

Seagreen Offshore Wind Farm

Offshore Wind Farm Development Specification and Layout Plan

May 2020



Project Title	Seagreen Wind Energy Ltd
Document Reference Number	LF000009-CST-OF-PLN-0004

Offshore Wind Farm Development Specification and Layout Plan (OWF DSLP)

Section 36 Consent Condition 12 For the approval of Scottish Ministers

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Rev	Date	Reason for Issue	Originator	Checker	ECoW	Approver
02	20/05/2020	For approval	Xodus Group Ltd			

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Consent Plan Overview

Purpose of the Offshore Wind Farm Development Specification and Layout Plan (OWF DSLP)

This Offshore Wind Farm Development Specification and Layout Plan (OWF DSLP) is submitted by Seagreen Wind Energy Limited (SWEL) on behalf of Seagreen Alpha Wind Energy Limited (SAWEL) (hereinafter referred to as Seagreen) to address the specific requirements of Condition 12 of the Section 36 (S36) Consent granted by the Scottish Ministers to SAWEL under section 36 of the Electricity Act 1989 (in respect of the Alpha Offshore Wind Farm) and to Seagreen Bravo Wind Energy Limited (SBWEL) (in respect of the Bravo Offshore Wind Farm) on 10 October 2014 both as varied by the Scottish Ministers by decision letter issued pursuant to an application under section 36C of the Electricity Act 1989 on 28 August 2018 and, in respect of the consent applicable to the Bravo Offshore Wind Farm, as assigned to SAWEL on 22 November 2019.

Seagreen Alpha and Seagreen Bravo OWFs and the OTA are collectively referred to as the 'Seagreen Project'.

This OWF DSLP has been prepared to discharge condition 12 of the S36 consent for the Seagreen OWF Project.

The overall aims and objectives of the OWF DSLP are to provide details of the proposed specification and layout in so far as it relates to the:

- 150 Wind Turbine Generators (WTGs), spare locations and their associated foundations, across the Site; and
- Inter-array Cables

While Seagreen note that condition 12 of the S36 consent requires that the OWF DSLP shows the location of the substation platforms, Seagreen considers this part of the Offshore Transmission Asset (OTA) infrastructure and this information has been included in the OTA Development Specification and Layout Plan (OTA DSLP) (LF000009-CST-OF-PLN-0005) which addresses OTA Marine Licence Condition 3.2.2.6.

All Seagreen Contractors (including their Sub-Contractors) involved in the Seagreen OWF Project are required to comply with this OWF DSLP through conditions of contract.

Scope of the OWF DSLP

This OWF DSLP covers, in line with the requirements of condition 12 of the S36 Consents, industry standards and good practice, the following in relation to Alpha and Bravo OWFs:

- the proposed 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;
- a list of latitude and longitude co-ordinates, accurate to three decimal places of minutes of arc for each WTG, which is also provided as a geographic information system ("GIS") shape file using World Geodetic System 1984 ("WGS84") format;
- a table and 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;
- the generating capacity of each WTG used on the Site, and a confirmed generating capacity of the Site overall;
- the finishes for each WTG; and
- the length and proposed arrangements on the seabed of all inter-array cables.

Structure of the OWF DSLP

The OWF DSLP is structured as follows:

- | | |
|-------------|---|
| Section 1&2 | Provides an overview of the Project and the consent requirements that underpin the content of this OWF DSLP. It also sets out the purpose, objectives and scope of the OWF DSLP and sets out the process for making updates and amendments. |
| Section 3 | Provides the required details in relation to the development specification and layout of the WTGs. |
| Section 4 | Provides the required details in relation to the development specification and layout of the Inter-array Cables. |
| Section 5 | Demonstrates compliance with the original application and commitments made. |
| Section 6 | Lists the references made within this OWF DSLP. |
| Appendices | <p>Appendix A – Abbreviations and Definitions</p> <p>Appendix B – Change Management Process</p> <p>Appendix C – GIS information to Support the OWF DSLP</p> <p>Appendix D – Compliance with ES Parameters</p> <p>Appendix E – Summary Mitigation Measures</p> |

Plan Audience

This OWF DSLP will be submitted for approval to the Scottish Ministers in consultation with other stakeholders in relation to monitoring compliance with the specific requirements of the relevant S.36 consent conditions.

Copies of the OWF DSLP are to be held in the following locations:

- Seagreen's head office;
- Seagreen's construction office and marine coordination centre;
- at the premises of any Contractor (as appropriate), including the Seagreen ECoW, appointed by Seagreen; and
- aboard any vessel engaged in the Construction and operation of the Wind Farms.

1. Introduction

1.1 Consents and Licences

Seagreen Wind Energy Limited (SWEL), (hereafter referred to as Seagreen) was granted Section 36 Consents (S36 Consents) under the Electricity Act 1989 by Scottish Ministers in October 2014 for Seagreen Alpha and Seagreen Bravo Offshore Wind Farms (OWFs), as varied. Marine Licences for Seagreen Alpha and Bravo OWFs and the Offshore Transmission Asset (OTA) (together the 'Marine Licences') were also granted by Scottish Ministers in October 2014, as varied, under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 (together the 'Marine Licences'). Seagreen Alpha and Seagreen Bravo Offshore Wind Farms (OWFs) and the OTA are collectively referred to as the 'Seagreen Project'.

In 2018, following application by Seagreen, the Alpha OWF Marine Licence and Bravo OWF Marine Licence were varied by the Scottish Ministers, following application by Seagreen in 2019 these licences were subsequently varied. In 2019, the OTA Marine Licence was also varied by the Scottish Ministers. In 2019, the Bravo Marine Licence was assigned from Seagreen Bravo Wind Energy Limited (SBWEL) to Seagreen Alpha Wind Energy Limited (SAWEL).

1.2 Project Description

The Seagreen Project is located in the North Sea, in the outer Firth of Forth and Firth of Tay region and comprises the OWFs (the Wind Turbine Generators (WTGs), their foundations and associated array cabling), together with associated infrastructure of the OTA (Offshore Substation Platform (OSP), their foundations and the offshore export cable), to facilitate the export of renewable energy to the national electricity transmission grid. The location of the Seagreen Project is shown in Figure 1.0.

The Seagreen Project will consist of the following key components:

- 150 WTGs; comprising:
 - 114 WTGs installed on three legged steel jackets, each installed on suction bucket caissons;
 - 36 WTGs installed on up to four legged steel jackets, each installed on pin pile foundations;
 - Two OSPs, each installed on 12 pin pile foundations;
 - A network of inter-array subsea cables as detailed below;
 - Circa 300km of inter-array cables to connect strings of WTGs on suction bucket caissons together and to connect these WTGs to OSP 1
 - Circa 55km of inter-array cables to connect strings of WTGs on piled foundations together and to connect these WTGs to OSP 2; and
 - Circa three km of interconnector cable to connect the two OSPs
 - Inter-array cables will be buried where possible and where burial is not possible cable protection will be provided.
- Three subsea export cables, totalling circa 190km in length, to transmit electricity from the OSPs to the landfall at Carnoustie and connecting to the onshore export cables for transmission to the onshore substation and connection to the National Grid network. Export cables will be buried where possible and where burial is not possible cable protection will be provided.

