operation, as detailed in Section 6.8. |

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| Condition Number | Condition Wording | Where Addressed in this document |
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| Condition 3.2.3.4 | <p><i>The Licensee must ensure that the Works are marked and lit in accordance with the requirements of the MCA, NLB, the CAA and the Ministry of Defence ("MoD") at all times and such markings and/or lighting must be continued unless and until such time as the Licensing Authority, by notice, relevantly varies this licence under section 30(3)(c) of the 2010 Act.</i></p> <p><i>The Licensee must not display any marks and lights additional to those required by virtue of this licence and as agreed in the LMP without the written approval of the Licensing Authority following consultation with the NLB, the CAA, the MoD and the MCA.</i></p> | This LMP will be agreed and approved with the relevant authorities, and will be adhered to following its completion. |
| Condition 3.2.3.4 | <i>The Licensee must ensure that the Works are marked and lit in accordance with IALA Recommendation O-139.</i> | As stated in Section 5.1, this LMP has been informed by IALA O-139 (2013). |
| Condition 3.2.3.4 | <i>The turbines must be lit with a single 2000 candela (cd), red aviation light, flashing Morse 'W' in unison with all other turbines and in accordance with the Civil Aviation Authority Air Navigation Order Part 28 Lights and Lighting (220).</i> | Section 7 details lighting and marking relevant to aviation users. The lighting plan proposed is compliant with the requirement of red aviation lights. |

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| Condition Number | Condition Wording | Where Addressed in this document |
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| Condition 3.2.3.4 | <i>Turbines 4 & 5, as specified in the Application, must be fitted with synchronised sound signals with a nominal range of two nautical miles, placed not less than 6 metres and not more than 30 metres above sea level. The character must be rhythmic blasts corresponding to morse letter 'U' every 30 seconds. The minimum duration of the short blast must be 0.75 seconds and the sound signal must be operated when the meteorological visibility is two nautical miles or less. The sound signal must comply with IALA recommendations and have an availability of not less than 97.0% (IALA Category 3), calculated over a rolling 3 year period.</i> | <p>During consultation undertaken since the issue of the Marine License conditions (see Section 5.2), the NLB requested all seven turbines be fitted with sound signals due to the seasonal approach to construction. Therefore, as stated in Section 6.7, all turbines will be fitted with sound signals satisfying the specifications listed in the original condition, with certain signals then turned off upon final commissioning of the Project.</p> <p>Note that due to Location id changes the relevant turbines are now 3 & 4.</p> |
| Condition 3.2.3.4 | <i>Each turbine must display identification panels with black letters or numbers 1 metre high on a yellow background visible in all directions. These panels shall be easily visible in daylight as well as at night, either by the use of illumination or retro-reflecting material.</i> | The proposed Identification (ID) marking of each turbine location is given in Section 6.5, and is compliant with the requirements set out in this condition. |

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| Condition 3.2.4.3 | <p><i>The Licensee must notify the UKHO of the Completion of the Works to facilitate the promulgation of maritime safety information and updating of Admiralty charts BA741 and BA743 and publications through the national Notice to Mariners system.</i></p> <p><i>The Licensee must, within 1 calendar month of the Completion of the Works, provide the "as-built" positions and maximum heights of all turbines along with any sub-sea infrastructure, to the UKHO for aviation and nautical charting purposes.</i></p> <p><i>The Licensee must ensure that local mariners, fishermen's organisations and HM Coastguard, in this case Aberdeen Coastguard Operations Centre, are made fully aware of the Completion of the Works.</i></p> <p><i>The Licensee must ensure that the Completion of the Works is promulgated in the Kingfisher Fortnightly Bulletin to inform the Sea Fish Industry.</i></p> | Details of the promulgation of information to marine stakeholders which will be undertaken are provided in Section 6.2. |
| Condition 3.2.4.3 | <p><i>The Licensee must, where any damage, destruction or decay is caused to the Works, notify the Licensing Authority, in writing, of such damage, destruction or decay as soon as reasonably practicable following such damage, destruction or decay. The Licensee must carry out any remedial action which the Licensing Authority advises the Licensee, in writing, as requiring to be taken, which may include a requirement to display aids to navigation, following consultation by the Licensing Authority with the MCA, the NLB or any such advisers as required.</i></p> | Following completion of construction, KOWL will comply with any additional requests for AtoNs from the NLB and MCA arising from any damage, destruction, or decay associated with Project. |

