



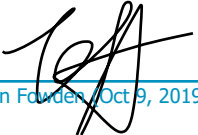


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Project Environmental Monitoring Plan
KINCARDINE OFFSHORE WINDFARM PROJECT

Prepared	Checked	Reviewed	Approved	ECoW Approved
Oct 9,2019	Oct 9,2019	Oct 9,2019	Oct 9,2019	Oct 9,2019
Organisation: KOWL	Organisation: KOWL	Organisation: KOWL	Organisation: KOWL	Organisation: KOWL
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ACRONYMS, ABBREVIATIONS AND DEFINITIONS

dB	Decibel
ECoW	Ecological Clerk of Works
ECT	KOWL Environment and Consents Team
EIA	Environmental Impact Assessment
EOWDC	European Offshore Wind Deployment Centre
EMP	Environmental Management Plan
ES	Environmental Statement
GIS	Geographic Information Systems
GPS	Global Positioning System
HAT	Highest Astronomical Tide
HRA	Habitats Regulation Assessment
Hz	Hertz
KOWL	Kincardine Offshore Wind Ltd
LAT	Lowest Astronomical Tide
LMP	Lighting and Marking Plan
MHWS	Mean High Water Springs
MMO	Marine Mammal Observer
MS-LOT	Marine Scotland Licensing and Operations Team
MSS	Marine Scotland Science
MW	MegaWatt
NRMSD	National Research and Monitoring Strategy for Diadromous Fish
PEMP	Project Environmental Monitoring Plan
ROV	Remotely Operated Vehicle
RSPB	The Royal Society for the Protection of Birds
SAMS	Scottish Association for Marine Science
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SpORRAn	Scottish Offshore Renewables Research Framework
SSMEG	Scottish Strategic Marine Environment Group

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TBC	To be confirmed
WTG	Wind Turbine Generator
μPa	Pascal

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1. INTRODUCTION

1.1. Purpose of the Document

This document has been created to satisfy Condition 22 of the Section 36 Consent issued by Marine Scotland Licensing Operations Team (MS-LOT) to Kincardine Offshore Wind Ltd (KOWL) for the Kincardine Offshore Windfarm (the Project).

Condition 22 requires the production of a Project Environmental Monitoring Plan (PEMP). The overall aim of the PEMP is to outline and define the approach KOWL, its survey contractors and advisors will take with respect to the environmental monitoring of the Project required under the consent conditions.

The PEMP is designed to provide guidance to those involved in the Project, on the monitoring of potential environmental impacts associated with the installation, post-construction and operational phases of the wind farm.

1.2. Scope of the Document

This PEMP is not intended to present the full detail of the monitoring proposals, but to summarise the agreed approach. The PEMP:

- Describes the objectives and methodologies for monitoring surveys
- Describes the proposed programmes for monitoring and reporting on:
 - o Birds (Kittiwake and Puffin);
 - o Diadromous fish;
 - o Marine mammals;
- The objectives and methodologies for the monitoring surveys;
- Provides evidence of consultation on and approval of the monitoring approach and survey methodology;

1.3. Approach to Amending and Updating this PEMP

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 to this document 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.

1.4. Compliance

Compliance with the various consent conditions are documented in the Commitments Register and where applicable throughout the PEMP.

2. PROJECT OVERVIEW

2.1. Summary

The Project is considered a commercial demonstrator site, which will utilise floating foundation technology, and will be one of the world's first array 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 that provides suitable water depth for a floating offshore wind demonstrator development (approximately 60-80m).

The project is split into the following areas:

- The Development Area – the wind farm area including the Wind Turbine Generators (WTG) and inter-array cables.
- The Offshore Export Cable Corridor – the area within which the proposed export cables will be laid, from the perimeter of the Development Area to 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.

This PEMP focuses on the offshore elements only as per Section 36 Consent and Marine Licences granted. The onshore area is subject to a separate planning permission granted by Aberdeen City Council

2.2. Turbine Locations

The project originally consisted of 8 locations. This has been reduced to 6 locations and hence the designations have now changed as follows;

Table 2-1 Turbine Designations

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 C 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. 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 power 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 WTGs (to be installed 2020)
- 5 x 33kv inter-array cables (to be installed 2020)
- 2 x export cables (one currently installed)
- All turbine substructures are the semi-submersible Windfloat™ design.

2.4. 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.

2.5. Project Design Life

The design life for the windfarm is 25 years.

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. CONSENT CONDITIONS

Licence	Condition Number	Name	Wording in licence	Where Addressed in this Document
S36	22	Project Environmental Monitoring Programme	<p>The Company must, no later than 6 months, or at such a time as agreed with the Scottish Ministers, prior to the Commencement of the Development, submit a Project Environmental Monitoring Programme (“PEMP”), in writing.</p> <p>The PEMP must cover, but not be limited to, the following matters:</p> <p>a. pre-construction, construction (if considered appropriate by the Scottish Ministers) and post-construction monitoring or data collection as relevant in terms of the ES and ES Addendum and any subsequent monitoring or data collection for:</p> <p>i) birds. This should include, but not be limited to, a detailed entanglement monitoring and reporting schedule, as well as a post-consent monitoring plan for bird strike;</p> <p>ii) marine mammals. This should include, but not be limited to, a detailed entanglement monitoring and reporting schedule, particularly of load on the moorings from derelict fishing gear; and</p> <p>iii) diadromous fish;</p> <p>b. the methodology to record and report noise levels from construction and sound profiles from operational floating turbines to be carried out in relation to marine mammals; and</p> <p>c. the participation and contribution to be made by the Company to data collection or monitoring of wider strategic relevance, identified and agreed</p>	<p>a. Monitoring plans are outlined in Sections 4, 5 and 6</p> <p>i. Detailed in Section 4</p> <p>ii. Detailed in Section 5</p> <p>iii. Detailed in Section 6</p> <p>b. Detailed in Section 5</p> <p>c. Bird monitoring plans have been agreed in discussions with RSPB and detailed in Section 4.</p> <p>Reporting timelines of data collected are detailed in Section 4, 5 and 6.</p>



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			<p>by the Scottish Ministers, and may include but not necessarily be limited to:</p> <p>i) the avoidance behaviour of breeding seabirds around turbines;</p> <p>ii) flight height distributions of seabirds at wind farm sites; and</p> <p>iii) effects on survival and productivity at relevant breeding colonies.</p> <p>The Company must submit written reports and associated raw data of such monitoring or data collection to the Scottish Ministers at timescales to be determined by them.</p>	
S36	23	Regional Advisory Group	<p>The Company must participate in any Regional Advisory Group, or any successor group, established by the Scottish Ministers for the purpose of advising the Scottish Ministers on research, monitoring and mitigation programmes for, but not limited to, ornithology, marine mammals, and diadromous fish. The extent and nature of the Company's participation is to be agreed by the Scottish Ministers.</p>	<p>At the time of writing this PEMP there have been no active groups for KOWL to participate in. KOWL will however, participate in the future, if a group was to become active again.</p>
S36	28	SpORRAn (Scottish Offshore Renewables Research Framework)	<p>The Company must, to the satisfaction of the Scottish Ministers, participate in the monitoring requirements as laid out in the 'SpORRAn' (Scottish Offshore Renewables Research Framework) for Diadromous Fish'. The extent and nature of the Company's participation is to be agreed by the Scottish Ministers.</p>	<p>At the time of the writing this PEMP there has been no active research undertaken under the SpORRAn framework for KOWL to participate in. KOWL will however, participate in the future, if SpORRAn becomes active again.</p>
S36	29	Marine Mammal Observer	<p>Prior to the Commencement of the development, the Company must confirm the appointment of a Marine Mammal Observer ("MMO"). When appointed, the MMO must, as a minimum, maintain a record of any sightings of marine mammals and maintain a record of the action taken to avoid any disturbance being</p>	<p>An MMO will be appointed prior to the commencement of works and provide reports as appropriate.</p> <p>The geophysical site investigations and construction undertaken to date were carried out under an EPS licence specifically for the surveys. The reports from these surveys will be</p>

