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DEVELOPMENT SPECIFICATION AND LAYOUT PLAN KINCARDINE OFFSHORE WINDFARM PROJECT

Prepared	Checked	Reviewed	Approved
22/03/2018	22/03/2018	22/03/2018	22/03/2018
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Revision History

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*Purpose of Issue: for information, for review, for approval




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ACROYNMS AND ABBREVIATIONS

ALARP	As Low As Reasonably Practical
CaP	Cable Plan
DS	Design Statement
DSLPP	Development Specification and Layout Plan
HDD	Horizontally Directional Drill
KOWL	Kincardine Offshore Wind Farm Limited
LMP	Lighting and Marking Plan
m	Metre
MCA	Maritime and Coastguard Agency
MS-LOT	Marine Scotland Licensing Operations Team
MW	Mega Watt
nm	Nautical Mile
OREI	Offshore Renewable Energy Installation
s	Second
S36C	Section 36 C Variation Application to vary the Section 36 Consent granted to KOWL in March 2017
UKHO	United Kingdom Hydrographic Centre
UXO	Unexploded Ordnance
WROV	“Work Class” Remotely Operated Vehicle

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1. INTRODUCTION

1.1. Purpose of the Document

This document has been authored to satisfy Condition 11 of the Section 36 Consent issued to Kincardine Offshore Windfarm Ltd (KOWL) for the Kincardine Offshore Windfarm (the Project). This document provides the current (at the time of writing) Development Specification and Layout Plan (DSLPL) proposed for the Project, (see Section 1.5 for the wording of the condition), which requires the submission of a DSLP no later than six months prior to the Commencement of the Development

1.2. Scope of the Document

This document outlines the indicative location and design parameters of the Project including, co-ordinates of the turbines and substructures, dimensions of the turbines, lighting and markings and cables, both inter-array and export cables. This document also supports the Design Statement (Condition 12 of the Section 36 Consent – see Section 1.5 for further details), and is informed by the Lighting and Marking Plan (Condition 18 of the of the Section 36 Consent – see Section 1.5 for further details).

1.3. Project Description

The Project is considered a commercial demonstrator site, which will utilise floating foundation 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 that provides suitable water depth for a floating offshore wind demonstrator development (approximately 60-80m) (Figure 1-1).


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 Mean High Water Spring (MHWS) including the underground cables connecting to the onshore substation at Redmoss.

This DSLP 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), of additional environmental information 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').

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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 1-1 Summary of document timelines


Original Documents	Addendums	Variation
Date Submitted: March 2016	Date Submitted: September 2016	Date Submitted: November 2017
Original Application	Original Application	S36C Variation Application
Kincardine Offshore Windfarm ES (Original ES)	ES Additional Information Addendum (ES Addendum)	Section 36C Variation ES (Variation ES)
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
Substructures: semi-submersible	Substructures: semi-spar	Substructures: combination of semi-submersible and semi-spar
Cables: 33kv inter-array and export cables	Cables: 33kv inter-array and export cables	Cables: 33kv inter-array and export cables

Project Components

As noted in the table above, 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 and size of the turbines, and the substructure type.

As applied for in the Variation Application, the Project will now consist of the following offshore components:

- WTGs: 1 x 2MW and 6 x 8.4MW
- Substructures: semi-submersible Windfloat™ design
- 33kv inter-array and two export cables

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Onshore, the following construction activities will also take place (under permissions granted by Aberdeen City Council):


- Onshore substation
- Horizontal Directional Drilling landfall and onshore cable route

Construction Programme Overview

The construction of the Project is anticipated to occur in 'Tranches' in-line with the indicative Programme outlined below. A final Construction Programme for each tranche will be provided to Scottish Ministers prior to commencement of the construction as a requirement of the consent conditions.

Table 1-2 Indicative construction programme

Tranche	Activities	Indicative Start Dates
Tranche 1	Onshore works and HDD drilling	March 2018
	Mooring installation Turbine Location 1	May 2018
	Export Cable 1 installation	May 2018
	Installation of 2MW turbine to Location 1	June 2018
Tranche 2	Export Cable 2 installation	April 2019
	Mooring installation Turbine Locations 5-7	April 2019
	Installation of inter-array cables Locations 5-7	Aug 2019
	Installation of turbines to Locations 5-7	Aug 2019
Tranche 3	Mooring installation Turbine Locations 1-3	March 2020
	Installation of inter-array cables Locations 1-3 and 8	June 2020
	Move 2MW to Location 8 (dependent on recertification and consultation as noted above)	June 2020
	Installation of turbines to Locations 1-3	June 2020

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Please note, Export cable 2 may be installed as part of Tranche 1; however, at the time of writing this DSLP the timing was still to be decided. This will be confirmed in due course, and this document updated if required as per Section 1.4 below.