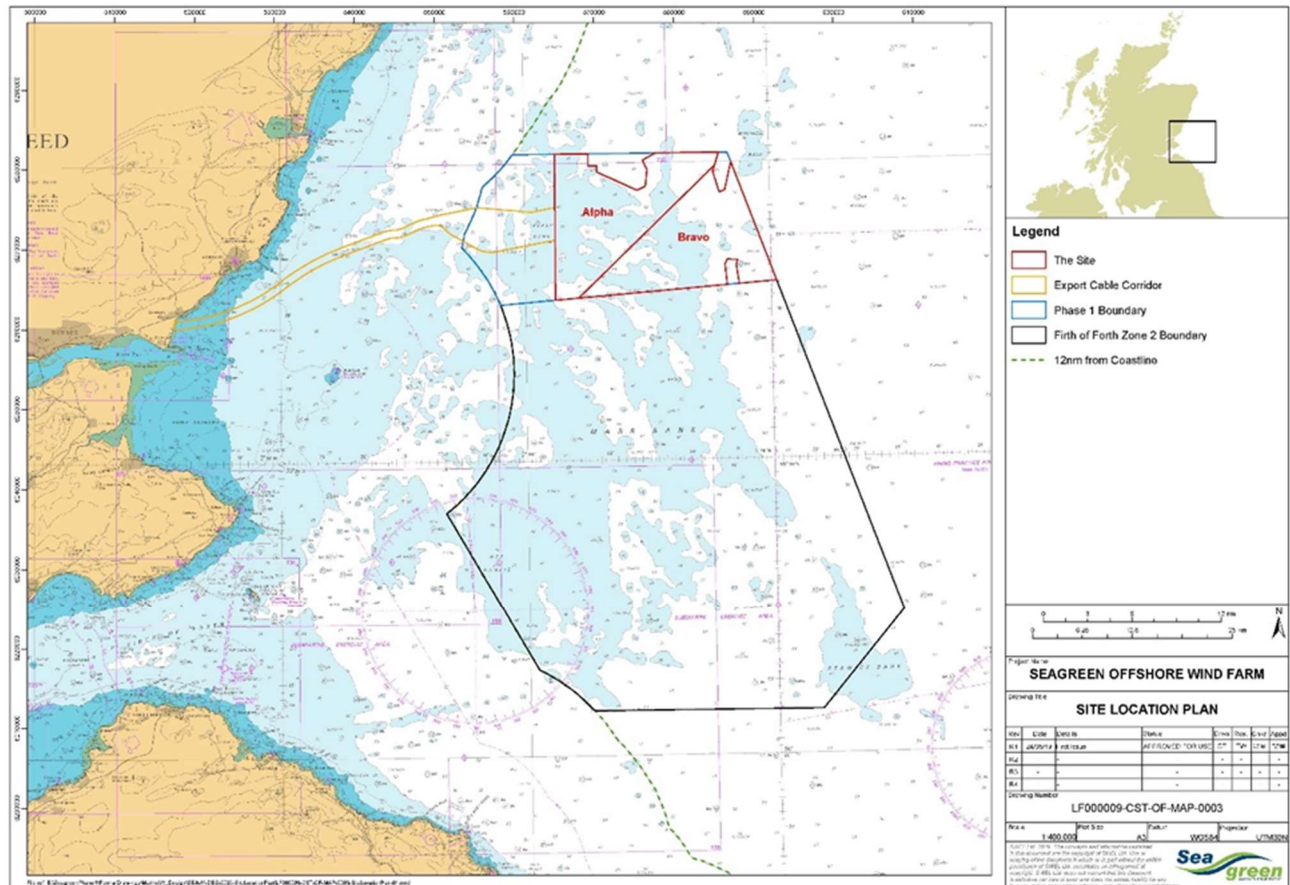


Figure 1.0 - Project Location

1.3 Consent and Licence Requirements

This OWF DSLP has been prepared to discharge condition 12 of the S36 Consents as set out in Table 1.1.

A separate Offshore Transmission Asset Development Specification and Layout Plan (OTA DSLP) (LF000009-CST-OF-PLN-0005) has been prepared for the OTA assets (i.e. the installation of the OSPs, the Export Cables and the OSPs Interconnector Cable).

Table 1.1 - Consent Conditions to be discharged by this OWF DSLP

Consent Document	Condition Reference	Condition Text	Reference to relevant Section of this OWF DSLP
Section 36 Consents	Condition 12	The Company must, no later than 6 months prior to the Commencement of the Development, submit a Development Specification and Layout Plan (“DSLPP”), in writing, to the Scottish Ministers for their written approval. Such approval may only be granted following consultation by the Scottish Ministers with the MCA, NLB, CoS, the JNCC, SNH, SFF, CAA and any such other advisors or organisations as may be required at the discretion of the Scottish Ministers. The Development must, at all times, be constructed in accordance with the approved DSLP (as updated and amended from time to time by the Company). Any updates or amendments made to the DSLP by the Company must be submitted, in writing, by the Company to the Scottish Ministers for their written approval.	The submission of the OWF DSLP document
		The DSLP must include, but not be limited to the following: a. A plan showing the proposed location of each individual WTG (subject to any required micro-siting), including information on WTG spacing, WTG identification / numbering, location of the substation platforms, seabed conditions, bathymetry, confirmed foundation type for each WTG and any key constraints recorded on the Site;	Section 3. Note - location of the substation platforms is included in the OTA DSLP (as discussed in overview section of this document and Section 3 of the OTA DSLP)
		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 (“GIS”) shape file using WGS84 format;	Section 3.8 and Appendix C
		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;	Section 3.9

		d) The generating capacity of each WTG used on the Site (Annex 1, Inset A of Figure 1) and a confirmed generating capacity for the Site overall;	Section 3.10
		e) The finishes for each WTG (see condition 19 on WTG lighting and marking); and	Section 3.11
		f) The length and proposed arrangements on the seabed of all inter-array cables.	Section 4

1.4 Linkages with other consent plans and Consent Conditions

The OWF DSLP is not linked with any other Project consent plan for the purposes of discharging condition 12 of the S36 Consents. However, the linkage with other Project consent plans is provided below for information only.

Table 1.2 - Linkages with other consent plans

Reference	Linkage with the OWF DSLP	Cross-reference in this OWF DSLP
Design Statement (DS) (required by S36 Condition 13)	The DS includes representative OWF visualisations from key viewpoints based on this OWF DSLP.	This document was provided as part of development of the DS. (LF000009-CST-OF-PLN-013).

1.5 Construction management

Full details of the construction management procedures, including environmental compliance, monitoring and reporting and roles and responsibilities are provided in the Offshore Construction Environmental Management Plan (LF000009-CST-OF-PLN-0014 - Offshore CEMP).

1.6 Updates and Amendments

The change management process for any updates required to the OWF DSLP, including resubmission of consent plans for approval, is outlined in Appendix B.

2. Scope and Objectives of the OWF DSLP

This OWF DSLP covers, in line with the requirements of condition 12 of the S36 Consents issued to Seagreen Wind Energy Limited, industry standards and good practice and applies to all construction as required to be undertaken before the Final Commissioning of the Works.

This OWF DSLP provides details of the proposed specification and layout in so far as it relates to the:

- 150 WTGs and 12 spare locations;
- Associated foundations; and
- Inter-array Cables.

All Seagreen personnel and Seagreen's Contractors (including their Sub-Contractors) involved in the Seagreen Project must comply with the OWF DSLP.

Figure 3.1 identifies the WTGs and spare locations layout within the site layout and the co-ordinates and water depths of the spare locations can be found in Table 3.2.

3. Development Specification and Layout – Offshore Wind Farm Asset – WTGs and Spare Locations

3.1 Introduction

This section of the DSLP details the OWF development specification and layout of the 150 WTGs and 12 spare locations across the Site. It is highlighted that the current locations identified are the preferred locations and the spare locations would only be utilised in the event of insurmountable difficulties being encountered during the foundation installation process at WTG locations that could not be otherwise overcome by micro-siting. If spare locations need to be used the number of WTGs in either Alpha OWF or Bravo OWF will not exceed the maximum consented of 75 WTGs for each (and 150 WTGs total).

3.2 WTGs and Spare Locations Layout

The OWF layout presented in Figure 3.1 below includes the 150 WTGs, with 75 WTGs located within Alpha OWF and 75 WTGs located in Bravo OWF, and 12 spare locations located across both the OWFs.

3.3 WTGs Spacing

The WTGs have grid based spacing within the OWF Site:

- North West to South East, 1,042m
- North East to South, 1,299m

The distances stated are WTG spacing prior to micro-siting. The consents do not specify a micro-siting distance. However, the Section 36 Consents require that the WTGs cannot be less than 1,000m apart from centrepont to centrepont in any direction. Micro-siting will be approached on a site by site basis during

installation. The WTGs are arranged in a pattern that permits navigation between rows of WTGs in any direction.

3.4 WTG Identification / Numbering

Each WTG is marked with a unique alpha-numeric identifier, as shown in Figure 3.1 and Figure 3.2 below. The WTG identification system has been devised in line with the following principles and/or requirements:

- Each unique WTG identifier is prefixed with a capital SN for Seagreen.
- The unique identifiers consist of a letter and a number (alpha from SW to NE, numeric from NW to SE).
- The use of O and I has been avoided to prevent confusion with numeric characters in line with MCA guidance note (MGN 543), Safety of Navigation: Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response.
- The numbering system aligns with Search and Rescue (SAR) lanes and facilitates navigation thorough the OWF. The numbering system has been designed to aid navigation through the structures, as SAR lanes each have a consistent letter on each bounding side, or a consistent number. Vessels navigating through the WTGs along any lane in any direction could follow rows of WTGs and OSPs via their unique identifiers of either the same letter or number, depending on orientation of transit.

3.5 Wind Turbine Foundation Types

114 of the WTGs will be supported by suction bucket caisson jacket foundations and 36 WTGs will be supported by piled jacket foundations.

There are three suction bucket caissons per jacket structure, resulting in 342 caissons in total across the Site, each with a maximum diameter of 10.5m or 11.5m.

There will be up to four pin piles per jacket structure, resulting in a maximum of 144 pin piles in total across the Site. The pin piles are each 3m in diameter and 45m in length.

Further details on piling parameters, approach and methodology are provided within the Offshore Wind Farm Piling Strategy ((OWF PS) LF000009-CST-OF-PLN-0022).

The interface elevation (between the foundations and the WTG) will be between 23.6m and 28.1m LAT, taking into account variable water depths across the Site. Variable hub heights were also discussed and confirmed to be acceptable for compliance with project consents by MS-LOT, in February 2019.

3.6 Site Bathymetry and Seabed Conditions

Bathymetry across the Site ranges from 39.77m below LAT in the north-west area of the Site up to 64.82m in the southwest area, as shown in Figure 3.2.