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| Condition Number | Condition Wording | Where Addressed in this document |
|-------------------|--|---|
| Condition 3.2.4.3 | <i>The Licensee must ensure that no radio beacon or radar beacon operating in the Marine frequency bands is installed or used on the Works without the prior written approval of OfCom.</i> | Applications for the use of transmission equipment as AtoNs will be issued to OfCom prior to their operation, as detailed in Section 6.8. |
| Condition 3.2.4.3 | <i>The Licensee must not exhibit, alter or discontinue navigational lighting of the Works without the Statutory Sanction of the Commissioners of Northern Lighthouses. An 'Application for Statutory Sanction to Exhibit/Discontinue' form must be completed by the Licensee as fully as possible and returned to the Northern Lighthouse Board via e-mail to navigation@nlb.org.uk for the necessary sanction to be granted prior to exhibiting, altering or discontinuing navigational lighting.</i> | KOWL will not exhibit, alter, or remove any AtoNs without first receiving Statutory Sanction from the NLB, as stated in Section 6.1. |
| Condition 3.2.4.5 | <p><i>The Licensee must ensure that the Works are marked and lit in accordance with the agreed LMP and the requirements of the MCA, NLB, CAA and MoD at all times and such marking and/or lighting must be continued unless and until such time as the Licensing Authority, by notice, relevantly varies this licence under section 30 of the 2010 Act.</i></p> <p><i>The Licensee must ensure that the Works are marked and lit in accordance with IALA Recommendation O-139.</i></p> | <p>As set out in Section 5.1, this LMP has been created in line with MCA, NLB, CAA and MoD requirements, and is in accordance with IALA O-139 Recommendations.</p> <p>KOWL commits to adhering to the final approved version of this LMP.</p> |

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5. GUIDANCE AND CONSULTATION

5.1. Guidance and Legislation

This document has been created in order to be compliant with the relevant guidance on the lighting and marking of the offshore wind farm for both marine and aviation users. The guidance considered is listed below:

- International Association of Lighthouse Authorities (IALA) O-139 – The Marking of Man-Made Offshore Structures (IALA 2013);
- Maritime and Coastguard Agency (MCA) Marine Guidance Note (MGN) 543 - Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA 2016);
- CAP 764 (Feb 2016) Civil Aviation Authority (CAA) Policy and Guidelines on Wind Turbines (CAA 2016a);
- CAP 393 (Aug 2016) Air Navigation: The Order (ANO) and the Regulations (CAA 2016b);
- CAP 437 (Dec 2016) Standards for Offshore Helicopter Landing Areas (CAA 2016c); and
- Ministry of Defence (MoD) Obstruction Lighting Guidance, November 2014 (MoD 2014).

5.2. Consultation

Consultation meetings with marine stakeholders listed below were held in 2015, with additional meetings with the MCA / NLB in 2017 and then MCA in 2019. The key points arising from these meetings which are considered relevant to this document are summarised in Table 5.1.

- Royal Yachting Association (RYA) (11th June 2015);
- NLB (16th June 2015);
- Royal Yachting Association Scotland (RYAS) (17th June 2015);
- Chamber of Shipping (25th June 2015);
- Cruising Association (25th June 2015);
- Scottish Fishermen's Federation (2nd July 2015);
- Aberdeen Harbour (2nd July 2015);
- Royal National Lifeboat Institution and the MCA (3rd July 2015);
- MCA (18th October 2017); and
- NLB (13th November 2017).
- MCA (28th March 2019)

It should be noted that various aspects of the Development have been changed since the 2015 meetings (held pre-consent), including the plan to install the turbines in two Tranches, rather than four separate Tranches as described in 2015. Any points raised at a 2015 meeting that has since been superseded has not been included in the table.




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Table 5.1 **Key Stakeholder Consultation relevant to Lighting and Marking**