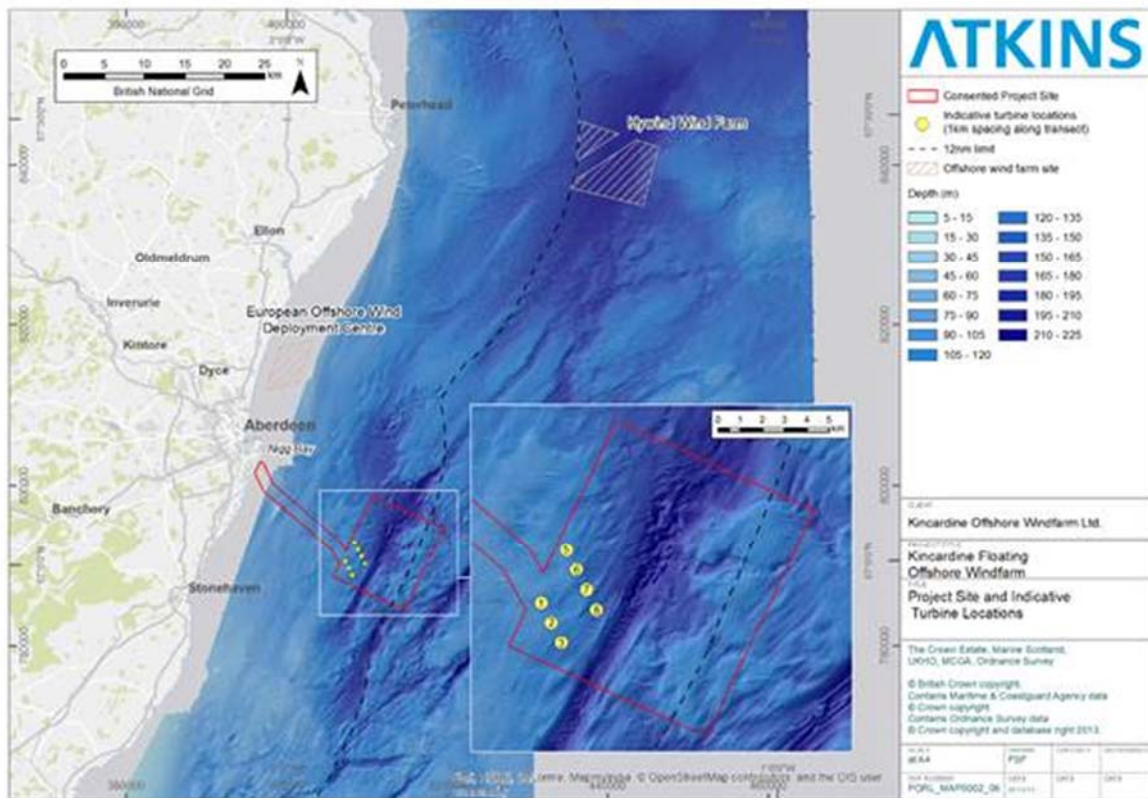



Figure 1-1 Project site and indicative turbine locations

1.4. Approach to Amending and Updating this DSLP

This is the first iteration of the DSLP (submitted pre-installation of the initial turbine on site). The nature of the construction process proposed for Project, (see Section 4.2 for full details) means that there may be further changes to the possible layout of the moorings, Export Cable 2 and the inter-array cables. Furthermore, the 2MW turbine may also be deployed in two different locations (1 and 8 in Figure 1-1) Therefore, two layouts have been provided as part of this DSLP in Appendix A and Appendix B. The first (Appendix A) is the layout plan for the 2MW deployment only with the export cables; and the second (Appendix B) for the possible likely final configuration (2MW turbine in Location 8 and the six larger turbines, both export cables and the inter-array cables) as presented in the visualisations that were assessed in the Seascape, Landscape Visual Impact Assessments Section of the Variation ES (see Section 5 and Appendix A of the Variation ES).