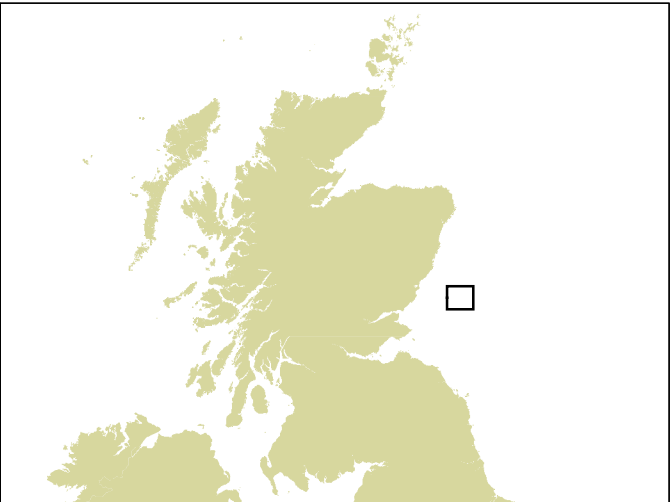
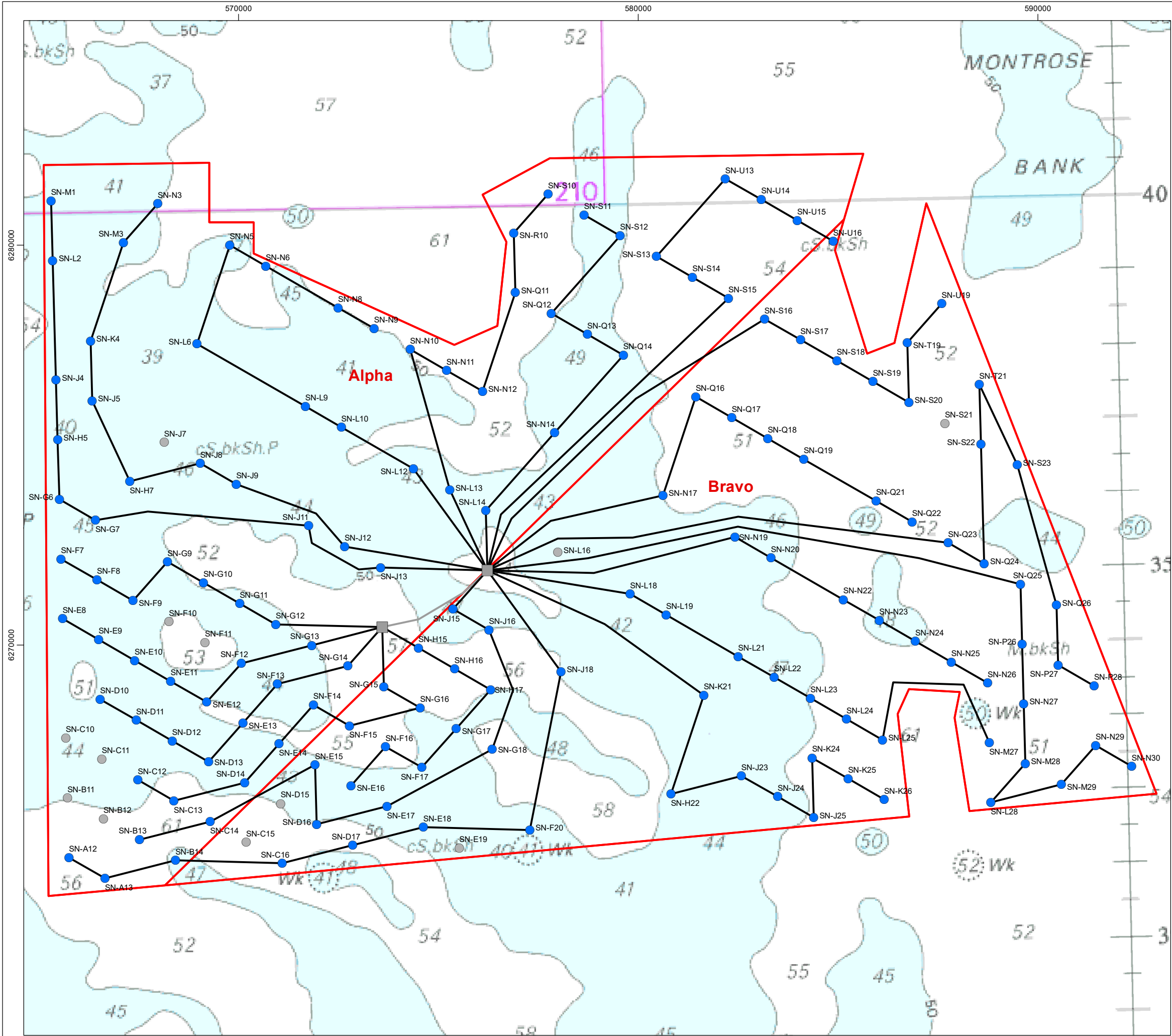
The WTGs will be installed in water depths ranging from 41.0m to 58.6m below LAT.

Seabed sedimentary conditions across the Site are characterised in general as being comprised of gravelly sand to silty sand to sand. Seabed conditions are shown in Figure 3.3.

3.7 Key Constraints

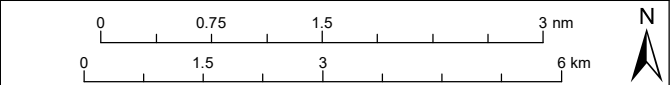
There are a small number of physical spatial constraints within the Site. Infrastructure within the Site avoids these constraints, as shown in Figure 3.4.

These include several features of potential archaeological interest, and their associated Archaeological Exclusion Zones (AEZs) of 50m and 100m. Further details are provided in Seagreen's approved Marine Archaeological Written Scheme of Investigation & Protocol for Archaeological Discoveries Plan (WSI/PAD) (LF000009-CST-OF-PLN-0002).



Legend

- Site Boundary
- Wind Turbine Generator (WTG)
- WTG Spare Location (12)
- Offshore Substation Platform (OSP)
- Inter-Array Cable
- Interconnector Cable



Project Name
SEAGREEN OFFSHORE WIND FARM

Drawing Title
**FIGURE 3.1 - SEAGREEN
150 TURBINE LAYOUT**

Rev	Date	Details	Status	Drwn	Rqst	Chkd	Appd
R1	09/12/19	First Issue	APPROVED FOR USE	CT	TW		AJ
R2	-	-	-	-	-	-	-
R3	-	-	-	-	-	-	-
R4	-	-	-	-	-	-	-

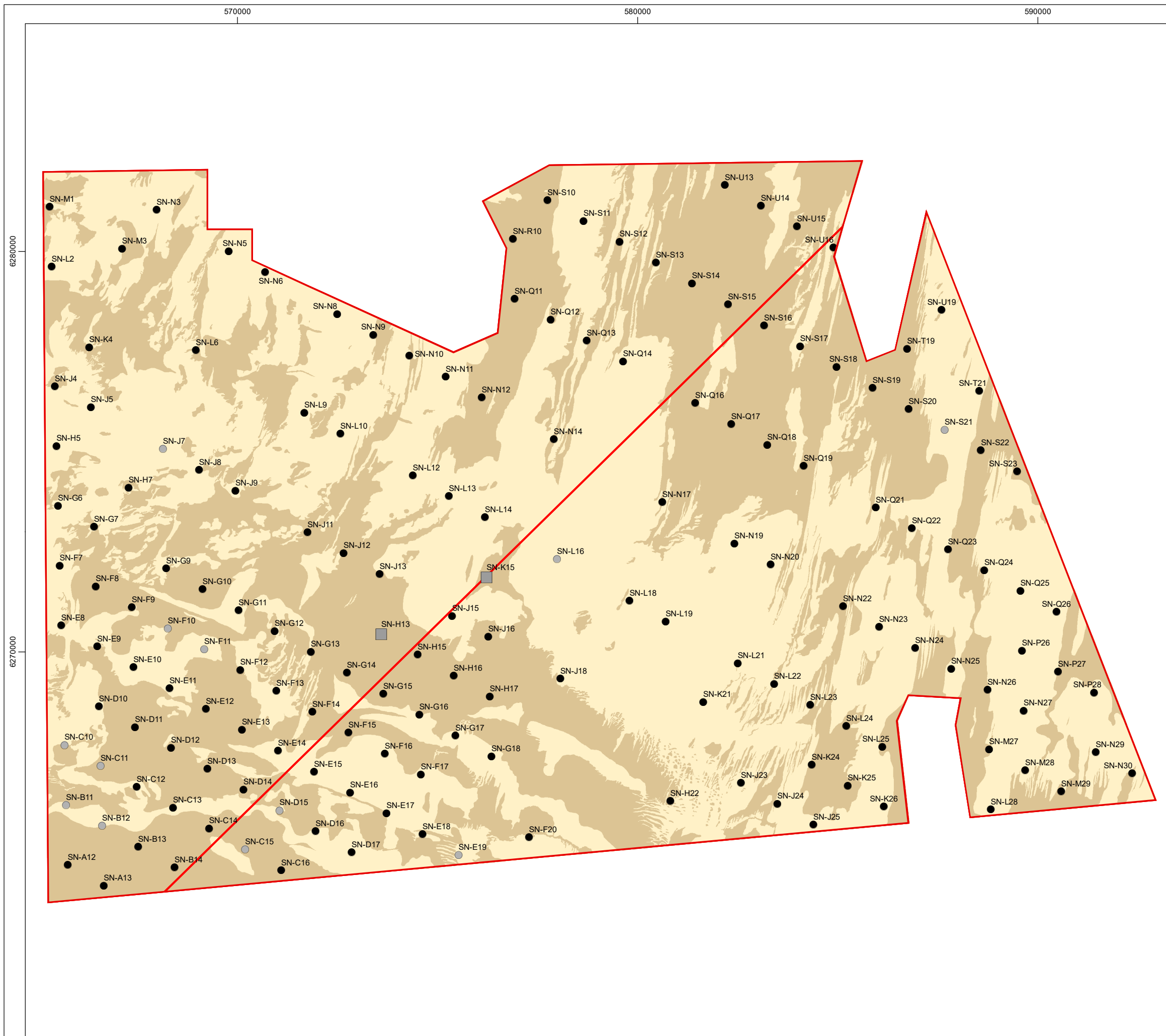
Drawing Number
SEA-M-DES-0055-11

Scale
1:95,000





Plot Size
A3

Datum
WGS84

Projection
UTM30N



Legend

-  Site Boundary
-  Wind Turbine Generator (WTG)
-  WTG Spare Location (12)
-  Offshore Substation Platform (OSP)