| Stakeholder | Point Raised | Where Addressed in this document |
|---|---|--|
| RYA Meeting held on the 17 th June 2015. | RYA requested that consideration was given to pre-existing lights during the creation of the the Project LMP. | The potential for light confusion has been considered throughout the creation of this LMP. |
| MCA Meeting held on the 20 th June 2017. | An ID marking plan should be included in the LMP. | The proposed ID marking of the turbine locations is summarised in Section 6.5. |
| MCA Meeting held on the 20 th June 2017. | Aviation lighting should have 360 degree (°) visibility. | As set out in Section 7.3, aviation hazard lighting will be visible from 360°. |
| MCA Meeting held on the 18 th October 2017. | All turbines should be fitted with a 2000cd red aviation light flashing Morse "W" with 360° visibility. The lights should be synchronised, and should be dimmable to avoid light confusion during Search and Rescue (SAR) operations. | As per Section 7.3, all turbines will be fitted with aviation lights satisfying the required specifications. |
| MCA Meeting held on the 18 th October 2017. | The MCA did not require that the buoyancy chambers be ID marked, assuming 360° visibility of the ID markings on the turbines. It was noted that this would require agreement with the NLB. | The location ID markings on the turbines will be visible from 360°, as stated in Section 7.3. |
| MCA Meeting held on the 18 th October 2017. | The MCA require all turbine blades to be marked with red dots at 10, 20 and 30m, and for the blade tip to be painted red. | As per Section 7.4, each turbine blade will satisfy the MCA marking requirements. |

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| Stakeholder | Point Raised | Where Addressed in this document |
|--|--|--|
| NLB Meeting held on the 13 th November 2017. <i>(Following changes to the planned developments schedule lighting and marking requirements were reconsidered with NLB).</i> | Each column of the semi-submersible steel structures should be fitted with a 5 nautical mile (nm) light with 360° visibility. These lights should be dimmable to 25% output allowing the intensity to be reduced upon installation of intermediate structures. | As per Section 6.3 each column of the semi-submersible steel structures will be fitted with a light satisfying the NLB requirements. |
| NLB Meeting held on the 13 th November 2017. | A fog signal should be installed on each structure. Only certain fog signals will be active upon final commissioning, depending on whether Site 8 is utilised. | As per Section 6.7, each structure will be fitted with a fog signal, with those remaining active upon final commissioning to be agreed with NLB. |
| NLB Meeting held on the 13 th November 2017. | Consideration should be given to installing warning signs on the structures to warn of subsurface hazards. | Signage plans are stated in Section 6.9. |
| NLB Meeting held on the 13 th November 2017. | Each structure should be marked to indicate no-go areas for infield vessels. | Signage plans are stated in Section 6.9. |
| NLB Meeting held on the 13 th November 2017. | Turbines at Sites 1, 3, 5, 7, and 8 should be fitted with 5nm lights. | The lighting scheme is detailed in Section 6.3. |
| NLB Meeting held on the 13 th November 2017. | All lights and fog signals should be synchronised. | All Significant Peripheral Structure (SPS) lights will flash in synchronisation (Section 6.3). All aviation lights will flash in synchronisation (Section 7.3). All fog signals will sound in synchronisation (Section 6.7). |
| NLB Meeting held on the 13 th November 2017. | A single RAL yellow paint should be used consistently for all turbines, however the NLB do not require a specific yellow. | As per Section 6.6, all turbines will be painted in RAL 1023 yellow. |

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| Stakeholder | Point Raised | Where Addressed in this document |
|--|--|---|
| NLB Meeting held on the 13 th November 2017. | Automatic Identification System (AIS) should transmit from turbines 1, 3, and 4, and an OFCOM license should be obtained as such. The NLB stated that having all turbines transmit via AIS was not favourable as it may lead to confusion to passing mariners. | Turbines at locations 3, and 4 will transmit via AIS (as per Section 6.8). It is noted that AIS may be installed on all turbines for the purpose of tracking in the event of a turbine breaking free of its moorings, however only those at Locations 3, and 4 will transmit publically. Prior to final commissioning, the turbine at Location 1 will also transmit via AIS. |
| NLB Meeting held on the 13 th November 2017. | The NLB do not require the export cables to be marked with cable marker boards. | Export cable marker boards will not be utilised (see Section 6.10). |
| NLB Meeting held on the 13 th November 2017. | Based on the length of the construction periods and the size of the site, the NLB do not require buoyage. | No buoyage is proposed during the construction phase other than that used to mark subsea hazards (see Section 6.4). No buoyage is proposed during the operational phase. |
| NLB Meeting held on the 13 th November 2017. | The NLB raised the importance of Notice to Mariners, and timely issuing of navigational radio warnings. It should also be ensured that the UKHO are informed well in advance of the installations. | As per Section 6.2, NtM will be issued, including notifications to the UKHO. |
| MCA Meeting held on the 28 th March 2019. | Renaming of turbine location due to reduction from 8 to 6. | Revised drawing and location plan issued in Appendix A. |

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6. MARINE NAVIGATION LIGHTING AND MARKING

6.1. Introduction

This section sets out the marine lighting and marking to be implemented during each operational phase of the Project. The lighting and marking has been designed to comply with the relevant MCA, and NLB guidance (see Section 5.1) for marking offshore wind farms, and also any additional relevant consent conditions (Section 4).