Where the need for an update or amendment is identified following approval from Marine Scotland Licensing Operations Team (MS-LOT) of the DSLP, 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. If the suggested change is

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accepted by MS-LOT, the DSLP will be redrafted, and submitted for re-approval. The Design Statement will also be updated if required as per the procedure laid out in that document.

1.5. Consent Conditions

The following consent condition is taken from the Section 36 Consent which forms the requirements for this DSLP.

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Table 1-3 Licence conditions relevant to the DSLP

Licence	Condition Number	Name	Details	Where Addressed in this Document
S36	11	Development Specification and Layout Plan	<p>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 Design Specification and Layout Plan (“DSLPL”), in writing, to the Scottish Ministers for their written approval. Such approval may only be granted following consultation by the Scottish Ministers with SNH, MoD, SFF, JRC, CAA, ACC, AC, MCA, NLB, NATS, and any such other advisors or organisations as may be required at the discretion of the Scottish Ministers.</p> <p>The DSLP must include, but not be limited to:</p> <ul style="list-style-type: none"> a. a plan showing the location of each individual WTG (subject to any required micro-siting), including information on WTG spacing, WTG identification/numbering, seabed conditions, bathymetry, confirmed foundation type for each WTG and any key constraints recorded on the Site; b. a list of latitude and longitude co-ordinates accurate to three decimal places of minutes of arc for each WTG. This should also be provided as a Geographic Information System 	<ul style="list-style-type: none"> a. plans are provided in Appendix A and B b. provided in Section 2.3



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			<p>(“GIS”) shapefile using the World Geodetic System 1984 (“WGS84”) format;</p> <ul style="list-style-type: none">c. a table or diagram of each WTG dimensions including – height to blade tip (measured above Lowest Astronomical Tide (“LAT”)) to the highest point, height to hub (measured above LAT to the centreline of the generator shaft), rotor diameter and maximum rotation speed;d. the generating capacity of each WTG used on the Site (Annex 1, Figure) and a confirmed generating capacity for the Site overall;e. the finishes for each WTG (see condition 18 on WTG lighting and marking); andf. the length and proposed arrangements on the seabed of all inter-array cables.	<ul style="list-style-type: none">c. Provided in Section 2.4d. Provided in Section 2.5e. Provided in Section 2.6f. Provided in Section 2.7 and 2.8
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Linkages to Other Consent Plans

The following consent condition is taken from the Section 36 Consent with which this DSLP has linkages to.

Table 1-4 Licence conditions linked to the DSLP

Licence	Condition Number	Name	Details
Section 36	12	Design Statement	The Company must, no later than 6 months prior to the Commencement of the Development, submit a Design Statement ("DS"), in writing, to the Scottish Ministers. The DS, which must be signed off by at least one qualified landscape architect as instructed by the Company prior to submission to the Scottish Ministers, must include representative wind farm visualisations from key viewpoints as agreed with the Scottish Ministers, based upon the final DSLP as approved by the Scottish Ministers as updated or amended.

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2. DEVELOPMENT SPECIFICATION AND LAYOUT PLAN DETAILS

2.1. Layout Plans

In Appendix A and Appendix B two layout plans are provided;

- Appendix A shows the plan for the 2MW turbine and substructure, Export Cable 1, and Export Cable 2 (KOWL-DR-0001-001 1 of 2 and 2 of 2)).
- Appendix B shows the final layout plan for the whole Project including the 2MW turbine and substructure, the six larger turbines, both export cables and the inter-array cables (KOWL-DR-0001-002 1 of 2 and 2 of 2)).

In each plan the following is provided in line with the wording of the consent condition:

- The location of each turbine;
- Details on spacing between each turbine (where relevant);
- Turbine numbering;
- Seabed conditions;
- Bathymetry;
- Foundation type (in this case number of mooring lines and anchor position); and
- Key constraints on the Site.

Further information is also provided on the bathymetry at the site, seabed conditions and key constraints of the site.

The remaining information requested in the Consent Condition is presented in the following sections.

Seabed Conditions


The seabed type varies along the Offshore Export Cable Corridor but is predominately sand overlaying a range of gravel and clay substrates. There are sections along the route which have boulder clays which may present challenges for trenching and are identified in the figure below (and is also shown in Appendix A-1 and Appendix A-2) in pink as “Fine to medium SAND with occasional boulders.