Seabed Classification



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Project Name

SEAGREEN OFFSHORE WIND FARM

	Drawing Title
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FIGURE 3.3 - SEABED CONDITIONS

Rev	Date	Details	Status	Drwn	Rqst	Chkd	Appr
R1	10/12/19	First Issue	APPROVED FOR USE	CT	AJ	-	AJ
R2	-	-	-	-	-	-	-
R3	-	-	-	-	-	-	-
R4	-	-	-	-	-	-	-

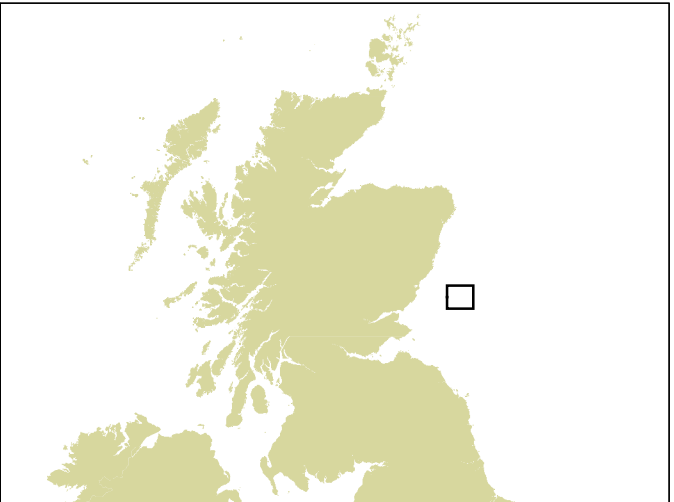
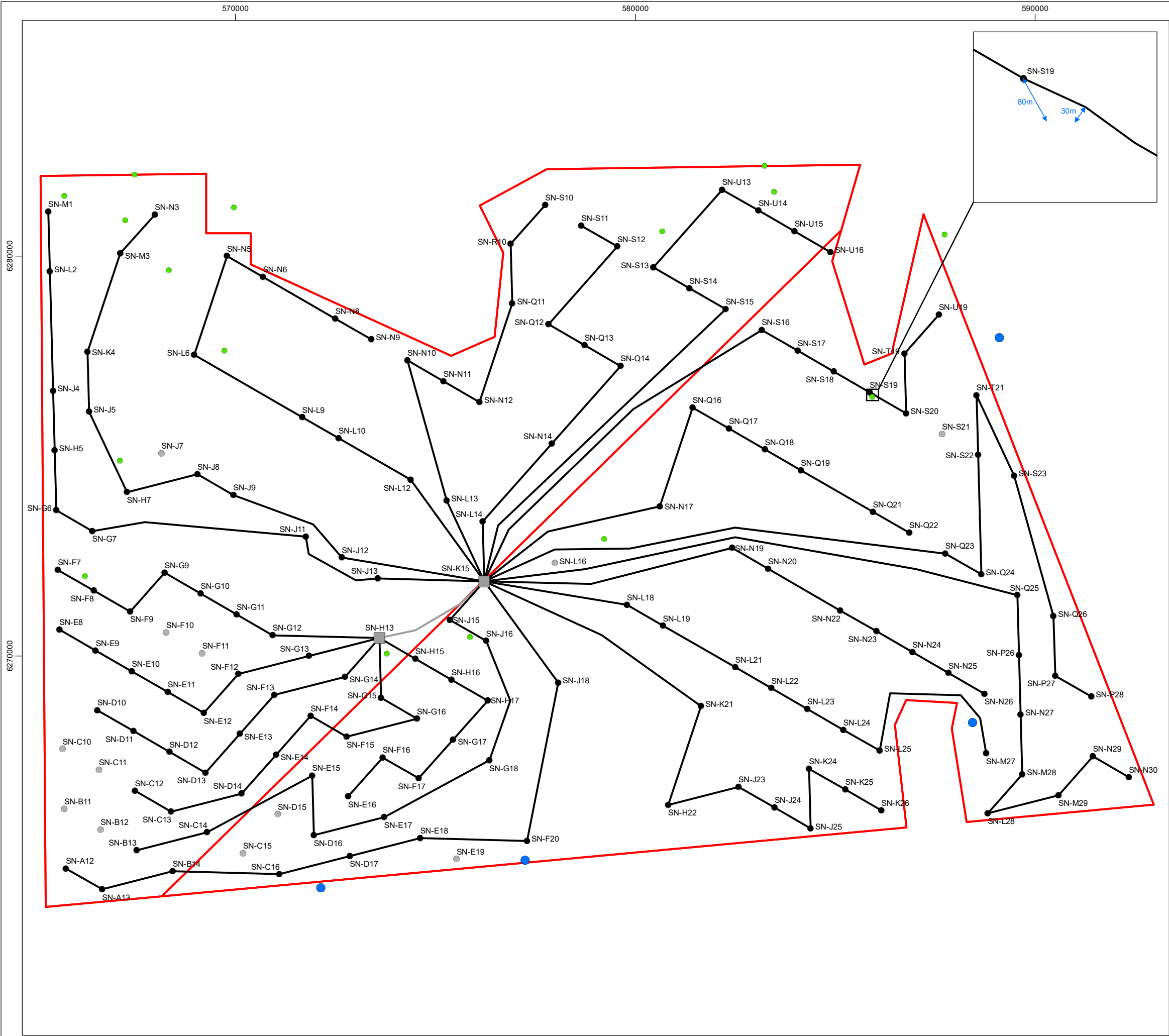
R4		
Drawing Number		

SEA-T-DES-0055-02

Scale	Plot Size	Datum	Projection
1:95,000	A3	WGS84	UTM30

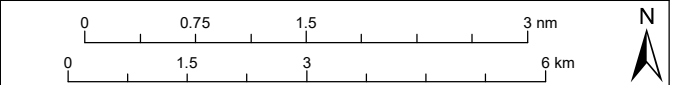
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Legend

- Site Boundary
- Wind Turbine Generator (WTG)
- WTG Spare Location (12)
- Offshore Substation Platform (OSP)
- Inter-Array Cable
- Interconnector Cable
- 50m AEZ
- 100m AEZ



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Project Name
SEAGREEN OFFSHORE WIND FARM

Drawing Title
FIGURE 3.4 - KEY CONSTRAINTS

Rev	Date	Details	Status	Drwn	Rqst	Chkd	Appd
R1	11/12/19	First Issue	APPROVED FOR USE	CT	AJ	-	AJ
R2	-	-	-	-	-	-	-
R3	-	-	-	-	-	-	-
R4	-	-	-	-	-	-	-

Drawing Number
SEA-T-DES-0055-03

Scale	Plot Size	Datum	Projection
1:95,000	A3	WGS84	UTM30N

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3.8 Co-ordinates for WTG Locations

The 150 WTGs will be installed, subject to micro-siting, at the locations listed in Table 3.1 as indicated in Figure 3.1.

The 12 spare locations are also listed in Table 3.2.

A GIS shape file with co-ordinates data is provided under Appendix C.