It should be noted that one 2MW turbine has already been installed, with 5 x 9.5MW turbines to be installed in the 2020 Tranche. Operational lighting and marking must be agreed for each stage within the construction phase with the NLB in advance of deployment. KOWL will also seek Statutory Sanction from NLB prior to exhibiting or altering any AtoNs as appropriate.

6.2. Promulgation of Information

Conditions 3.2.2.3, 3.2.3.3, and 3.2.4.3 of the Marine License require that KOWL notify relevant marine stakeholders (most notably the United Kingdom Hydrographic Office (UKHO)) of the progress of the project prior to, during and upon completion of construction, including via Notice to Mariners and KIS-ORCA. The details provided will include information in relation to the lighting and marking to be implemented.

At least seven days prior to the Commencement of the Works, stakeholders (including the UKHO, local mariners, fishermen's organisations and Aberdeen Coastguard Operations Centre) will be informed of the proposed works of any of the following:

- Installation of any AtoN;
- Installation of any subsea infrastructure for each Tranche individually;
- Installation of the turbines for each Tranche individually;
- Commissioning of each Tranches' turbines individually; and
- The completion of construction works.

Full details of the promulgation of information to be undertaken will be provided in the Navigational Safety Plan.


6.3. Substructure Lighting

The NLB require that all turbines substructures would be fitted with a 5nm (five nautical mile) light with the capability of being dimmed to 25% output. All substructures will therefore be fitted as follows:

- Yellow light with special mark characteristic (flash once every five seconds);
- Light to have range of five nautical miles;
- 360° visibility¹;
- Classed as IALA Category 1 (availability of at least 99.8%);

Note the substructures / turbine is floating and hence the lighting location will be at least 6m above the water level but not more than 30m together with being below the lowest point of the blade arc.

¹ NLB indicated one light would be required on each column for the substructures.

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The 5nm lights will remain on full intensity unless designated as an IPS by NLB. Those turbines designated as IPS will have their 5nm lights dimmed to 25% intensity².

All marine aid to navigation lights will flash in synchronisation and be controlled (on/off) by a Supervisory control and data acquisition (SCADA) system.

It is also noted that all vessels associated with the construction of the Project will comply with marking requirements as adopted by the Flag State, most notably the International Regulations for the Prevention of Collisions at Sea (COLREGS 1972 as amended).

6.4. Buoyage

Based on the short durations of the construction periods during each Tranche, and based on the size of the site, it has been agreed with the NLB (13th November 2017, see Section 5.2) that no buoyage will be required to mark construction activities, or to mark the turbines once operational.

Reference is made to the Navigation Safety Plan, KOWL-PL-0004-007 for the detailed requirements for buoys and surface and subsea marking.

6.5. ID Markings

ID markings will be fixed per Location (rather than by turbine)


The location IDs will be of the form KIN-XX, where XX is a unique number between 01 and 06, assigned as shown in the Layout Plan, KOWL-DR-0001-015 in Appendix A.

Each location ID will be displayed using painted IDs on the substructure columns and identification panels fitted to the turbines.

Multiple illuminated panels will be used on the turbine to ensure the location ID is clearly visible in all directions during night hours.

All location IDs will be clearly visible from 150 m away and will be lit as per MGM 543. The alphanumeric characters visible from 150 metres away (typically at least 1m in height) and shown in black over a yellow background.

² Following consultation with NLB

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6.6. Paint

The substructure will be painted yellow (RAL 1023) in lead free pigmentation from the water line to a minimum height of 15m.

The turbine and turbine tower will be painted light grey (RAL 7035) in lead free pigmentation.

6.7. Sound Signals

All turbines will be fitted with fog signals, however a number of these will be switched off upon final commissioning³. As a minimum, the signals on the southernmost and northernmost turbines (Locations 3 and 4 respectively) will remain active. The final layout of turbines requiring sound signals will be agreed with the NLB.

All fog signals will satisfy the following specifications:

- Range of at least two nautical miles;
- Sound a Morse “U” every 30 seconds, with a minimum duration of the short blasts of 0.75 seconds;
- Classed as IALA Category 3 (availability of at least 97%); and
- Will be activated automatically when visibility falls below two nautical miles, as detected by the visibility metres.