The seabed type in the Development Area is also predominantly loose medium sand overlaying dense to very dense medium sand, with some clay deposits also presents.

Site Constraints

The principal constraints on the site are illustrated in the figure below and also in the drawing presented in Appendix A;

- Consented Project Site – As defined in the S36 Consent and Marine Licence
- Survey Extents – As surveyed in the offshore campaigns
- The Crown Estate Scotland Lease Area Boundary – a reduced area within the consented Project Site focused around the locations the turbines will be positioned in
- Identified wreck sites as confirmed in the geophysical survey

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Bathymetry

The water depth along the Offshore Export Cable Corridor varies from circa 20m (nearshore) to approximately 70m within the Development Area. Detailed bathymetry from the Export Cable Corridor is illustrated in Figure 2-1 (N.B. the surveyed area shown in the figure below is bigger than the consented area).

The water depth in the Development Area varies from approximately 68 – 72m. The bathymetry in the Development Area is shown below.

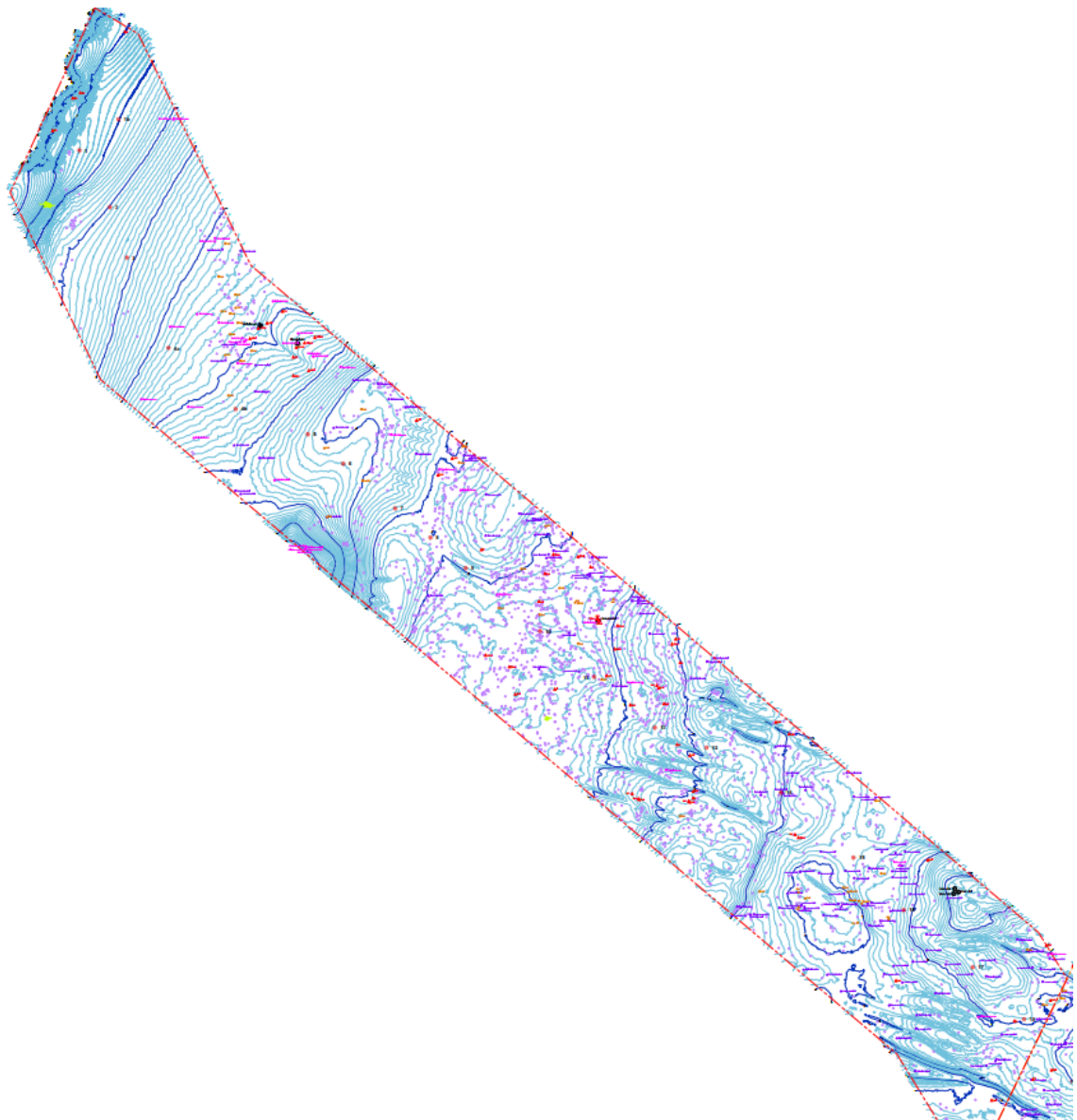


Figure 2-1 Detailed bathymetry of the Export Cable Corridor

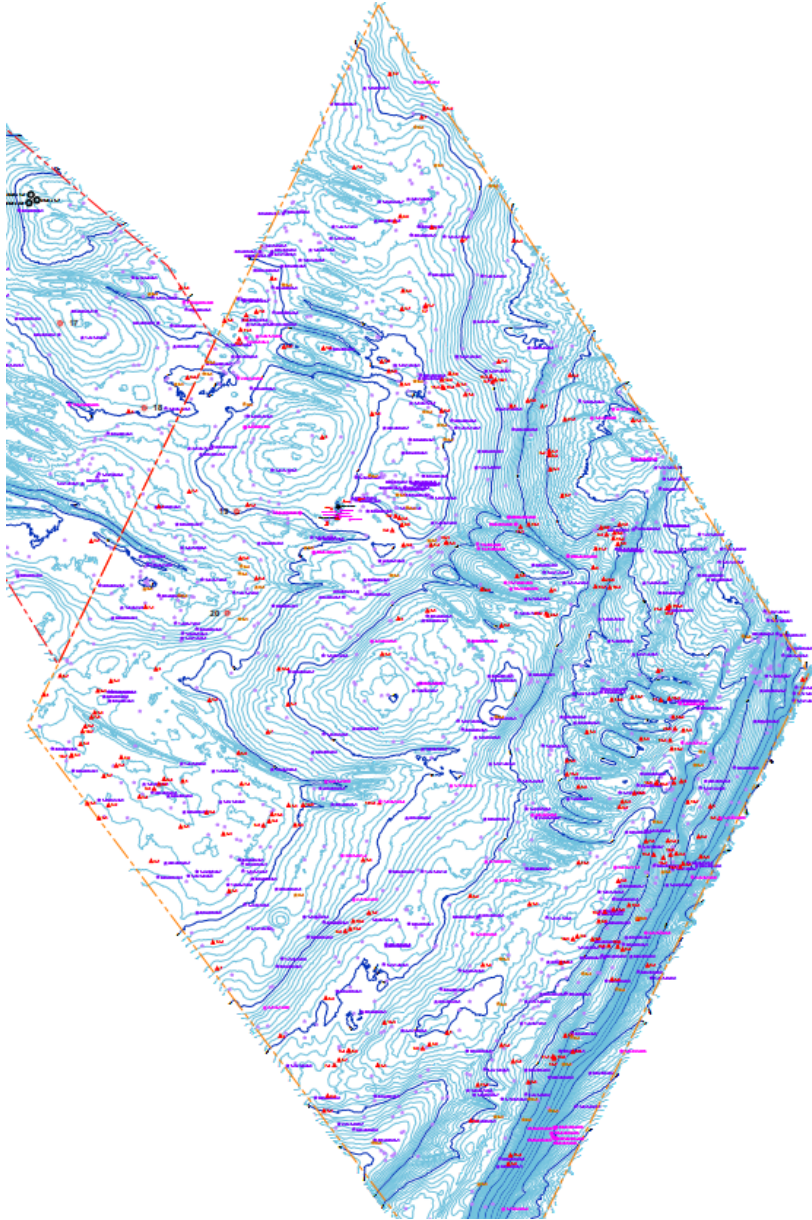



Figure 2-2 Detailed bathymetry of surveyed area within the Development Area

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2.2. Substructure Type and Moorings

2MW Turbine

As noted in the S36C Variation ES and the DS the substructure to be used for the 2MW turbine will be the semi-submersible Windfloat™ design.