Table 3.1 – WTG co-ordinates (WG S84) and water depths

WTG Identification	Foundation Type	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT
SN-A12	Suction Bucket Caisson	56° 31.318' N	1° 55.867' W	58.6
SN-A13	Suction Bucket Caisson	56° 31.029' N	1° 54.995' W	56.1
SN-B13	Suction Bucket Caisson	56° 31.546' N	1° 54.139' W	57.0
SN-B14	Suction Bucket Caisson	56° 31.257' N	1° 53.267' W	51.5
SN-C12	Piled Foundation	56° 32.351' N	1° 54.156' W	48.6
SN-C13	Piled Foundation	56° 32.062' N	1° 53.284' W	56.3
SN-C14	Suction Bucket Caisson	56° 31.773' N	1° 52.412' W	57.0
SN-C16	Suction Bucket Caisson	56° 31.196' N	1° 50.669' W	54.0
SN-D10	Piled Foundation	56° 33.444' N	1° 55.045' W	51.0
SN-D11	Piled Foundation	56° 33.156' N	1° 54.172' W	50.4
SN-D12	Piled Foundation	56° 32.867' N	1° 53.300' W	51.1
SN-D13	Piled Foundation	56° 32.578' N	1° 52.427' W	50.0
SN-D14	Piled Foundation	56° 32.289' N	1° 51.555' W	49.8
SN-D16	Suction Bucket Caisson	56° 31.711' N	1° 49.812' W	53.1
SN-D17	Suction Bucket Caisson	56° 31.422' N	1° 48.941' W	52.0
SN-E10	Piled Foundation	56° 33.960' N	1° 54.188' W	48.8
SN-E11	Piled Foundation	56° 33.672' N	1° 53.316' W	49.0
SN-E12	Piled Foundation	56° 33.383' N	1° 52.443' W	51.5
SN-E13	Piled Foundation	56° 33.094' N	1° 51.571' W	51.0
SN-E14	Piled Foundation	56° 32.805' N	1° 50.699' W	50.6

WTG Identification	Foundation Type	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT
SN-E15	Suction Bucket Caisson	56° 32.516' N	1° 49.827' W	50.6
SN-E16	Piled Foundation	56° 32.227' N	1° 48.955' W	45.5
SN-E17	Suction Bucket Caisson	56° 31.938' N	1° 48.084' W	44.9
SN-E18	Suction Bucket Caisson	56° 31.649' N	1° 47.213' W	46.4
SN-E8	Piled Foundation	56° 34.537' N	1° 55.934' W	45.3
SN-E9	Piled Foundation	56° 34.249' N	1° 55.061' W	46.8
SN-F12	Piled Foundation	56° 33.899' N	1° 51.586' W	47.9
SN-F13	Piled Foundation	56° 33.610' N	1° 50.714' W	44.3
SN-F14	Piled Foundation	56° 33.321' N	1° 49.842' W	49.5
SN-F15	Piled Foundation	56° 33.032' N	1° 48.970' W	54.4
SN-F16	Piled Foundation	56° 32.743' N	1° 48.098' W	54.3
SN-F17	Piled Foundation	56° 32.453' N	1° 47.227' W	49.7
SN-F20	Suction Bucket Caisson	56° 31.585' N	1° 44.614' W	46.4
SN-F7	Piled Foundation	56° 35.342' N	1° 55.951' W	46.5
SN-F8	Piled Foundation	56° 35.054' N	1° 55.078' W	49.4
SN-F9	Piled Foundation	56° 34.765' N	1° 54.205' W	47.8
SN-G10	Piled Foundation	56° 34.993' N	1° 52.475' W	52.0
SN-G11	Piled Foundation	56° 34.704' N	1° 51.602' W	49.9
SN-G12	Piled Foundation	56° 34.415' N	1° 50.729' W	47.9
SN-G13	Piled Foundation	56° 34.126' N	1° 49.857' W	50.9
SN-G14	Piled Foundation	56° 33.837' N	1° 48.984' W	54.7
SN-G15	Piled Foundation	56° 33.548' N	1° 48.112' W	55.7
SN-G16	Piled Foundation	56° 33.258' N	1° 47.241' W	52.8
SN-G17	Piled Foundation	56° 32.969' N	1° 46.369' W	49.2
SN-G18	Suction Bucket Caisson	56° 32.679' N	1° 45.498' W	54.1

WTG Identification	Foundation Type	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT
SN-G6	Suction Bucket Caisson	56° 36.147' N	1° 55.968' W	46.6
SN-G7	Suction Bucket Caisson	56° 35.859' N	1° 55.095' W	47.4
SN-G9	Piled Foundation	56° 35.282' N	1° 53.348' W	50.2
SN-H15	Piled Foundation	56° 34.063' N	1° 47.254' W	57.6
SN-H16	Piled Foundation	56° 33.774' N	1° 46.383' W	57.4
SN-H17	Piled Foundation	56° 33.484' N	1° 45.511' W	54.3
SN-H22	Suction Bucket Caisson	56° 32.035' N	1° 41.156' W	49.6
SN-H5	Suction Bucket Caisson	56° 36.952' N	1° 55.985' W	42.2
SN-H7	Suction Bucket Caisson	56° 36.375' N	1° 54.237' W	45.1
SN-J11	Suction Bucket Caisson	56° 35.736' N	1° 49.886' W	47.9
SN-J12	Suction Bucket Caisson	56° 35.447' N	1° 49.013' W	50.5
SN-J13	Suction Bucket Caisson	56° 35.158' N	1° 48.141' W	49.0
SN-J15	Suction Bucket Caisson	56° 34.579' N	1° 46.396' W	47.7
SN-J16	Suction Bucket Caisson	56° 34.289' N	1° 45.524' W	51.3
SN-J18	Suction Bucket Caisson	56° 33.710' N	1° 43.781' W	50.3
SN-J23	Suction Bucket Caisson	56° 32.260' N	1° 39.427' W	50.0
SN-J24	Suction Bucket Caisson	56° 31.969' N	1° 38.557' W	49.5
SN-J25	Suction Bucket Caisson	56° 31.679' N	1° 37.687' W	51.4
SN-J4	Suction Bucket Caisson	56° 37.757' N	1° 56.002' W	43.5
SN-J5	Suction Bucket Caisson	56° 37.469' N	1° 55.128' W	41.0
SN-J8	Suction Bucket Caisson	56° 36.603' N	1° 52.506' W	46.0
SN-J9	Suction Bucket Caisson	56° 36.314' N	1° 51.633' W	46.3
SN-K21	Suction Bucket Caisson	56° 33.355' N	1° 40.309' W	47.3
SN-K24	Suction Bucket Caisson	56° 32.484' N	1° 37.697' W	52.5
SN-K25	Suction Bucket Caisson	56° 32.193' N	1° 36.827' W	53.3

WTG Identification	Foundation Type	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT
SN-K26	Suction Bucket Caisson	56° 31.902' N	1° 35.957' W	54.9
SN-K4	Suction Bucket Caisson	56° 38.273' N	1° 55.145' W	43.2
SN-L10	Suction Bucket Caisson	56° 37.057' N	1° 49.042' W	46.9
SN-L12	Suction Bucket Caisson	56° 36.478' N	1° 47.296' W	45.3
SN-L13	Suction Bucket Caisson	56° 36.189' N	1° 46.423' W	45.7
SN-L14	Suction Bucket Caisson	56° 35.899' N	1° 45.551' W	50.1
SN-L18	Suction Bucket Caisson	56° 34.740' N	1° 42.063' W	45.6
SN-L19	Suction Bucket Caisson	56° 34.450' N	1° 41.191' W	46.8
SN-L2	Suction Bucket Caisson	56° 39.367' N	1° 56.036' W	52.6
SN-L21	Suction Bucket Caisson	56° 33.869' N	1° 39.449' W	49.2
SN-L22	Suction Bucket Caisson	56° 33.579' N	1° 38.578' W	48.4
SN-L23	Suction Bucket Caisson	56° 33.289' N	1° 37.708' W	52.5
SN-L24	Suction Bucket Caisson	56° 32.998' N	1° 36.837' W	53.3
SN-L25	Suction Bucket Caisson	56° 32.707' N	1° 35.967' W	56.9
SN-L28	Suction Bucket Caisson	56° 31.835' N	1° 33.358' W	54.3
SN-L6	Suction Bucket Caisson	56° 38.212' N	1° 52.538' W	48.6
SN-L9	Suction Bucket Caisson	56° 37.346' N	1° 49.916' W	49.3
SN-M1	Suction Bucket Caisson	56° 40.172' N	1° 56.053' W	50.4
SN-M27	Suction Bucket Caisson	56° 32.640' N	1° 33.367' W	55.0
SN-M28	Suction Bucket Caisson	56° 32.349' N	1° 32.498' W	54.2
SN-M29	Suction Bucket Caisson	56° 32.057' N	1° 31.628' W	55.4
SN-M3	Suction Bucket Caisson	56° 39.595' N	1° 54.303' W	46.8
SN-N10	Suction Bucket Caisson	56° 38.088' N	1° 47.324' W	52.6
SN-N11	Suction Bucket Caisson	56° 37.798' N	1° 46.451' W	51.7
SN-N12	Suction Bucket Caisson	56° 37.509' N	1° 45.577' W	53.3