6.8. Automatic Identification System (AIS)

It is proposed that the turbines KIN-03, and KIN-04 (the southernmost and northernmost turbines respectively) broadcast via AIS, transmitting continually once commissioning of all turbines are complete.

It is also proposed that the demonstrator turbine at Location 1 transmits via AIS, until KIN-03 begins AIS transmission.

The AIS AtoN will be classed as IALA Category 3 and will therefore have a minimum availability of 97%.

It should be noted that AIS will be installed on all six turbines for the purpose of tracking their position in the event of a moorings failure; however, only KIN-03 and KIN-04 will broadcast publically to avoid confusion to passing mariners.


KOWL will apply for the relevant licenses from Office of Communications (OFCOM) in advance of the use of any AIS.

6.9. Signage

Warning signs will be fitted to all sub-structures indicating the presence of subsea infrastructure (including mooring lines).

The relevant stakeholders will be made aware of the presence of cables, mooring lines, and other subsea infrastructure via various means including Notice to Mariners. This will include details of the intended installation dates.

³ At NLBs request.

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6.10. Export Cable Marking

Following consultation with the NLB, export cable marker boards are not considered necessary.


The location of the export cables, mooring line and inter-array cables will be submitted to the UKHO for inclusion on the appropriate charts.

6.11. Emergency Response – Marine AtoNs Reporting

In line with requirements associated with the management of marine AtoNs within Scottish waters, KOWL will maintain a record of the availability of all AtoNs associated with the Project. Summaries of these records will be provided to NLB in the event of any AtoN failure or loss of availability, as soon as it is practicable to do so.

KOWL, or a nominated contractor will be responsible for submitting the availability reports to the NLB. Specific details of other reporting requirements including notifications to local mariners are provided in the Navigation Safety Plan, KOWL-PL-0004-007

In the event of a significant AtoN failure which may lead to a significant risk to navigational safety, additional temporary risk mitigation measures will be considered, including the use of a guard vessel until such time as the AtoN has been repaired or replaced.

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7. AVIATION LIGHTING AND MARKING

7.1. Introduction

The proposed lighting and marking has been designed to comply with the relevant CAA and Defence Infrastructure Organisation guidance (see Section 5.1) for marking offshore wind farms together with any additional consent conditions relevant to aviation.

7.2. Promulgation of Information

Prior to the Commencement of the Development and following the approval of the Development Specification and Layout Plan, KOWL will provide the UKHO with positions and heights of each of the turbines to be installed for aviation charting purposes. It is noted that a 2MW turbine has already been installed on location KIN-01.

Within one month of the commencement of the commissioning of the final Tranche, KOWL will provide the installed positions (accurate to three decimal places of minutes of arc) of the turbines to the UKHO.

There is also an international civil aviation requirement detailed in CAP437 (CAA 2016) for all structures over 91.4m to be reported to the Defence Geographic Centre (DGC) no later than ten weeks prior to construction. As discussed above, it is proposed that the relevant details of all turbines are provided to the DGC at least ten weeks prior to the construction. Details will be submitted electronically to dvof@mod.uk, and will include:

- Type of structure;
- Name of location;
- Accurate position of structure;
- Maximum height AMSL;
- Lighting status; and
- Anticipated date of completion of construction, and removal (if applicable).


The maximum height of any construction equipment used is also required to be provided to the DGC.

To ensure aviation stakeholders are aware of the construction of the turbines while aviation charts are being updated, promulgation of the information listed above will also be undertaken in the form of a Notice to Airmen (NOTAM). KOWL will arrange this with the CAA Airspace Regulation (AROps@caa.co.uk / 0207 453 6599) no later than 14 days prior to construction. A NOTAM will be arranged for the final Tranche.

7.3. Turbine Lighting

Each turbine will be fitted with a medium intensity 2000 candela (cd) red light visible from 360°, and mounted as close as is reasonably practicable to the top of the nacelle, as per Air Navigation Order (ANO) Article 223 (CAA 2016b). In order to avoid confusion with the marine lights, and in line with standard marine practise and NLB recommendation, the red aviation hazard lights will flash Morse W with a five second sequence. All red aviation lighting will be synchronised across the turbines.