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			caused to marine mammals during pre-construction and geophysical surveys and construction activities.	provided in accordance with the conditions of the licence.
S36	30	Scottish Strategic Marine Environment Group	The Company must participate in any Scottish Strategic Marine Environment Group (“SSMEG”) established by the Scottish Ministers for the purposes of advising the Scottish Ministers on research, monitoring and mitigation programmes for, but not limited to, ornithology, diadromous fish, marine mammals and commercial fish.	<p>KOWL attended a Scoping Workshop on 06/03/2018 ‘Sectoral Marine Plan for Offshore Wind Energy’ organised by Marine Scotland Planning and the Scottish Crown Estate to input into the next round of offshore wind developments in Scotland. An element of this workshop was discussion research and monitoring programmes.</p> <p>KOWL will continue to participate in future meetings, or any other groups established by the Scottish Ministers as appropriate.</p>

4. BIRDS MONITORING PLAN

4.1. Monitoring Approach

Table 4-1 Summary of bird monitoring discussions in PEMP meetings held with SNH, RSPB, MS-LOT and MSS

Date	Summary of key discussions and agreements
05/05/2017	<p>Kittiwake:</p> <p>Agreed that focus of monitoring for Kittiwake was regarding collision risk</p> <p>Puffin:</p> <p>Agreed that focus of monitoring for Puffin was displacement</p> <p>Bird Tagging:</p> <p>Agreed that tagging Kittiwake would not provide data specific to assessing collision risk and therefore was not considered necessary.</p> <p>Agreed that tagging of Puffins could offer some benefit, and should be considered as part of the PEMP from 2018 onwards (tagging in 2017 was not possible).</p> <p>Collision sensors in WTG blades:</p> <p>It was agreed that installing collision sensors in the blades of the WTGs would be the most appropriate way to monitor collision risk. However, it was agreed that due to the timescales involved before construction of Unit 1 KOWL would not be able to install sensors in the first unit, but that they will be included for consideration in the PEMP for the larger turbines.</p>

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	<p>Cameras/Radar:</p> <p>It was agreed that installation of cameras would also be beneficial for detecting bird collisions and species identification. It was discussed that KOWL would explore available 'off the shelf' camera systems for Unit 1 and work with the manufacturer to develop a more sophisticated system for Units 2-6, including radar if possible.</p> <p>Aerial Surveys:</p> <p>A discussion was had as to the cost/benefit of aerial surveys in terms of what the results can provide i.e. presence/absence rather than flight path etc. It was concluded that tagging is more useful and flight data from cameras/radars from the turbine and monitoring focus should be on these instead of aerial surveys. Agreed that Aerial Surveys will be included in the PEMP to start with as a potential option which could be taken forward or removed from the scope as other methods are developed over the next two years of construction.</p> <p>Adaptive PEMP:</p> <p>All parties agreed to KOWL taking an Adaptive approach to the PEMP to reflect the Tranches in overall Project programme. The first iteration of the PEMP will present the overarching principles of the monitoring as agreed above and all likely technologies that may be considered for each tranche of WTG installation and once the whole farm is operational. Over time, the PEMP will then be revised at times to be agreed going forward.</p>
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Table 4-2 Monitoring approach to birds

Monitoring Approach	<p>Pre-Construction: No further pre-construction monitoring is required for birds than that already undertaken for the Environmental Impact Assessment (EIA).</p> <p>Construction: The construction of the substructures will be undertaken at a port, and therefore the activities on site will be limited to installation of the substructures and WTGs including towing, hook up and commissioning only. Installation on site is expected to take less than 1 week (tow to site, hook up to moorings and export cables), and therefore, monitoring during construction and installation is not considered necessary as agreed during consultation with RSPB and SNH.</p> <p>Post-Construction: The objectives of the bird monitoring post-construction are to improve understanding of seabird interactions with offshore windfarms, and particularly floating offshore windfarms which are located further offshore than fixed foundations windfarms, and validate the assumptions made in the Original ES, ES Addendum and Variation ES.</p> <p>With regards to a 'detailed entanglement monitoring plan' for birds as outlined within the S36 Condition 22, following consultation with MS-LOT is has been agreed that an entanglement plan for marine mammals is sufficient and an entanglement plan for birds is not required.</p> <p>The key seabird concerns identified in the Original ES and HRA were collision risk for Black-Legged Kittiwake from Fowlsheugh Special</p>
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	<p>Protection Area (SPA) and displacement risk for Puffins from Forth Island SPA. The aim of the monitoring surveys is to address these key questions:</p> <ol style="list-style-type: none"> 1. In relation to Atlantic Puffin; is there connectivity between Forth Island SPA and the Project? 2. In relation to Black-legged Kittiwake; are there detectable effects of collisions occurring at the Project site? 3. Are the impacts sufficiently large to influence the populations of kittiwake?
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4.2. Objectives and Methods

Table 4-3 Objectives and Methods of Bird Monitoring Programme

Objectives and Methods for each technique employed	
GPS Tagging	<p><u>Objective</u></p> <ul style="list-style-type: none"> • Use foraging distribution data obtained through tag deployment to investigate the extent of connectivity between the Project and Forth Island SPA populations and potentially finer scale movements in relation to the turbines; and • Build on the previous tagging work conducted by RSPB. <p><u>Method</u></p> <p>KOWL will fund a tagging programme designed and managed by RSPB or a sub-contractor. It is proposed that a single pilot project will be undertaken in year one with the full scope of the programme to be developed and agreed by Autumn 2018. It is anticipated that the tagging work will be undertaken during May/June 2019. The programme will include tagging of individual puffins from the Forth Islands SPA using remote download GPS tags. High resolution location data is collected by the tags which will provide information on trip distances and duration with the potential to infer foraging locations via further analysis of the data. Data is downloaded remotely each time the bird returns to the colony. Subsequent years of tagging to be undertaken on the Forth Islands SPA/other relevant colonies may also be considered as appropriate, following a review of the initial pilot programme.</p> <p>This monitoring work will better establish the connectivity of the KOWL Project site to relevant puffin breeding colonies. This data will also contribute towards improving the understanding of colony specific distributions. This information is pertinent to KOWL, other existing projects and potential future projects.</p>
Collision sensors in WTG blades (only to be considered for turbines 2- 6)	<p><u>Objective</u></p>

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	<ul style="list-style-type: none"> Collect direct measurements of collisions with WTG blades to assess number of collisions per year and compare to estimates used in collision risk modelling. <p><u>Method</u></p> <p>Where appropriate, acoustic sensors could be installed inside the WTG blades of a number of the later turbine units to detect collisions at all times of day. The decision to install such sensors can be made following the initial twelve months of site data collected from the cameras on the 2MW turbine. The data from the collision sensors coupled with the data from the cameras will provide accurate data of bird collisions on all the turbines which can then be used to provide evidence to support/amend bird collision models used for the project HRA, and future offshore windfarm projects.</p>
Cameras	<p><u>Objective</u></p> <ul style="list-style-type: none"> Real time detection of birds in the vicinity of the windfarm; Video and audio recordings of bird collisions; and Species identification of bird collisions recorded by collision sensors (if using). <p><u>Method</u></p> <p>Eight HD cameras will be initially installed on the 2MW turbine which will continuously record video and sounds of every flight that is made within the vicinity of the turbine. The system being deployed is DTBird which is a self-working system that monitors bird activity in real-time, and detects any bird species flying during the day or night, all year round. The system uploads video and audio recordings of every bird flight detected to DTBird online Data Analysis Platform, access is protected with a username and password. Recorded data can include location, flight ID, flight time data, flight video records with embedded audio. This system should enable bird identification based on bird shape, flight pattern and wing beat frequency from both the video and the audio files. In addition, the system takes HD camera snapshots every hour. There are environmental sensors on the DTBird units to collect information on light, temperature, humidity, rain, fog, wind speed and direction. See Appendix A for the full DTBird Specification.</p> <p>Cameras will have limited capability during hours of darkness, however, thermal cameras could be mounted to ensure night detection of bird activity on the five 9.5MW turbines.</p>
Radar (where suitable deck space and engineering parameters permit)	<p><u>Objective</u></p> <ul style="list-style-type: none"> Provide accurate bird flight and behaviour monitoring around the windfarm. <p><u>Method</u></p> <p>Monitoring by radar would provide accurate bird flight and behaviour monitoring around structures. This will provide real-time data (day and night) on any macro-avoidance around the turbines. However due to the size and power requirements of such bird monitoring devices, any decision</p>