WTG Identification	Foundation Type	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT
SN-N14	Suction Bucket Caisson	56° 36.929' N	1° 43.832' W	49.2
SN-N17	Suction Bucket Caisson	56° 36.060' N	1° 41.215' W	51.3
SN-N19	Suction Bucket Caisson	56° 35.479' N	1° 39.471' W	48.9
SN-N20	Suction Bucket Caisson	56° 35.189' N	1° 38.600' W	49.8
SN-N22	Suction Bucket Caisson	56° 34.608' N	1° 36.858' W	56.3
SN-N23	Suction Bucket Caisson	56° 34.317' N	1° 35.987' W	50.1
SN-N24	Suction Bucket Caisson	56° 34.026' N	1° 35.116' W	53.6
SN-N25	Suction Bucket Caisson	56° 33.736' N	1° 34.246' W	57.2
SN-N26	Suction Bucket Caisson	56° 33.445' N	1° 33.376' W	58.2
SN-N27	Suction Bucket Caisson	56° 33.154' N	1° 32.506' W	54.7
SN-N29	Suction Bucket Caisson	56° 32.571' N	1° 30.767' W	54.6
SN-N3	Suction Bucket Caisson	56° 40.111' N	1° 53.444' W	50.5
SN-N30	Suction Bucket Caisson	56° 32.280' N	1° 29.898' W	54.8
SN-N5	Suction Bucket Caisson	56° 39.533' N	1° 51.694' W	47.6
SN-N6	Suction Bucket Caisson	56° 39.244' N	1° 50.820' W	57.7
SN-N8	Suction Bucket Caisson	56° 38.666' N	1° 49.071' W	50.9
SN-N9	Suction Bucket Caisson	56° 38.377' N	1° 48.198' W	55.2
SN-P26	Suction Bucket Caisson	56° 33.958' N	1° 32.515' W	53.3
SN-P27	Suction Bucket Caisson	56° 33.667' N	1° 31.645' W	55.7
SN-P28	Suction Bucket Caisson	56° 33.376' N	1° 30.775' W	55.3
SN-Q11	Suction Bucket Caisson	56° 38.829' N	1° 44.730' W	55.8
SN-Q12	Suction Bucket Caisson	56° 38.539' N	1° 43.857' W	51.6
SN-Q13	Suction Bucket Caisson	56° 38.249' N	1° 42.984' W	51.1
SN-Q14	Suction Bucket Caisson	56° 37.959' N	1° 42.111' W	49.7
SN-Q16	Suction Bucket Caisson	56° 37.379' N	1° 40.366' W	54.2

WTG Identification	Foundation Type	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT
SN-Q17	Suction Bucket Caisson	56° 37.089' N	1° 39.494' W	52.6
SN-Q18	Suction Bucket Caisson	56° 36.799' N	1° 38.621' W	53.7
SN-Q19	Suction Bucket Caisson	56° 36.508' N	1° 37.750' W	57.2
SN-Q21	Suction Bucket Caisson	56° 35.927' N	1° 36.007' W	53.1
SN-Q22	Suction Bucket Caisson	56° 35.636' N	1° 35.136' W	54.2
SN-Q23	Suction Bucket Caisson	56° 35.345' N	1° 34.265' W	57.4
SN-Q24	Suction Bucket Caisson	56° 35.054' N	1° 33.394' W	56.6
SN-Q25	Suction Bucket Caisson	56° 34.763' N	1° 32.524' W	53.2
SN-Q26	Suction Bucket Caisson	56° 34.472' N	1° 31.653' W	55.6
SN-R10	Suction Bucket Caisson	56° 39.634' N	1° 44.743' W	57.1
SN-S10	Suction Bucket Caisson	56° 40.149' N	1° 43.882' W	53.9
SN-S11	Suction Bucket Caisson	56° 39.859' N	1° 43.009' W	49.0
SN-S12	Suction Bucket Caisson	56° 39.569' N	1° 42.135' W	50.9
SN-S13	Suction Bucket Caisson	56° 39.279' N	1° 41.262' W	54.1
SN-S14	Suction Bucket Caisson	56° 38.989' N	1° 40.389' W	57.0
SN-S15	Suction Bucket Caisson	56° 38.699' N	1° 39.516' W	56.9
SN-S16	Suction Bucket Caisson	56° 38.408' N	1° 38.643' W	54.6
SN-S17	Suction Bucket Caisson	56° 38.118' N	1° 37.771' W	54.7
SN-S18	Suction Bucket Caisson	56° 37.827' N	1° 36.899' W	57.1
SN-S19	Suction Bucket Caisson	56° 37.537' N	1° 36.027' W	56.8
SN-S20	Suction Bucket Caisson	56° 37.246' N	1° 35.155' W	57.3
SN-S22	Suction Bucket Caisson	56° 36.664' N	1° 33.412' W	55.0
SN-S23	Suction Bucket Caisson	56° 36.373' N	1° 32.541' W	56.3
SN-T19	Suction Bucket Caisson	56° 38.051' N	1° 35.164' W	58.4
SN-T21	Suction Bucket Caisson	56° 37.469' N	1° 33.421' W	53.6

WTG Identification	Foundation Type	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT
SN-U13	Suction Bucket Caisson	56° 40.309' N	1° 39.538' W	57.6
SN-U14	Suction Bucket Caisson	56° 40.018' N	1° 38.665' W	56.2
SN-U15	Suction Bucket Caisson	56° 39.728' N	1° 37.792' W	54.8
SN-U16	Suction Bucket Caisson	56° 39.437' N	1° 36.919' W	56.9
SN-U19	Suction Bucket Caisson	56° 38.565' N	1° 34.302' W	53.6

Table 3.2 – Spare location co-ordinates (WG S84) and water depths

Spare Location Identification	Type	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT
SN-B11	Spare	56° 32.123' N	1° 55.884' W	50.4
SN-B12	Spare	56° 31.834' N	1° 55.011' W	56.6
SN-C10	Spare	56° 32.928' N	1° 55.901' W	45.9
SN-C11	Spare	56° 32.639' N	1° 55.028' W	48.3
SN-C15	Spare	56° 31.484' N	1° 51.540' W	54.3
SN-D15	Spare	56° 32.000' N	1° 50.684' W	53.1
SN-E19	Spare	56° 31.359' N	1° 46.342' W	45.1
SN-F10	Spare	56° 34.477' N	1° 53.332' W	51.0
SN-F11	Spare	56° 34.188' N	1° 52.459' W	51.9
SN-J7	Spare	56° 36.891' N	1° 53.380' W	43.9
SN-L16	Spare	56° 35.320' N	1° 43.806' W	47.9
SN-S21	Spare	56° 36.955' N	1° 34.283' W	54.2

3.9 WTG Dimensions

The WTGs which will be installed at the Seagreen project will be MHI Vestas V164 10MW WTGs. The dimensions of the WTGs are presented in Figure 3.5 and summarised in Table 3.3.

Table 3.3 - Key dimensions of the MHI Vestas V164 10MW WTG

Parameter	Dimension
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Height to blade tip	At highest point (12 o'clock position) at 201 m to 205m above Lowest Astronomical Tide (LAT)
Height to hub	119m to 123m above LAT measured to the centreline of the generator shaft
Rotor diameter	164m (blade length 80m)
Rotational speed	Maximum 13.9 rpm (10.5 rpm at nominal rating, range 5.2 – 13.9 rpm)

3.9.1 Revised Collision Risk Modelling

The final selection of WTG supplier results in changes to the turbine parameters for the project as it will be built, compared to the turbine previously envisaged, although the WTG parameters are within those assessed in the Application and required by the S36 Consents, including S36 Consent variation pertaining to removal of capacity limit granted in 2018. The most notable changes are the increase in WTG hub height and a small decrease in rotor diameter. This has the effect of increasing the minimum blade tip clearance. A comparison of the parameters of the Project as consented and as it will be built is provided in Table 3.4.

Updated collision risk modelling for the Seagreen Alpha and Seagreen Bravo OWFs as they will be built shows that the revised parameters would reduce estimated annual collisions by more than 50% for both gannet and kittiwake, compared to the worst case scenario (WCS) assessed in the original application (Chapter 10, 10.156-10.170). When apportioned to Special Protection Areas (SPAs), the same level of reduction in effect is achieved, that is a decrease in estimated collisions attributable to the Seagreen Project of between 50% and 60% for each species at each SPA of Forth Islands, Fowlsheugh and St Abb's Head to Fast Castle.