Where visibility is considered to be at least 5km in all directions (as indicated by the visibility meters fitted to the turbines as discussed in Section 6.7), the red aviation lights may be dimmed to no less than 10% of the original intensity. It is noted that the lights will also be able to be dimmed manually

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via the SCADA system if requested by the MCA for the purposes of Search and Rescue (SAR) operations.

Each red aviation hazard light will be active following commissioning of each turbine.

7.4. Blade Marking

For the purposes of SAR operations, Annex 5 of MGN543 (MCA, 2016) requires the marking of all turbine blades with hover reference marks. In line with this guidance, the trailing edge of each blade will have three red marks at points 10, 20, and 30m from the hub end. These marks will have a minimum diameter of 600 millimetres.

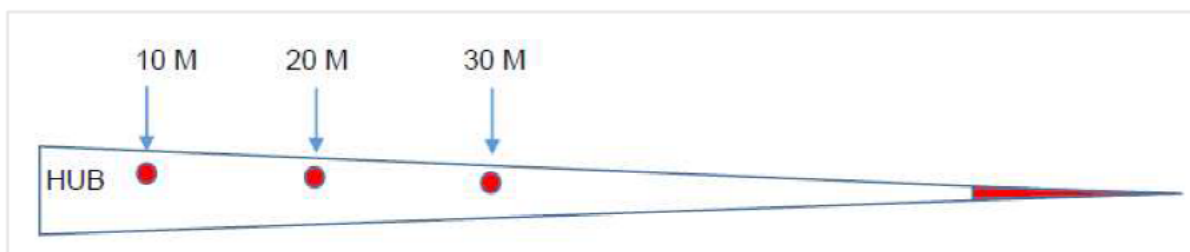


Figure 7.1 Indicative Blade Marking

In addition, the tip of each blade will be painted red. An indicative blade marking plan is presented in Figure 7.1.

7.5. Nacelle Marking

The ID number of each turbine location will be clearly displayed on the roof of the nacelle, ensuring SAR helicopters can visually identify any given structure. The location ID numbers will be as large as is reasonably practicable, but not less than 1.5m in height, and will be displayed on each turbine such as to be recognisable from an aircraft flying at a height of 150m above the highest point of the structure.


7.6. Emergency Response – Aviation Lighting and Marking Reporting

Article 223 (7) of the Air Navigation Order, ANO (CAA 2016) 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 of a wind turbine generator must repair or replace the light as soon as reasonably practicable.”

Details of procedures to be followed in the event of the failure of aviation lights fitted on wind turbines are detailed in CAP 764 (CAA 2016a). Where meteorological or sea conditions prevent safe access for the purposes of replacing or repairing a failed aviation light, such that the light will be inactive for a period of 36 hours or more, KOWL will arrange a NOTAM be issued.

KOWL, or a nominated contractor will contact the NOTAM section of the UK Aeronautical Information Service (UK-AIS) (+44 (0) 20 8750 3773/3774, operated 24 hours) as soon as is reasonably practicable. The following details will be provided, with the UK-AIS also providing a copy of the information to the CAA:


- Name of the wind farm (as will already be recorded in the UK Aeronautical Information Publication (AIP);
- Identifiers of affected lights (as listed in the AIP) or region of wind farm if fault is extensive;

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- Expected date of reinstatement; and
- Contact telephone number.


If considered necessary, KOWL may also make contact directly with local aviation stakeholders that may be affected (e.g., local air traffic service units, local airports or helicopter operators), providing the same information as was provided to the UK-AIS.

If the aviation light is expected to be inactive for a period of greater than 14 days, KOWL or a nominated contractor will notify the CAA directly via windfarms@caa.co.uk to consult on and agree an appropriate strategy to be implemented until such a time as the light is repaired or replaced.

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8. REFERENCES

1. CAA (2016a), CAP 764 – Policy and Guidelines on Wind Turbines. Feb 2016.
2. CAA (2016b), The Air Navigation Order (ANO) 2016, Statutory Instrument No. 765. Civil Aviation Publication 393. Aug 2016.
3. CAA (2016c), Civil Aviation Publication (CAP) 437 – Standards for offshore helicopter landing areas. Dec 2016.
4. IALA (2013), International Association of Lighthouse Authorities (IALA) 0-139 – The Marking of Man-Made Offshore Structures. Dec 2013.
5. International Maritime Organisation (COLREGS 1972). International Regulations for Preventing Collisions and Sea, as amended. 1972.
6. MCA (2016), Marine Guidance Note (MGN) 543 – Offshore Renewable Energy Installations – Guidance on UK Navigational Practice, Safety and Emergency Response. Jan 2016.
7. MoD (2014) Ministry of Defence Obstruction Lighting Guidance. November 2014.