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	on installing such units on later turbines will be deferred until the initial 12 months of monitoring has been collated.
Aerial Surveys	<p><u>Objective</u></p> <ul style="list-style-type: none"> • Collect seabird distribution and estimation of abundance to compare against baseline survey collected pre-construction to estimate displacement resulting from avoidance of the windfarm; and • Estimate the extent of connectivity between the Project and Fowlsheugh and Forth Island SPA through analysis of flight directions. <p><u>Method</u></p> <p>An aerial survey could be undertaken one-year post installation of all six turbines, utilising the same flight paths from pre-construction survey detailed in the ES. The data from the post construction survey can then be compared to the pre-construction survey to estimate displacement.</p>
Reporting	<p>KOWL will submit survey reports and raw data to MS-LOT on behalf of the Scottish Ministers in support of the discharge of conditions within three months of receiving the data from survey contractors or equivalent.</p> <p>Meetings will also be held with SNH and RSPB before iterations to PEMP are due to review any available data and agree any amendments to the strategy.</p>

The following programme includes all potential monitoring options and will be reviewed at subsequent intervals as also outlined in the table below.

Table 4-4 Bird Monitoring Programme

Project Phase	Proposed Activity	Reason
Tranche 1	Cameras – 2MW	Collisions and macro-avoidance behaviour around the 2MW turbine
Pre-Tranche 2 Data Review and PEMP Update	Meeting with SNH and RSPB	To discuss data collected from Tranche 1 and agree any amendments to PEMP
Tranche 2	GPS Tagging (Puffins) 2019 breeding season	Puffin locations and movements, flight data including flight height and speed
	Cameras – five x 9.5MW	Collisions and macro-avoidance behaviour around the first turbine
	Potentially collision sensors – five x 9.5MW	Collisions
	Radar	Flight and flight behaviour around windfarm (can also

		operate at night whereas cameras will be limited during darkness)
Pre-O&M (prior to final commissioning)	Meeting with SNH and RSPB	To discuss data collected and agree Final PEMP for O&M
O&M	Aerial Survey similar to 2012 survey 1 year after final commissioning	Seabird distribution and estimation of abundance to compare against baseline survey collected pre-construction to estimate displacement

5. MARINE MAMMALS MONITORING PLAN

5.1. Monitoring Approach

Table 5-1 Summary of marine mammals monitoring discussions in PEMP meetings held with SNH, RSPB, MS-LOT and MSS

Date	Summary of key discussions and agreements
05/05/2017	<p>Noise Profiling: Noise Profile – all parties agreed that any data on the noise profile of floating offshore windfarms will be invaluable as this data does not currently exist.</p> <p>Entanglement: All parties agreed that load cells and ROV surveys were sufficient methods for monitoring impacts to marine mammals, however, it was suggested that ROV survey frequency may need to be increased in the purpose of marine mammals monitoring to start with, and then over time, the frequency could be reduced.</p> <p>Adaptive PEMP: All parties agreed to KOWL taking an Adaptive approach to the PEMP to reflect the Tranches in overall Project programme. The First Iteration of the PEMP will present the overarching principles of the monitoring as agreed above and all likely technologies that may be considered for each tranche of WTG installation and once the whole farm is operational. Over time, the PEMP will then be revised at times to be agreed going forward.</p>

Table 5-2 Monitoring Approach to marine mammals

Monitoring Approach	<p>Pre-Construction:</p> <p>Pre-construction noise profiling has been agreed with SNH and MS-LOT. The purpose of the measurements is to provide good quality, reliable measurements of the baseline underwater noise to determine the pre-existing acoustic environment prior to the installation of the 2MW turbine.</p> <p>Construction:</p>
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	<p>The construction of the substructures will be undertaken in ports, and therefore the activities on site will be limited to installation of the units (substructures and WTGs) including towing, hook up and commissioning only. Installation of the units on site is expected to take less than one week (tow to sites, hook up to moorings and export cables), and therefore, monitoring during construction and installation of the units is not considered necessary as agreed during consultation with the key stakeholders.</p> <p>Post-Construction:</p> <p>As part of the project HRA no marine mammal impacts were identified from the proposed construction approach (no piling being the main reduction factor), therefore, the primary aim of the monitoring is to improve the understanding of the noise profile from floating windfarms.</p> <p>The aim of the monitoring surveys is to address these key questions:</p> <ol style="list-style-type: none"> 1. What is the noise profile of floating offshore wind turbines? 2. Does the presence of the mooring lines cause a potential hazard to marine mammals in the vicinity of the Project?
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Table 5-3 Objectives and Methods of marine mammal monitoring programme

Objectives and methods for each technique employed	
Noise Profiling	<p><u>Objective</u></p> <ul style="list-style-type: none"> • Collect data on noise emitted into the water column from a floating turbine, to determine the noise profile around the structure. <p><u>Method</u></p> <p>Pre-Construction Noise Profiling:</p> <p>The purpose of noise profiling pre-construction is to provide good quality, reliable measurements of the baseline underwater noise to determine the pre-existing acoustic environment prior to the installation of the 2MW turbine.</p> <p>It has been agreed with SNH and MS that a one-day (eight hours of survey data) boat based survey is sufficient to provide information for both background noise (pre-installation) and baseline information, to be repeated as exactly as possible during operation.</p> <p>Noise monitoring will be undertaken using the Scottish Association for Marine Science (SAMS) own designed Drifting Ear. The Drifting Ear deployment methodology was specifically designed by SAMS for noise measurements in high flow tidal sites. The basic principal of the Drifting Ear design is to keep a free-floating drogue mounted hydrophone fixed to a moving body of water rather than the seabed. The devices are</p>

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	<p>connected to a surface float which contains an Iridium based satellite communication system for field-based tracking, as well as a GPS unit to record precise location information. The recorded satellite and GPS data monitor the tracks and drift rate of each Drifting Ear unit for subsequent analysis. Hydrophones are suspended within the drogues approximately six meters below the surface and connected near the recorder to reduce the introduction of cable-related noise.</p> <p>The drifter mounted hydrophones (RESON TC4014-5) are broadband omnidirectional units characterized by low internal noise and high sensitivity (180 dB \pm3 dB re 1V/μPa) with a frequency response of 25 Hz – 250 kHz \pm 3 dB. Acoustic data is recorded using a compact digital underwater recorder (EA-SDA14), with resulting sound files stored internally on SD cards.</p> <p>The recorders will be set up to sample at 312.5 kHz with 32-bit resolution to cover a broad frequency band and allow interpretation of all likely noise sources without aliasing risks. The Drifting Ear method does not require any license as the equipment will not be deposited on the seabed.</p> <p>Two Drifting Ears units will be prepared for mobilisation to cover for the unlikely eventuality of equipment failure. The SAMS Project Manager will liaise with the vessel to identify a suitable weather window for mobilisation. The equipment and two field scientists will mobilise from SAMS facilities in Oban and transit in a van to site the day before the survey.</p> <p>The field scientists will carry out the deployment and retrieval of the field equipment with support of the vessel crew. Risk assessments and safe working procedures will be reviewed once the vessel is known, and will be followed during operations. The weight of the unit means that it can be deployed and retrieved manually. The scientists will monitor the deployed unit throughout the survey period. If the unit drifts outside a pre-defined area, the vessel can intervene and recover the unit, and then re-deploy it. SAMS aims for a deployment time of 8 hours, regardless whether this is as a single or multiple deployment. During the deployment the field scientists will collect and record auxiliary data such as environmental conditions (e.g. sea state, swell, current speed, current direction, etc.) during the noise monitoring event at frequent intervals.</p> <p>Post-Construction (2MW turbine) Noise Profiling:</p> <p>The purpose of noise profiling post-construction is to provide good quality, reliable measurements of the acoustic environment following the installation of the 2MW turbine. Post construction monitoring will collect data on noise emitted into the water column from a floating turbine, to determine the noise profile around the structure. The methodology for post construction monitoring is yet to be determined, however, this will be confirmed in coming months and the PEMP will be updated accordingly.</p>
Load cells	<p><u>Objectives</u></p> <ul style="list-style-type: none"> • Monitor for any large strains on mooring lines