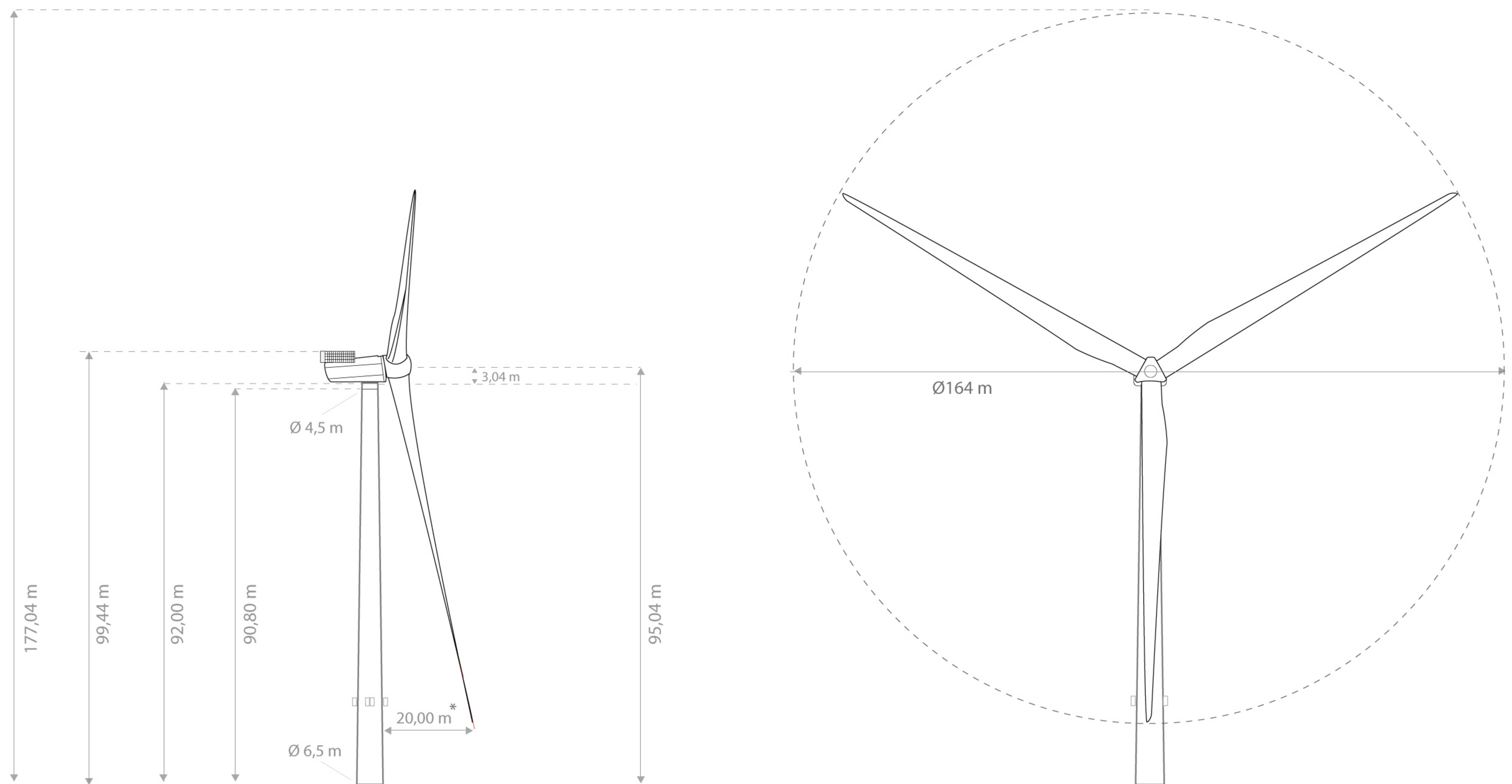
Table 3.4 Comparison of WTG Parameters

Parameter	Project as consented in 2014 (worst case scenario)	Project as it is planned to be constructed
Number of turbines ¹	150 (75 + 75)	No change
Maximum Rotor diameter (m)	167	164
Hub height above LAT (m)	113.3	119 to 123
Maximum blade tip height above LAT (m)	209.7	205 (with a minimum of 201)
Minimum blade tip clearance above LAT (m)	29.8 (with a maximum blade tip clearance of 42.7)	37 (with a maximum blade tip clearance of 41)
Blade width (m)	5.4	No change

¹ Note that the total number of turbines refers to Project Alpha and Project Bravo combined.

Parameter	Project as consented in 2014 (worst case scenario)	Project as it is planned to be constructed
Average annual rotations per minute (rpm)	10.6	8.8

Figure 3.5- Key dimensions of the MHI Vestas 10 MW Wind Turbines (overleaf)



Blade 0 position: 20,00 m
Blade 90 position: 21,00 m

3.10 Generating Capacity

As previously stated, the chosen WTG for installation at the Seagreen Project is the MHI Vestas V164 which has a generating capacity of circa 10MW.

The total generating capacity of the Seagreen Project will be circa 1,500MW.

3.11 WTG Finishes

Each WTG (tower sections, nacelle and blades) will be finished in the standard light grey, RAL 7035. The substructure will be finished in Traffic Yellow, RAL 1023.

WTG rotor blade markings and heli hoist platforms finishes (if required) will be as stated in the Lighting and Marking Plan (LMP) (LF000009-CST-OF-PLN-0010) further to condition 19 of the S36 Consents.

4. Development Specification and Layout – Offshore Wind Farm Asset – Inter-array Cables

4.1 Introduction

This section of the DSLP details the OWF development specification and layout of the Inter-array Cables.

4.2 Inter-array Cable Arrangement and Lengths

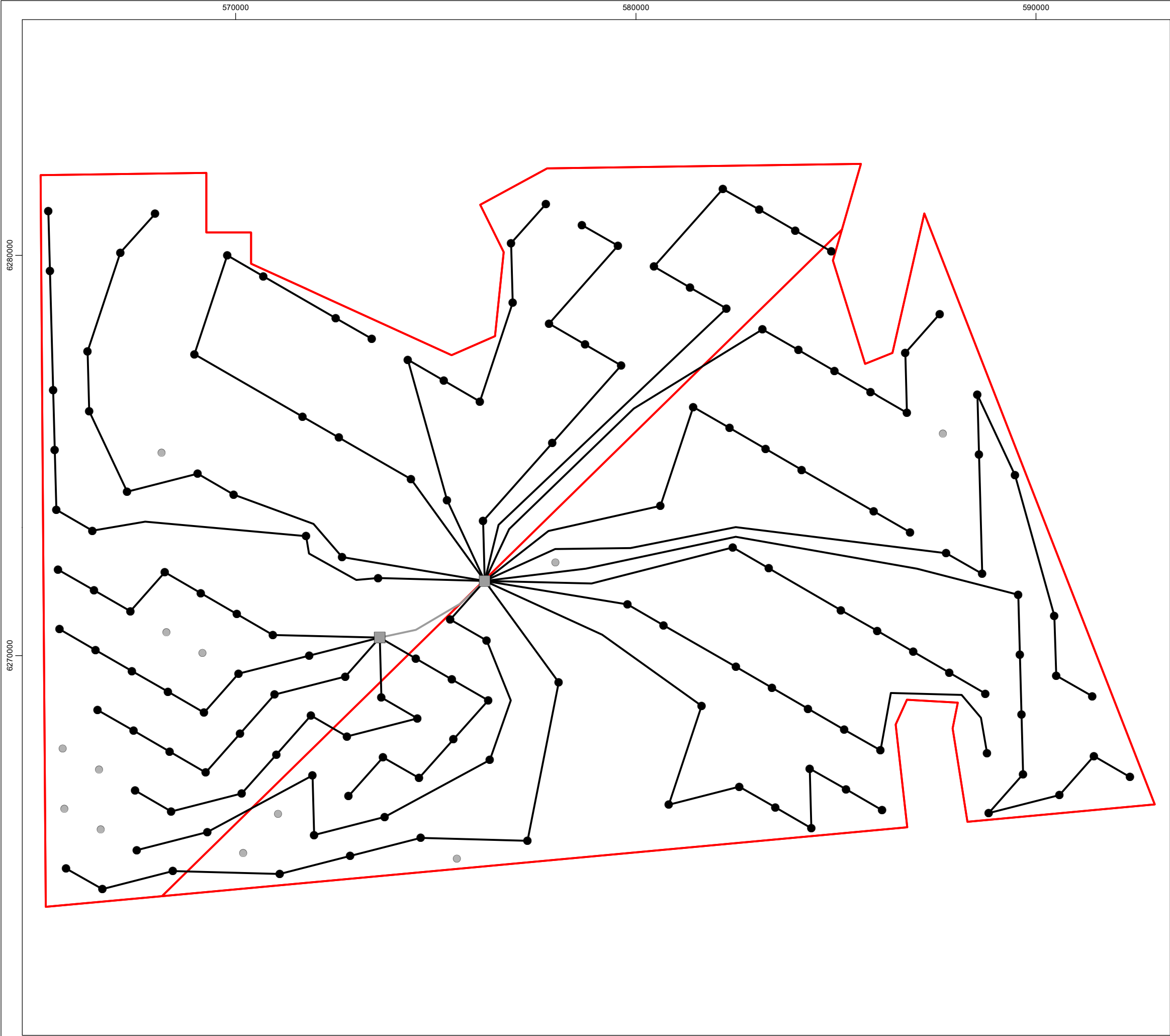
The WTGs are connected at a voltage of 66 kV by Inter-array Cabling in 'strings'. There are 20 strings.

Their lengths are as follows:

- Circa 300km of Inter-array Cables to connect strings of WTGs on suction caissons;
- Circa 55km of Inter-array Cables to connect strings of WTGs on piled foundations.

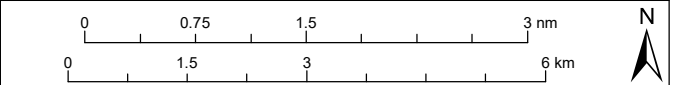
The proposed arrangement of the Inter-array Cables between the WTGs and the connections to the OSPs is set out in Figure 4.1 below.

The lengths of each of the Inter-array Cables between the WTGs and OSP locations (where relevant) are presented in Table 4.1. The total length of the inter-array cabling to be installed on the seabed is circa 355km.