8.4MW Turbines

The type of substructure to be used for the larger turbines is still under development, but it is currently understood that all the substructures will be the semi-submersible WindFloat™ design. This will however, be confirmed in a future iteration of this DSLP before Tranche 2 commences.

Moorings and Anchors

As per the moorings and anchors described and assessed in the Original ES, ES Addendum and Variation ES, the 2MW turbine and substructure will have four mooring lines and drag embedment anchors (12T Stevshark) will be used. The orientation of the mooring lines is shown in the drawings provided in Appendix A.

The number of mooring lines and anchors for the larger turbines will be confirmed prior to Tranche 2, however, it is still anticipated that only three mooring lines will be required, and that drag embedment anchors will be used.

2.3. Co-ordinates

Centre Point of Each Turbine Locations

As noted in the LMP, ID markings for the turbines will be fixed per Site (rather than per individual turbine), and therefore ID boards will be transferable between turbines should they change location so that the positions noted below will always align with charts and emergency documentations. The co-ordinates of the centre point for each location are provided in Table 2-1 below. These locations are shown in the Final Layout Plan shown in Appendix B. The spacings between the turbines is also shown in Appendix B (drawing 2 of 2) and Figure 2-3 below.

Table 2-1 Coordinates of each turbine location centre point

WTG	UTM ZONE 30		WGS84	
	Easting (m)	Northing (m)	Latitude	Longitude
KIN-01	567912	6318507	57° 0' 18.281"	-1° 52' 54.792"
KIN-02	568417	6317644	56° 59' 50.109"	-1° 52' 25.71"
KIN-03	568878	6316758	56° 59' 21.214"	-1° 51' 59.269"
KIN-05	569517	6320035	57° 1' 6.828"	-1° 51' 18.166"
KIN-06	569979	6319148	57° 0' 37.897"	-1° 50' 51.666"
KIN-07	570441	6318260	57° 0' 8.931"	-1° 50' 25.179"
KIN-08	567912	6318507	57° 0' 18.281"	-1° 52' 54.792"

A GIS shapefile with the centre locations listed above has also been provided to accompany this document which makes up the final configuration of turbines as presented in Appendix B, and aligns with the Variation ES and DS.