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	<p><u>Method</u></p> <p>It is currently expected that load cells will be attached to the mooring lines for continuous monitoring of significant loading to the lines for the larger turbines. It is acknowledged that the function of the load cells is predominantly to assess the performance of the mooring lines during operational conditions, however, they may also offer a potential method for detecting entanglement from fishing equipment. To prevent ghost fishing.</p>
ROV Surveys	<p><u>Objective</u></p> <ul style="list-style-type: none"> Identify if entanglement of marine mammals is a cause for strain on mooring lines. <p><u>Method</u></p> <p>As with the load cells, periodic maintenance ROV surveys are also primarily to be used for monitoring the integrity of the inter-array cables, mooring lines and anchors, however, the surveys also offer the opportunity to monitor the presence of ghost fishing nets lodged on the mooring system.</p>
Reporting	<p>KOWL will aim to submit survey reports and raw data to MS-LOT on behalf of the Scottish Ministers in support of the discharge of conditions were appropriate within three months of receiving the data from survey contractors or equivalent.</p>

Table 5-4 Marine Mammal Monitoring Programme

Project Phase	Proposed Activity	Reason
Pre-construction	Noise profiling (One 1-day survey)	Create a baseline noise profile prior to installation
Tranche 1	Noise profiling (One 1-day survey)	Create a noise profile for the turbine
Pre-Tranche 2 Data Review and PEMP Update for Final PEMP	Meeting with SNH	To discuss data collected from Tranche 1 and agree any amendments to PEMP
Tranche 2 and O&M	Load cells	Continuous monitoring for strains on the mooring lines
	ROV surveys (initially every six months and then reduced frequency over the life of the project)	Visual inspection of the mooring lines including for entanglement of marine mammals

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6. DIADROMOUS FISH MONITORING PLAN

6.1. Consent Conditions

Table 6-1 Summary of Diadromous Fish monitoring discussions in PEMP meetings held with SNH, RSPB, MS-LOT and MSS

Date	Summary of key discussions and agreements
05/05/2017	<p>It was noted during the meeting that the likely impacts to diadromous fish were of lesser significance than other organisms, namely Kittiwake and Puffin and therefore the level of monitoring should reflect that. It was suggested that KOWL could provide a contribution to the Scottish Government Strategy that is currently being conducted and this would constitute sufficient monitoring for diadromous fish.</p>

Table 6-2 Monitoring Approach to Diadromous Fish

Monitoring Approach	<p>Pre-Construction:</p> <p>No pre-construction monitoring or data collection on diadromous fish has been considered necessary as agreed during consultation with key stakeholders</p> <p>Construction:</p> <p>The construction of the substructures will be undertaken at port, and therefore the activities on site will be limited to installation of the units (substructures and WTGs) including towing, hook up and commissioning only. Installation of the units on site is expected to take less than 1 week (tow to sites, hook up to moorings and export cables), and therefore, monitoring during construction and installation of the units is not considered necessary as agreed during consultation with key stakeholders.</p> <p>Post-Construction:</p> <p>KOWL are planning a monitoring programme with Dee District Salmon Fishery Board & River Dee Trust and the River Don Trust which will contribute to the National Research and Monitoring Strategy for Diadromous Fish (NRMSD) which aims to investigate the potential for interactions between diadromous fish and wind, wave and tidal renewable energy developments.</p>
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Table 6-3 Objectives and Methods of Diadromous Fish monitoring programme

Objectives and methods for each technique employed	
Monitoring Programme	<p><u>Objective</u></p> <p>Contribute to the National Research and Monitoring Strategy for Diadromous Fish (NRMSD)</p>

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	<p><u>Method</u></p> <p>KOWL is currently exploring the potential to contribute to a monitoring programme regarding tagging adult salmon and/or sea trout and investigating adult returns to the Rivers Dee and Don Trusts and in conjunction with other on-going monitoring programmes. The programme will aim to establish migration pathways of adult diadromous fish will help to inform potential for interaction with offshore windfarm developments. The project would build upon the European Offshore Wind Deployment Centre (EOWDC) smolt tagging programme. This project would provide valuable information for offshore development in terms of where adult fish may be encountered, the scale of interaction and whether the fish follow a narrow migration pathway or cover a wider area.</p>
Reporting	<p>Confirmation of the contribution given from KOWL to the programme will be provided to MS-LOT in order to discharge the licence conditions, thereafter there will not be any further reporting requirements from KOWL, but it will be agreed the data from the programme will be provided to the Scottish Government as a requirement of the programme.</p>

6.2. Programme

No further monitoring requirements are expected to be undertaken at this stage, however, during further PEMP meetings, this will be discussed along with the monitoring scopes for bird and marine mammals, and the PEMP update accordingly if required.

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APPENDIX A

DTBird Specification

DTBird[®] System Specifications for Wind Turbines

Day & Night
On & Offshore

DTBIRD TEAM

November 2017.

Ref.: DTB0516SPWTG.Rev2

Fulfilled: Marcos Puente
Reviewed: Javier Díaz
Approved: Agustín Riopérez

13/11/17
14/11/17
16/11/17

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3. DTBird Collision Avoidance Module 4

4. DTBird Stop Control Module 5

5. DTBird Collision Control Module..... 6

Annex. Examples of the Surveillance Area of DTBird Detection Module models V4 and V8..... 7

DTBird® Day Detection Module		V4	V8
Service description	Automatic and real-time ¹ detection in daylight of bird flights in the airspace surrounding a Wind Turbine (WTG).	✓	
	Video and audio recordings of every bird flight detected uploaded to DTBird online Data Analysis Platform with Username and Password protected access, ensuring bird flight traceability.		
Installation site	Wind Turbines (WTGs) - On & Offshore.	✓	
Module specifications			
Components	HD cameras: 4 units/WTG.	✓	
	8 units/WTG.		✓
	Environmental sensors: Light, Temperature and Humidity. Optional: Rain and Fog. From the WTG: Wind Speed and Wind Direction.	✓	
	Cabinet (1/WTG): Analysis Unit, Detection Software, Electrical and Lighting Protection Systems and Communications Hardware.		
	Mounting System (not intrusive on WTG).		
Cables & Connections.			
Location on the facility	HD Cameras + Environmental Sensors + Mounting System (patented): outdoors on the WTG tower, from 5 to 80 m height (Project specific).	✓	
	Cabinet: indoors, normally inside the tower.		
	Cables & Connections: outdoors on the WTG tower, and inside the WTG tower.		
Cabinet			
Dimensions	51x65x25 cm, WxHxD.	✓	
	51x130x25 cm, WxHxD.		✓
Weight	10 Kg.	✓	
	20 Kg.		✓
Power supply	110-250 AC monophasic 50/60Hz (Power Grid Connection).	✓	
Power consumption	55 W.	✓	
	95 W.		✓
Operation conditions	Daylight (>50 lux).	✓	
Weatherproof	Outdoor components: IP 66 / -30° to 50° C. Falling blocks of ice protection system (optional).	✓	
	Cabinet components: IP 65 / 0° to 40° C. Heating or Cooling (optional).		
Communications	Wind Farm Network/Mobile Router 4G/ADSL/Optic Fiber/Satellite Internet.	✓	
Service specifications			
Detectable bird Species/Groups	All bird Species/Groups.	✓	
Bird Species/Group identification	Yes, through the review of bird flight video and audio recordings.	✓	
Surveillance area	360° around the WTG. See pages 7-8 (Examples of the Surveillance Area of DTBird Detection Module models V4 and V8).	✓	
Radius around the WTG	Bird wingspan	Set up range	
	>150 cm	200-320 m	✓
		350-600 m	✓
	75-150 cm	100-200 m	✓
		175-350 m	✓
	<75 cm	25-100 m	✓
		25-175 m	✓
Simultaneous detection of multiple bird flights	Yes (360° around WTG), detection of an unlimited number of flights and birds at the same time.	✓	
Bird flight detectability	>80% ²	✓	
Bird flight traceability³	Video and audio recordings of every bird flight stored in the Wind Farm online Data Analysis Platform, with Username and Password protected access.	✓	
False Positive rate (recording with no bird)	0.5 - 5.5 FP/day (yearly average).	✓	
Recorded data	Location.	✓	
	Flight ID.		
	Flight time data: Init time and total length.		
	Flight video records, with embedded audio record.		
	Online Snapshots of HD cameras every hour.		
	Environmental data, and WTG operational parameters during bird flight.		
Online Data Analysis Platform	Species/group and bird behavior analysis from video and audio recordings.	✓	
	Bird flights videos with audio storage for 2 years (up to 50 Gb/Year/DTBird unit) and data storage for 5 years, in DTBird® Server in Data Center Classified Tier 4. Optional one-year extensions.		
Service Control	Flight Analysis tools: review of video and audio records, flight analysis, data export, video download and automatic service reports.	✓	
	Self-checking and daily verification done remotely from DTBird Headquarters.		
Warranty	2-year worldwide.	✓	