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APPENDIX A – LAYOUT PLAN

LEGEND

PLANNED TURBINE LOCATIONS

| REF | WGS-84 | N | W |
|---------|-----------------|-----------------|---|
| KIN-01* | 57° 00' 19.095" | 01° 52' 52.181" | |
| KIN-02 | 56° 59' 50.109" | 01° 52' 25.710" | |
| KIN-03 | 56° 59' 21.214" | 01° 51' 59.269" | |
| KIN-04 | 57° 01' 06.828" | 01° 51' 18.166" | |
| KIN-05 | 57° 00' 37.897" | 01° 50' 51.666" | |
| KIN-06* | 57° 00' 08.931" | 01° 50' 25.179" | |

* CURRENT 2MW TURBINE AT KIN-01 LOCATION
WILL BE REMOVED AND REDEPLOYED AT
KIN-06 LOCATION

REF WGS84 UTM30N

| NORTHINGS | EASTINGS |
|-----------|------------|
| KIN-01 | 6318532.87 |
| KIN-02 | 6317645.51 |
| KIN-03 | 6316758.16 |
| KIN-04 | 6320034.94 |
| KIN-05 | 6319147.58 |
| KIN-06 | 6318260.23 |

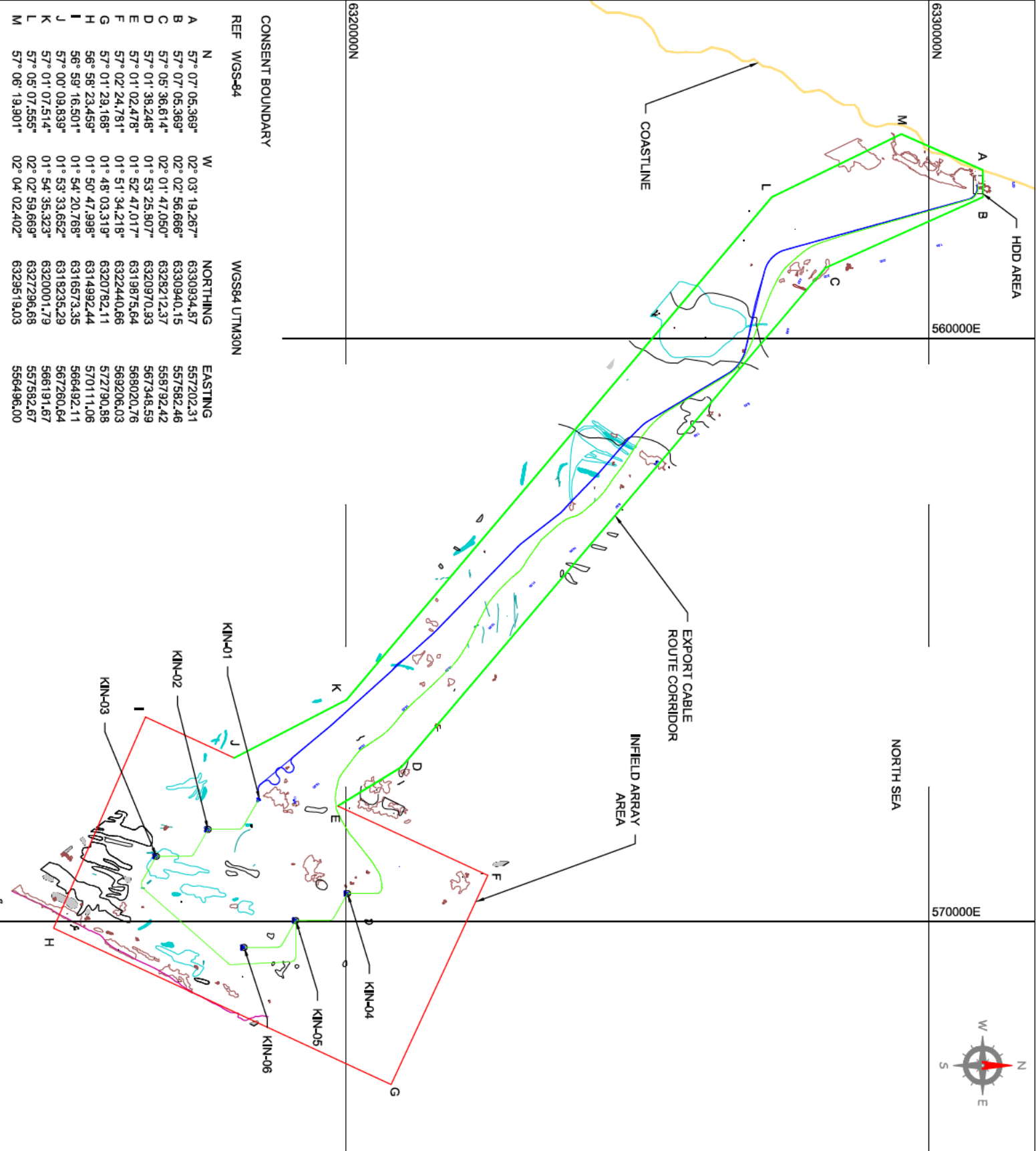
EXISTING EXPORT CABLE ROUTE
PROPOSED 2ND EXPORT CABLE ROUTE



| | |
|-----------------------|--|
| CLIENT | KINCARDINE OFFSHORE WINDFARM LIMITED |
| PROJECT | KINCARDINE OFFSHORE WINDFARM PROJECT |
| TITLE | FIELD LAYOUT CONSENT AND WTG POSITION CHECK |
| CLIENT DRAWING NUMBER | WTG-DIR-0001-015 |
| SCALE UNITS | W3G DRAWING NUMBER |
| 1:60 | KOWL-DIR-0001-015 |

| CLIENT DRAWING NUMBER | SHEET | 1 OF 1 | SHEET SIZE |
|-----------------------|-------|--------|------------|
| WTG-DIR-0001-015 | A4 | | A3 |

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CONSENT BOUNDARY
REF WGS-84
WGS84 UTM30N

| N | W | NORTHING | EASTING |
|---|-----------------|-----------------|------------|
| A | 57° 07' 06.369" | 02° 03' 19.267" | 6330934.87 |
| B | 57° 07' 05.369" | 02° 02' 56.666" | 6330940.15 |
| C | 57° 01' 36.614" | 02° 01' 47.050" | 6328212.37 |