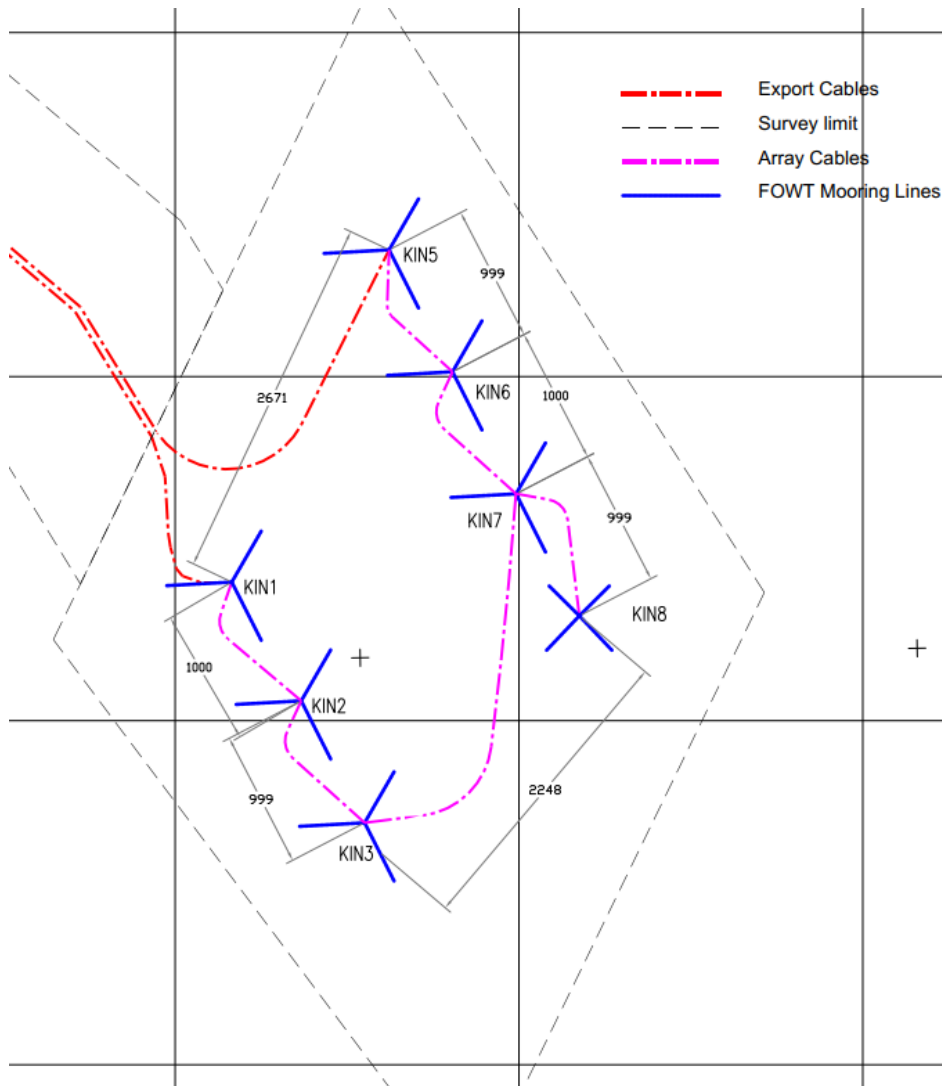



Figure 2-3 2MW and six 8.4MW turbine final layout plan showing spacing between the turbines

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Centre Point of 2MW Anchor Locations

As shown in Appendix A-1, the 2MW turbine and substructure will have four mooring lines and anchors. The centre point co-ordinates for the anchors are provided below. A GIS shapefile with the centre locations of the 2MW in location 1 and the four anchor points has also been provided to accompany this document. This is the as per the Tranche 1 Layout Plan shown in Appendix A.

The co-ordinates of the anchors for the larger turbines will be confirmed prior to Tranche 2.

Table 2-2 Coordinates of each anchor centre point for the 2MW turbine and substructure

WTG	UTM ZONE 30		WGS84	
	Easting (m)	Northing (m)	Latitude	Longitude
KIN-01 – ML1	568130	6318724	57° 0' 25.182"	-1° 52' 41.664"
KIN-01 – ML2	567693	6318724	57° 0' 25.412"	-1° 53' 7.559"
KIN-01 – ML3	567674	6318257	57° 0' 10.324"	-1° 53' 9.139"
KIN-01 – ML4	568149	6318257	57° 0' 10.072"	-1° 52' 40.991"

2.4. Turbine Dimensions

The dimensions of each of the two turbine types to be used for the Project are summarised below. It is not anticipated that the dimensions for the larger turbines will change prior to Tranche 2 which is why both have been confirmed at this point. However, if there are any changes, this will be confirmed and updated proper to commencement of the tranche.

Table 2-3 2MW and 8.4MW turbine dimensions

WTG	Vestas V80	Vestas V164
Height of blade tip above water surface	106m	191m
Height of the hub above water surface	66m	104.9m
Rotor diameter	80	164m
Maximum rotation speed	17rpm	12.1rpm

2.5. Generating Capacity

The table below outlines the generating capacity of each turbine type and the overall capacity of the Project is confirmed below. It is noted that the overall capacity of the individual turbines is greater than 50MW, however, the turbines will be rated to ensure the overall capacity of the Project will not be greater than 50MW.


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Table 2-4 Generating Capacity of the individual turbine and whole Project

Details	Generating Capacity
Vestas V80	2MW
Vestas V164	8.4MW
Whole Project	50MW

2.6. Export Cables


The proposed routes for the export cables are shown in Appendix A-2 below. The lengths are provided in the table below. Further detailed of the export cables is provided in the Cable Plan (CaP).

Table 2-5 Length of Export Cable 1 and 2



Export Cable Number	Length (m)
Export Cable 1	17,100
Export Cable 2	18,500

2.7. Inter-array Cables

The inter-array cables will only be installed prior to Tranche 2. The layout provided in the Appendix A-2 is only indicative at this stage, and a final layout will be provided prior to the commencement of Tranche 2. There is a total of six inter-array cables, five of which are approximately 1.2km in length and a single cable of approximately 3km in length. It should be noted that the cables will be in a buoyant wave configuration prior to entering the turbine and hence the plan distance of the cable route will be slightly less. The exact length of each cable will be confirmed once the final seabed micro-routing has been completed.

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APPENDIX A TRANCHE 1 LAYOUT PLAN

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APPENDIX B FINAL LAYOUT PLAN