¹ Real-time means that time from image capture by the HD Camera to bird detection, is <1 second.

² Norwegian Institute for Nature Research (NINA). 2012. Evaluation of the DTBird video-system at the Smola wind-power plant. Detection capabilities for capturing near-turbine avian behavior.

DTBird® Night Detection Module		
Service description	Automatic and real-time detection at night of bird flights in the airspace surrounding a Wind Turbine (WTG). Video and audio recordings of every bird flight detected uploaded to DTBird online Data Analysis Platform with Username and Password protected access, ensuring bird flight traceability.	
Installation site	Wind Turbines (WTGs) - On & Offshore.	
Module specifications		
Components	Thermal Cameras: Variable number per WTG (Project specific). Environmental sensors: Light, Temperature and Humidity. Optional: Rain and Fog. From the WTG: Wind Speed and Wind Direction. Cabinet (1/WTG): Analysis Unit, Detection Software, Electrical and Lighting Protection Systems and Communications Hardware. Mounting System (not intrusive on WTG). Cables & Connections.	
Location on the facility	Thermal Cameras + Environmental Sensors + Mounting System (patented): outdoors on the WTG tower, from 5 to 80 m height (Project specific). Cabinet: indoors, normally inside the tower. Cables & Connections: outdoors on the WTG tower, and inside the WTG tower.	
Cabinet		
Dimensions	51x65x25 cm, WxHxD.	
Weight	10 Kg.	
Power supply	110-250 AC monophasic 50/60Hz (Power Grid Connection).	
Power consumption	55 W.	
Operation conditions	Night (<50 lux).	
Weatherproof	Outdoor components: IP 66 / -30° to 50° C. Falling blocks of ice protection system (optional). Cabinet components: IP 65 / 0° to 40° C. Heating or Cooling (optional).	
Communications	Wind Farm Network/Mobile Router 4G/ADSL/Optic Fiber/Satellite Internet.	
Service specifications		
Detectable bird Species/Groups	All bird Species/Groups.	
Bird Species/Group identification	The review of bird flight video and audio records, allows the identification based on bird shape, flight pattern, and wing beats frequency.	
Surveillance area	45° horizontal and 33° vertical per HD Camera.	
Radius around the WTG	Bird wingspan	Set up range
	>150 cm	140-230 m
	75-150 cm	70-140 m
	<75 cm	20-70 m
Simultaneous detection of multiple bird flights	Yes, detection of an unlimited number of flights and birds at the same time.	
Bird flight detectability	Under evaluation.	
Bird flight traceability ¹	Video and audio recordings of every bird flight stored in the Wind Farm online Data Analysis Platform, with Username and Password protected access.	
False Positive rate (recording with no bird)	1 - 4 FP/day (yearly average)/Camera. Based on preliminary test.	
Recorded data	Location.	
	Flight ID.	
	Flight time data: Init time and total length.	
	Flight video records, with embedded audio record.	
	Environmental data, and WTG operational parameters during bird flight.	
Online Data Analysis Platform	Species/group and bird behavior analysis from video and audio recordings.	
	Bird flights videos with audio storage for 2 years (up to 50 Gb/Year/DTBird unit) and data storage for 5 years, in DTBird® Server in Data Center Classified Tier 4. Optional one-year extensions. Flight Analysis tools: review of video and audio records, flight analysis, data export, video download and automatic service reports.	
Service Control	Self-checking and daily verification done remotely from DTBird Headquarters.	
Warranty	2-year worldwide.	

¹Traceability: Ability to verify bird flights' location, time and Species/Group identification by means of recorded video and data.

DTBird® Collision Avoidance Module	
Service description	Automatic emission of Warning/Discouraging sounds from the WTG linked to real-time bird flight detection in collision risk. Video and audio recordings of every bird flight detected uploaded to DTBird online Data Analysis Platform with Username and Password protected access, ensuring bird flight traceability.
Installation site	Wind Turbines (WTGs) - On & Offshore.
Module specifications	
Components	DTBird® <i>Detection Module V4 or V8</i> . 1 Amplifier & 4 – 10 Speakers per WTG. Sound signal: Frequency range: 250-12,500 Hz Maximum Power: 120 W RMS Mounting System (not intrusive for WTG). Cables & Connections.
Location on the WTG	Amplifier: DTBird® Cabinet inside the WTG tower. Speakers: outdoors on the WTG tower, from 10 to 130 m height and occasionally on the nacelle (Project specific). Cables & Connections: outdoors on the WTG tower, and inside the WTG tower.
Dimensions	Amplifier 26x43x9 cm, WxHxD Speaker 25x25x35 cm, WxHxD
Weight	20 – 30 Kg.
Power supply	Standard Power Grid Connection: 110-250 AC monophasic 50/60Hz
Power consumption	Including DTBird® Detection Module: 135 – 240 W
Weatherproof	Outdoor components: IP 66 / -30° to 50° C. Falling blocks of ice protection system (optional). Cabinet components: IP 65 / 0° to 40° C.
Service specifications	
Sound type:	Adjustable to target Species. Emission of Warning sounds to bird flights with Potential Collision Risk. Emission of Discouraging sounds to bird flights in High Collision Risk Area & Rotor Swept Area.
Sound power	Adjusted to legal requirements and bird sensitivity (Project specific). Maximum power location: Rotor Swept Area. Attenuation proportional to distance from the Rotor Swept Area.
Sound coverage	360° around WTG.
Sound trigger	Automatic and in real-time, <2 s after flight detection with Potential Collision Risk. Standard sound emission only with the WTG operating. No sound or low sound emission with the WTG stopped.
Sound emission traceability ¹	Sound recordings of every trigger uploaded to online Data Analysis Platform, with Username and Password protected access.
Collision Risk Reduction ²	Reduction of the bird flight time in the danger zone, especially larger birds, by 61-87%. Change of the bird flights' direction in 88% of cases where the bird is on a collision course with the wind turbine. ²
False Positive rate (sound trigger by DTBirdV4 with no bird)	0.2 – 4.0 FP/day, with a total duration of 0.1 - 2.5 min/day (yearly average).
Recorded data	Location. Flight with sound trigger ID. Sound time data: Init time and total length. Flight video records, with embedded audio record. Flight video with environmental data and WTG operational parameters. Species/group and bird behavior analysis from video and audio recordings.
Online Data Analysis Platform	Bird flights videos with audio storage for 2 years (up to 50 Gb/Year/DTBird unit) and data storage for 5 years, in DTBird® Server in Data Center Classified Tier 4. Optional one-year extensions. Flight Analysis tools: review of video and audio records, flight analysis, data export, video download and automatic service reports.
Service Control	Self-checking and daily verification done remotely from DTBird Headquarters.
Warranty	2-year worldwide.

¹ Traceability: Ability to verify location, time and sound emission by means of recorded sound, video and data.