| D | 57° 01' 36.248" | 01° 53' 25.807" | 6320970.93 |
| E | 57° 01' 02.478" | 01° 52' 47.017" | 6319875.64 |
| F | 57° 02' 24.781" | 01° 51' 34.218" | 6322440.66 |
| G | 57° 01' 29.168" | 01° 48' 03.319" | 6320782.11 |
| H | 56° 58' 23.459" | 01° 50' 47.998" | 6314992.44 |
| I | 56° 58' 16.501" | 01° 54' 20.768" | 6316573.35 |
| J | 57° 00' 09.839" | 01° 53' 33.662" | 6318235.29 |
| K | 57° 01' 07.514" | 01° 54' 35.323" | 6320001.79 |
| L | 57° 05' 07.555" | 02° 02' 59.669" | 6327296.68 |
| M | 57° 06' 19.901" | 02° 04' 02.402" | 6329519.03 |

KOWL-PL-0004-001 Lighting and Marking Plan Rev C2

Final Audit Report

2019-04-09

| | |
|-----------------|--|
| Created: | 2019-04-09 |
| By: | Redacted |
| Status: | Signed |
| Transaction ID: | CBJCHBCAABAA7vcTo_FLNGzy0f5lz5APtoHa27UtCkAP |

"KOWL-PL-0004-001 Lighting and Marking Plan Rev C2" History

-  Document created by Redacted
2019-04-09 - 4:13:39 PM GMT- IP address: Redacted
-  Document emailed to Redacted for signature
2019-04-09 - 4:16:48 PM GMT
-  Document viewed by Redacted
2019-04-09 - 4:17:28 PM GMT- IP address: Redacted
-  Document e-signed by Redacted
Signature Date: 2019-04-09 - 4:18:26 PM GMT - Time Source: server- IP address: Redacted
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2019-04-09 - 4:18:27 PM GMT
-  Document viewed by Redacted
2019-04-09 - 4:18:38 PM GMT- IP address: 151.237.232.154
-  Document e-signed by Redacted
Signature Date: 2019-04-09 - 4:19:29 PM GMT - Time Source: server- IP address: Redacted
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Redacted



2019-04-09 - 4:25:17 PM GMT



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