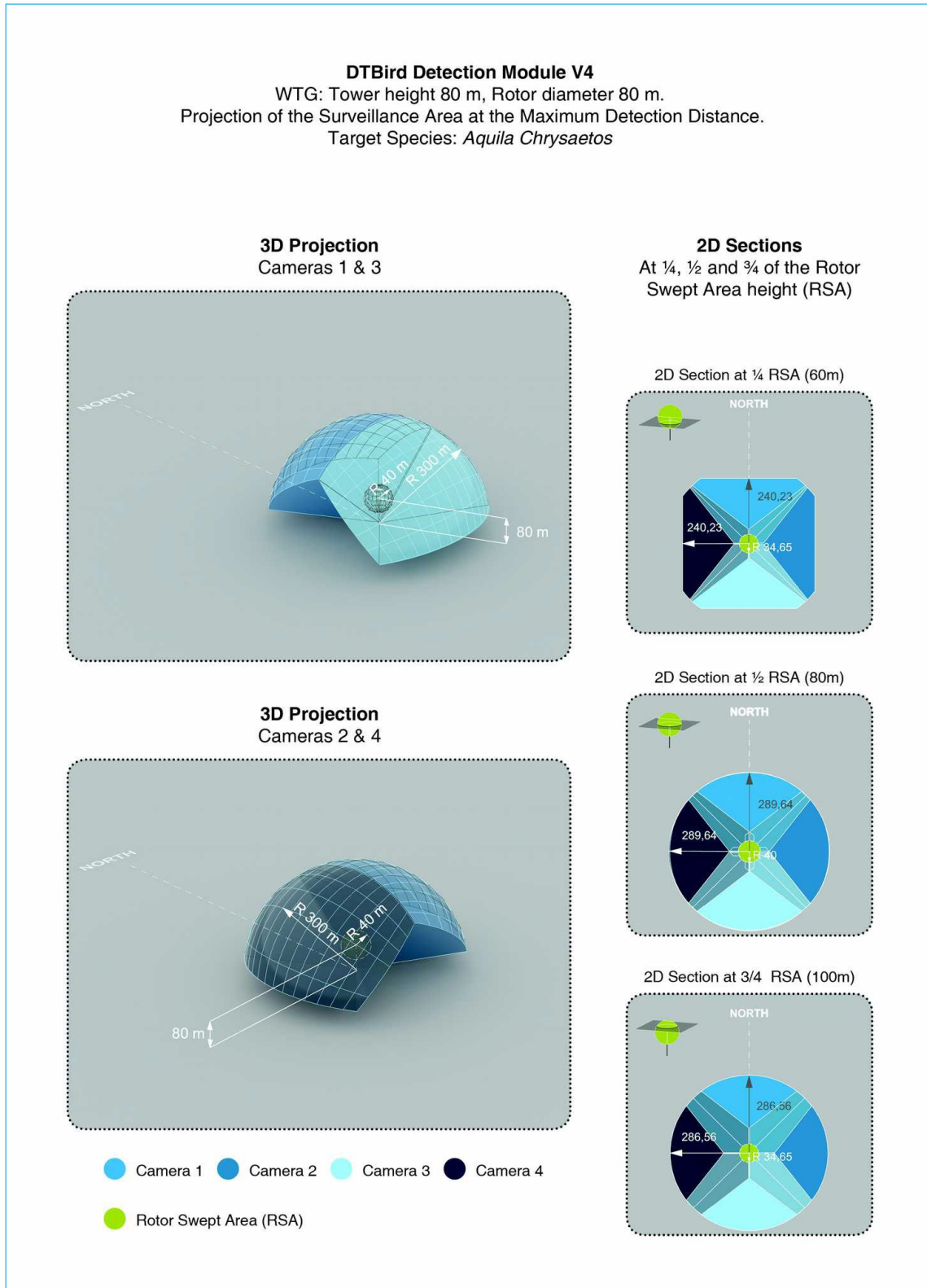
² Ecom AB. 2016. "Pilotinstallation av DTBird-systemet i Sverige. Möjligheter med skyddssystem för fågelfaunan vid vindkraftanläggningar – erfarenheter från Sveriges första installation av DTBird.". Report's summary translated by DTBird available in <http://www.dtbird.com/index.php/downloads-3> Experiences From Sweden's first DTBird Installation. Ecom AB. December 2016.

DTBird® Stop Control Module	
Service description	Automatic and real-time WTG Stop triggered by bird flights detected with Collision Risk. Video recordings of the entire WTG Stop uploaded to DTBird Data Analysis Platform, with Username and Password protected access, ensuring bird flight and stop traceability.
Installation site	WTGs (On & Offshore).
Module specifications	
Components & Location	DTBird® Detection Module V4 or V8 + Stop Control Software installed within DTBird® cabinet.
Dimensions/Weight/Power supply/Power consumption/Operation conditions/Weatherproof	Within DTBird® <i>Detection Module</i> . See <i>DTBird Detection Module</i> specifications for day or night (pages 2 and 3).
Communications	Connection with WTG PLC/Scada.
Service specifications	
Species/Group Stop trigger sensitivity (true positives) and specificity (true negatives)	Variable, depending on target Species/Group and bird community inhabiting the installation site.
Surveillance area	360° around WTG.
Radius of the Surveillance area around the wind turbine	DTBird® Detection Module V4 or V8.
Simultaneous detection of multiple bird flights	Yes (360° around WTG), detection of an unlimited n° of flights and birds at the same time.
Bird flight detectability	>80%
Stop trigger	Automatic and linked to real-time bird flight detection with collision risk. Collision risk calculation according to bird flight features.
Rotor Stop init time	Depending on WTG manufacturer, 2 – 18 s after DTBird® stop trigger ¹ .
Complete rotor Stop	Depending on WTG manufacturer, 15 – 35 s after WTG Stop init ¹ .
Stop length	Linked to real-time bird flight detection in collision risk. Automatic restart of WTG when the collision risk disappears.
Stop & bird flight traceability ²	Video recordings of every Stop & bird flight uploaded to DTBird Data Analysis Platform with Username and Password protected access. Automatic e-mail notification of every Stop: trigger time (first e-mail), end time and duration (second e-mail).
False Positive rate (Stops with no bird triggered by DTBirdV4)	0.5 – 10 hours/year/WTG
Recorded data	Flight with Stop trigger ID. Stop time data: Init time and total length. Stop video records, with embedded audio record. Environmental data and WTG operational parameters of every stop event. Species/group, bird behavior and Stop analysis from video and audio recordings.
Online Data Analysis Platform	Bird flights videos with audio storage for 2 years (up to 50 Gb/Year/DTBird unit) and data storage for 5 years, in DTBird® Server in Data Center Classified Tier 4. Optional one-year extensions. Flight Analysis tools: review of video and audio records, flight analysis, data export, video download and automatic service reports.
Service Control	Self-checking and daily verification done remotely from DTBird Headquarters.
Warranty	2-year worldwide.
<p>¹ The lowest wind turbine Stop time technically feasible should be used to achieve the maximum collision risk reduction. For individual bird flight efficient stops values below 30 s are recommended (species and site specific). DTBird stop protocol based on bird flight thresholds can be very efficient depending on the local bird activity.</p> <p>² Traceability: Ability to verify location, time and Stop of the rotor/blades by means of recorded documented identification.</p>	

DTBird® Collision Control Module	
Service description	Automatic and real-time detection of bird flights in Collision Risk Areas, and collision check from video and sound recordings, including birds potentially injured that fly away. Video and audio recordings uploaded to DTBird online Data Analysis Platform, with Username and Password protected access, that ensure bird flight and collision traceability.
Installation site	WTGs - On & Offshore.
Module specifications	DTBird® Detection Module V4 or V8. See pages 7-8 (Examples of the Surveillance Area of DTBird Detection Module models V4 and V8). Simultaneous video and sound recording of interconnected cameras for every detected bird flight. Continuous video recording saved for 5-10 days.
Service specifications	
Detectable bird Species/Groups	All bird Species/Groups.
Bird Species/Group identification	Yes, through the review of bird flight video and audio recordings.
Surveillance area	Whole WTG (including blades, nacelle and tower).
Multiple bird flights track & detection	Yes.
Nº of bird collisions simultaneously recorded	Unlimited.
Bird flights detectability	>80%
Bird collision detectability in video recordings	>96% (within the bird flights detected).
Overall bird collision detectability	>77% $0.8 \text{ (bird flight detectability)} \times 0.96 \text{ (collision detectability in video recordings)} = 0.77$
Collision traceability ¹	Video with audio recordings of every bird flight and potential collision uploaded to DTBird online Data Analysis Platform, with Username and Password protected access.
Request of in situ inspection to verify a potential collision and/or to recover a potentially injured bird	E-mail notifications of potential collision events, including online video data of the bird flight.
Recorded data	Location. Collision ID. Collision time data: Init time and total length. Collision video records, with embedded audio record. Environmental data, and WTG operational parameters of the collision event. Species/group, bird behavior and collision event analysis from video and sound recordings.
Online Data Analysis Platform	Bird flights videos with audio storage for 2 years (up to 50 Gb/Year/DTBird unit) and data storage for 5 years, in DTBird® Server in Data Center Classified Tier 4. Optional one-year extensions. Flight Analysis tools: review of video and audio records, flight analysis, data export, video download and automatic service reports.
Service Control	Self-checking and daily verification done remotely from DTBird® Headquarters.
Warranty	2-year worldwide.

¹ Traceability: Ability to verify bird flight collision events, time and Species/Group identification by means of recorded video and sound.

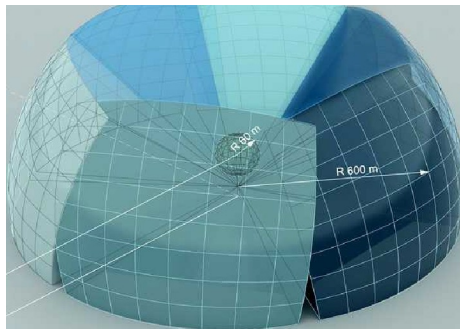
Annex. Examples of the Surveillance Area of DTBird Detection Module models V4 and V8.



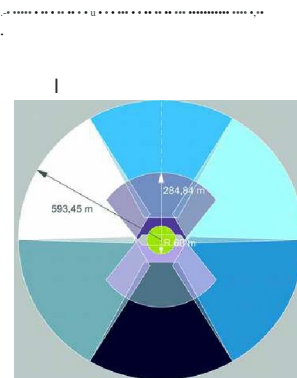
DTBird Detection Module VS

WTG: Tower height 130 m, Rotor diameter 120 m.
 Projection of the Surveillance Area.
 Target Species: . Golden Eagle (*Aquila chrysaetos*)
 . WTE (*Haliaeetus albicilla*)

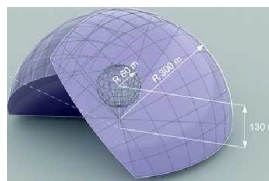
3D Projection
 Long Distance Cameras 1-2-3-4-5 & 6



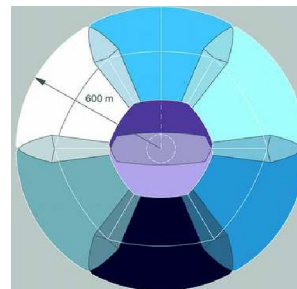
2D Sections
 At 1/2 of the Rotor Swept Area height (RSA)



3D Projection
 Medium to Short Distance Cameras 7 & 8



2D Plan projection



- Camera 1 Camera 2 • Camera 3 • Camera 4
- Camera 5 Camera 6 • Camera 7 • Camera 8
- Rotor Swept Area (RSA)

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APPENDIX B

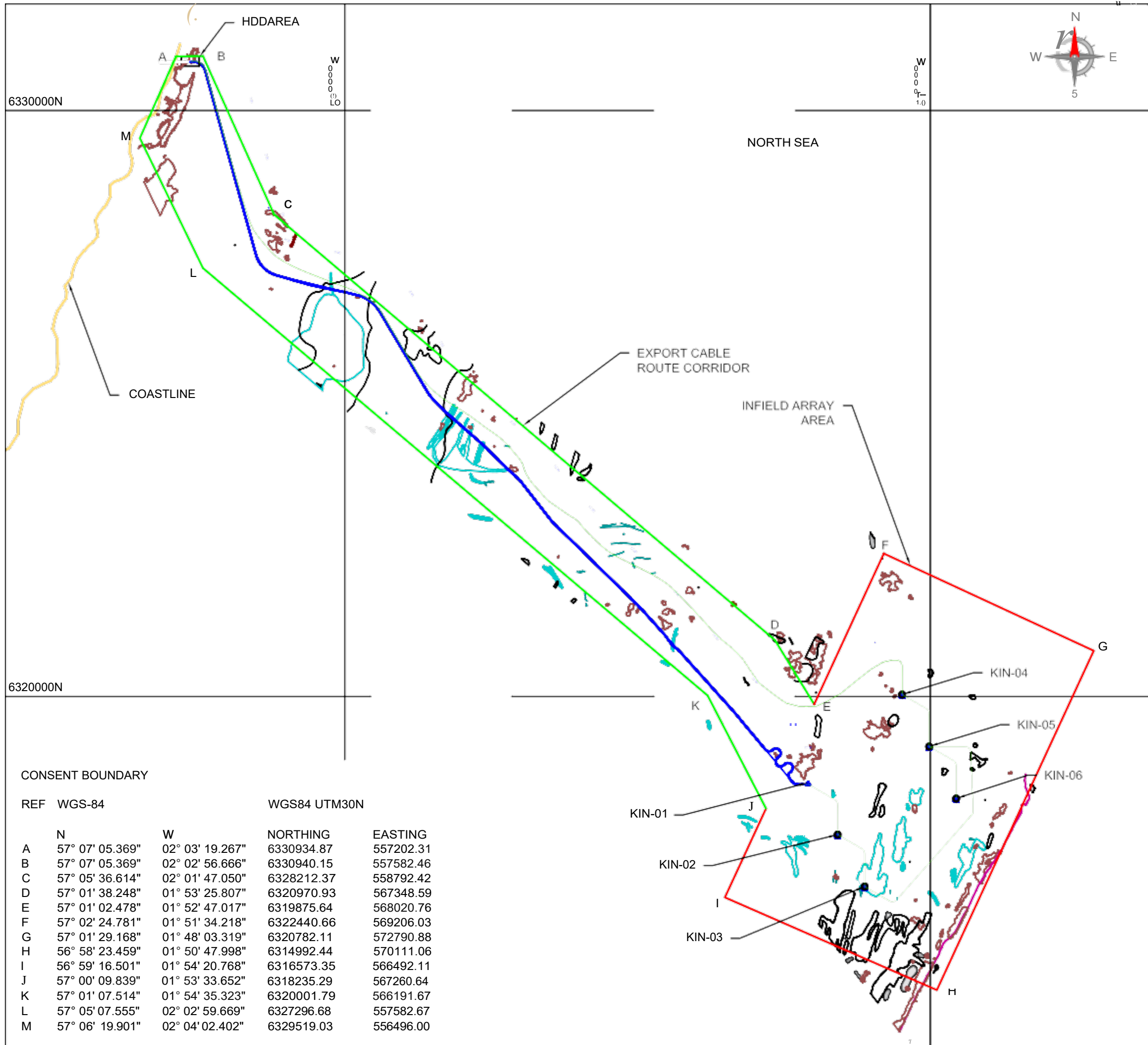
Key Monitoring Contractors

Topic	Contractor	Contact Detail
Bird monitoring	DTBird	Agustín Riopérez Edificio Indubuilding Avd. Democracia, 7, N 209 Madrid - 28031 (Spain) Tel: +34 91 344 90 86 arioperez@dtbird.com - www.dtbird.com
Bird Tagging	RSPB	TBC
Noise Profiling	SAMS	Paul Jowitt SAMS Research Services Ltd, Malin House, The European Marine Science Park, Oban, Argyll, PA37 1SZ UK Tel: +44 (0)1631 559470 Paul.Jowitt@sams.ac.uk
ROV	TBC	TBC
Load Cell	TBC	TBC

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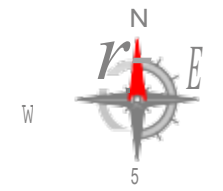
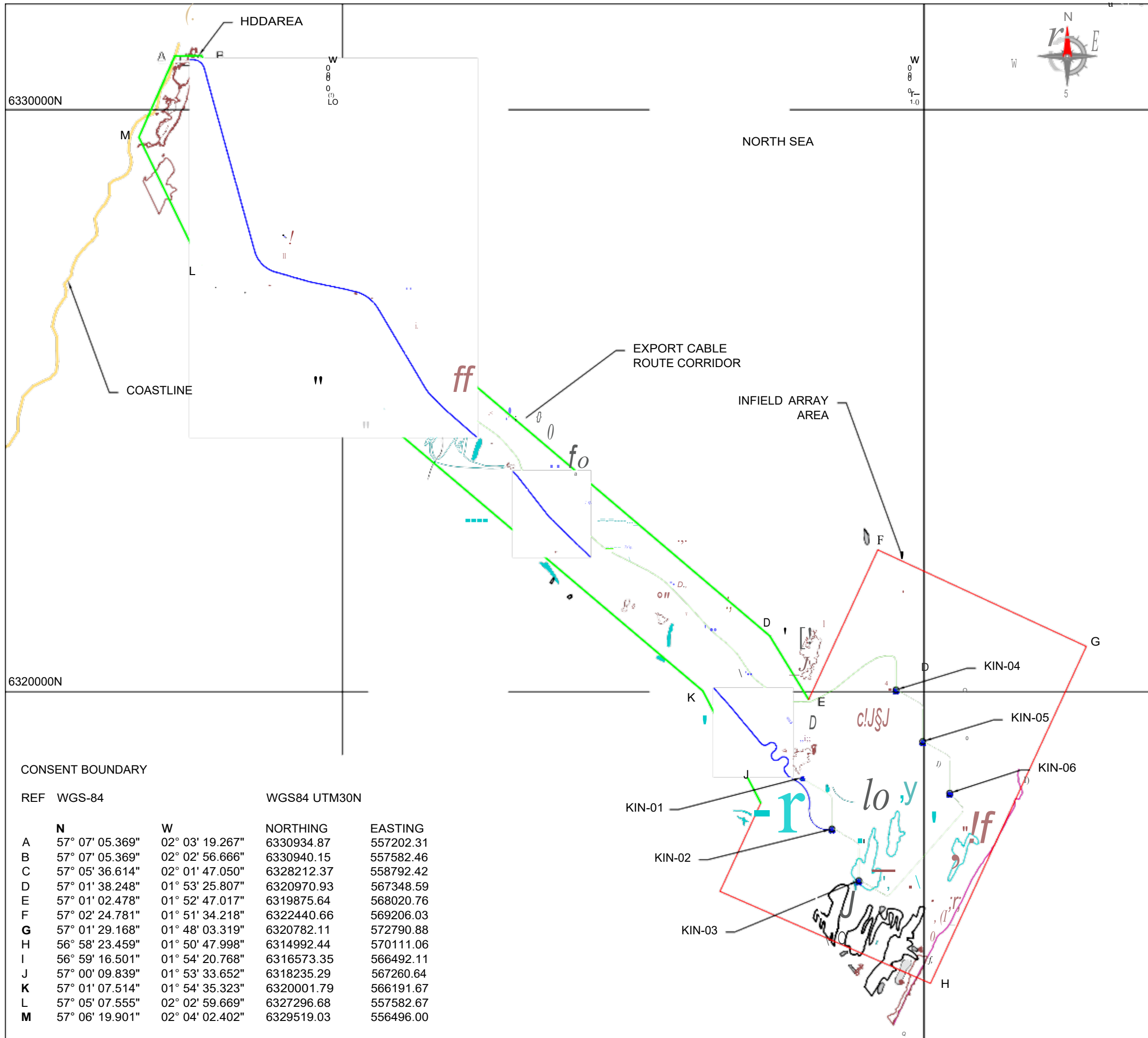
APPENDIX C

Field layout



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	567955.65			
KIN-02	6317645.51	568416.70			
KIN-03	6316758.16	568878.75			
KIN-04	6320034.94	569517.86			
KIN-05	6319147.58	569978.91			
KIN-06	6318260.23	570440.96			
<p>- EXISTING EXPORT CABLE ROUTE</p> <p>- PROPOSED 2ND EXPORT CABLE ROUTE</p>					
CLIENT: KINCARDINE OFFSHORE WINDFARM LTD					
PROJECT: KINCARDINE OFFSHORE WINDFARM					
TITLE: FIELD LAYOUT CONSENT AND WTG POSITION CHECK LAYOUT 1					
CLIENT DRAWING NUMBER: N/A		SHEET: 1 OF 2		SHEET SIZE: A3	
SCALE U.N.O.: 1:60		W3G DRAWING NUMBER: KOWL-DR-0001-015		REV: A5	
THIS DRAWING IS THE PROPERTY OF W3G MARINE LTD AND SHALL NEITHER BE COPIED NOR PRESENTED TO NON AUTHORIZED PERSONS WITHOUT THE WRITTEN CONCENT OF W3G MARINE LTD					

CONSENT BOUNDARY				
REF	WGS-84		WGS84 UTM30N	
	N	W	NORTHING	EASTING
A	57° 07' 05.369"	02° 03' 19.267"	6330934.87	557202.31
B	57° 07' 05.369"	02° 02' 56.666"	6330940.15	557582.46
C	57° 05' 36.614"	02° 01' 47.050"	6328212.37	558792.42
D	57° 01' 38.248"	01° 53' 25.807"	6320970.93	567348.59
E	57° 01' 02.478"	01° 52' 47.017"	6319875.64	568020.76
F	57° 02' 24.781"	01° 51' 34.218"	6322440.66	569206.03
G	57° 01' 29.168"	01° 48' 03.319"	6320782.11	572790.88
H	56° 58' 23.459"	01° 50' 47.998"	6314992.44	570111.06
I	56° 59' 16.501"	01° 54' 20.768"	6316573.35	566492.11
J	57° 00' 09.839"	01° 53' 33.652"	6318235.29	567260.64
K	57° 01' 07.514"	01° 54' 35.323"	6320001.79	566191.67
L	57° 05' 07.555"	02° 02' 59.669"	6327296.68	557582.67
M	57° 06' 19.901"	02° 04' 02.402"	6329519.03	556496.00



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 AND WILL REMAIN AT THAT LOCATION

REF	WGS84 UTM30N	
	NORTHINGS	EASTINGS
KIN-01	6318532.87	567955.65
KIN-02	6317645.51	568416.70
KIN-03	6316758.16	568878.75
KIN-04	6320034.94	569517.86
KIN-05	6319147.58	569978.91
KIN-06	6318260.23	570440.96

- EXISTING EXPORT CABLE ROUTE
- PROPOSED 2ND EXPORT CABLE ROUTE

REV	DESCRIPTION	DRN	CKD	APP	DATE
AS	ISSUED FOR COMMENT	JO	AW	AW	08/10/2019
A4	ISSUED FOR COMMENT	JO	JG	AW	03/04/2019
A3	ISSUED FOR COMMENT	JO	JG	AW	01/04/2019
A2	ISSUED FOR COMMENT	JO	JG	AW	29/01/2019
A1	ISSUED FOR COMMENT	JO	JG	AW	28/01/2019



CLIENT
KINCARDINE OFFSHORE WINDFARM LTD

PROJECT
KINCARDEN OFFSHORE WINDFARM

TITLE
FIELD LAYOUT CONSENT AND
WTG POSITION CHECK
LAYOUT 2

CLIENT DRAWING NUMBER	SHEET	SHEET SIZE
N/A	2 OF 2	A3

SCALE U.N.O. / W3G DRAWING NUMBER	REV
1:60 KOWL-DR-0001-015	AS

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CONSENT BOUNDARY

REF	WGS-84		WGS84 UTM30N	
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