Legend

- Site Boundary
- Wind Turbine Generator (WTG)
- WTG Spare Location (12)
- Offshore Substation Platform (OSP)
- Inter-Array Cable
- Interconnector Cable



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Project Name

SEAGREEN OFFSHORE WIND FARM

Drawing Title
FIGURE 4.1 - INTER ARRAY CABLING

Rev	Date	Details	Status	Drwn	Rqst	Chkd	Appd
R1	11/12/19	First Issue	APPROVED FOR USE	CT	AJ	-	AJ
R2	-	-	-	-	-	-	-
R3	-	-	-	-	-	-	-
R4	-	-	-	-	-	-	-

Drawing Number
SEA-T-DES-0055-04

Scale	Plot Size	Datum	Projection
1:95,000	A3	WGS84	UTM30N

Table 4.1. Inter-array string arrangements and cable lengths

String	Array Layout		Start Point			End Point			Route Length (m)
	Start	End	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT	
A	SN-K15	SN-S15	56° 35.094' N	1° 45.537' W	55.2	56° 38.699' N	1° 39.516' W	56.9	9286.9
	SN-S13	SN-U13	56° 39.279' N	1° 41.262' W	54.1	56° 40.309' N	1° 39.538' W	57.6	2597.6
	SN-S14	SN-S13	56° 38.989' N	1° 40.389' W	57.0	56° 39.279' N	1° 41.262' W	54.1	1042
	SN-S15	SN-S14	56° 38.699' N	1° 39.516' W	56.9	56° 38.989' N	1° 40.389' W	57.0	1042.1
	SN-U13	SN-U14	56° 40.309' N	1° 39.538' W	57.6	56° 39.728' N	1° 37.792' W	54.8	1042.2
	SN-U14	SN-U15	56° 40.018' N	1° 38.665' W	56.2	56° 39.437' N	1° 36.919' W	56.9	1042.1
	SN-U15	SN-U16	56° 39.728' N	1° 37.792' W	54.8	56° 39.437' N	1° 36.919' W	56.9	1042.1
B	SN-K15	SN-S16	56° 35.094' N	1° 45.537' W	55.2	56° 38.408' N	1° 38.643' W	54.6	9532.3
	SN-S16	SN-S17	56° 38.408' N	1° 38.643' W	54.6	56° 38.118' N	1° 37.771' W	54.7	1042.2
	SN-S17	SN-S18	56° 38.118' N	1° 37.771' W	54.7	56° 37.827' N	1° 36.899' W	57.1	1042.1
	SN-S18	SN-S19	56° 37.827' N	1° 36.899' W	57.1	56° 37.537' N	1° 36.027' W	56.8	1042.1
	SN-S19	SN-S20	56° 37.537' N	1° 36.027' W	56.8	56° 37.246' N	1° 35.155' W	57.3	1042.1
	SN-S20	SN-T19	56° 37.246' N	1° 35.155' W	57.3	56° 38.051' N	1° 35.164' W	58.4	1493.4
	SN-T19	SN-U19	56° 38.051' N	1° 35.164' W	58.4	56° 38.565' N	1° 34.302' W	53.6	1299.1
C	SN-K15	SN-N17	56° 35.094' N	1° 45.537' W	55.2	56° 36.060' N	1° 41.215' W	51.3	4887.8
	SN-N17	SN-Q16	56° 36.060' N	1° 41.215' W	51.3	56° 37.379' N	1° 40.366' W	54.2	2597.8
	SN-Q16	SN-Q17	56° 37.379' N	1° 40.366' W	54.2	56° 37.089' N	1° 39.494' W	52.6	1042.2
	SN-Q17	SN-Q18	56° 37.089' N	1° 39.494' W	52.6	56° 36.799' N	1° 38.621' W	53.7	1042.1
	SN-Q18	SN-Q19	56° 36.799' N	1° 38.621' W	53.7	56° 36.508' N	1° 37.750' W	57.2	1042.1
	SN-Q19	SN-Q21	56° 36.508' N	1° 37.750' W	57.2	56° 35.927' N	1° 36.007' W	53.1	2084.2
	SN-Q21	SN-Q22	56° 35.927' N	1° 36.007' W	53.1	56° 35.636' N	1° 35.136' W	54.2	1042.1
D	SN-K15	SN-Q23	56° 35.094' N	1° 45.537' W	55.2	56° 35.345' N	1° 34.265' W	57.4	11792.8

String	Array Layout		Start Point			End Point			Route Length (m)
	Start	End	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT	
	SN-P27	SN-P28	56° 33.667' N	1° 31.645' W	55.7	56° 33.376' N	1° 30.775' W	55.3	1042.1
	SN-Q23	SN-Q24	56° 35.345' N	1° 34.265' W	57.4	56° 35.054' N	1° 33.394' W	56.6	1042.1
	SN-Q24	SN-S22	56° 35.054' N	1° 33.394' W	56.6	56° 36.664' N	1° 33.412' W	55.0	2986.7
	SN-Q26	SN-P27	56° 34.472' N	1° 31.653' W	55.6	56° 33.667' N	1° 31.645' W	55.7	1493.4
	SN-S22	SN-T21	56° 36.664' N	1° 33.412' W	55.0	56° 37.469' N	1° 33.421' W	53.6	1493.4
	SN-S23	SN-Q26	56° 36.373' N	1° 32.541' W	56.3	56° 34.472' N	1° 31.653' W	55.6	3642
	SN-T21	SN-S23	56° 37.469' N	1° 33.421' W	53.6	56° 36.373' N	1° 32.541' W	56.3	2223.7
E	SN-K15	SN-Q25	56° 35.094' N	1° 45.537' W	55.2	56° 34.763' N	1° 32.524' W	53.2	13586.4
	SN-L28	SN-M29	56° 31.835' N	1° 33.358' W	54.3	56° 32.057' N	1° 31.628' W	55.4	1821
	SN-M28	SN-L28	56° 32.349' N	1° 32.498' W	54.2	56° 31.835' N	1° 33.358' W	54.3	1298.9
	SN-M29	SN-N29	56° 32.057' N	1° 31.628' W	55.4	56° 32.571' N	1° 30.767' W	54.6	1298.9
	SN-N27	SN-M28	56° 33.154' N	1° 32.506' W	54.7	56° 32.349' N	1° 32.498' W	54.2	1493.4
	SN-N29	SN-N30	56° 32.571' N	1° 30.767' W	54.6	56° 32.280' N	1° 29.898' W	54.8	1042.1
	SN-P26	SN-N27	56° 33.958' N	1° 32.515' W	53.3	56° 33.667' N	1° 31.645' W	55.7	1493.4
	SN-Q25	SN-P26	56° 34.763' N	1° 32.524' W	53.2	56° 33.958' N	1° 32.515' W	53.3	1493.4
F	SN-K15	SN-N19	56° 35.094' N	1° 45.537' W	55.2	56° 35.479' N	1° 39.471' W	48.9	6309.7
	SN-N19	SN-N20	56° 35.479' N	1° 39.471' W	48.9	56° 35.189' N	1° 38.600' W	49.8	1042.1
	SN-N20	SN-N22	56° 35.189' N	1° 38.600' W	49.8	56° 34.608' N	1° 36.858' W	56.3	2084.2
	SN-N22	SN-N23	56° 34.608' N	1° 36.858' W	56.3	56° 34.317' N	1° 35.987' W	50.1	1042.1
	SN-N23	SN-N24	56° 34.317' N	1° 35.987' W	50.1	56° 34.026' N	1° 35.116' W	53.6	1042.1
	SN-N24	SN-N25	56° 34.026' N	1° 35.116' W	53.6	56° 33.736' N	1° 34.246' W	57.2	1042.1
	SN-N25	SN-N26	56° 33.736' N	1° 34.246' W	57.2	56° 33.445' N	1° 33.376' W	58.2	1042.1
G	SN-K15	SN-L18	56° 35.094' N	1° 45.537' W	55.2	56° 34.740' N	1° 42.063' W	45.6	3617.9

String	Array Layout		Start Point			End Point			Route Length (m)
	Start	End	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT	
	SN-L18	SN-L19	56° 34.740' N	1° 42.063' W	45.6	56° 34.450' N	1° 41.191' W	46.8	1042.1
	SN-L19	SN-L21	56° 34.450' N	1° 41.191' W	46.8	56° 33.869' N	1° 39.449' W	49.2	2084.2
	SN-L21	SN-L22	56° 33.869' N	1° 39.449' W	49.2	56° 33.579' N	1° 38.578' W	48.4	1042.1
	SN-L22	SN-L23	56° 33.579' N	1° 38.578' W	48.4	56° 33.289' N	1° 37.708' W	52.5	1042.1
	SN-L23	SN-L24	56° 33.289' N	1° 37.708' W	52.5	56° 32.998' N	1° 36.837' W	53.3	1042.1
	SN-L24	SN-L25	56° 32.998' N	1° 36.837' W	53.3	56° 32.707' N	1° 35.967' W	56.9	1042.1
	SN-L25	SN-M27	56° 32.707' N	1° 35.967' W	56.9	56° 32.640' N	1° 33.367' W	55.0	4814.9
H	SN-H22	SN-J23	56° 32.035' N	1° 41.156' W	49.6	56° 32.260' N	1° 39.427' W	50.0	1821
	SN-J23	SN-J24	56° 32.260' N	1° 39.427' W	50.0	56° 31.969' N	1° 38.557' W	49.5	1042.1
	SN-J24	SN-J25	56° 31.969' N	1° 38.557' W	49.5	56° 31.679' N	1° 37.687' W	51.4	1042.1
	SN-J25	SN-K24	56° 31.679' N	1° 37.687' W	51.4	56° 32.484' N	1° 37.697' W	52.5	1493.4
	SN-K15	SN-K21	56° 35.094' N	1° 45.537' W	55.2	56° 33.355' N	1° 40.309' W	47.3	6281.6
	SN-K21	SN-H22	56° 33.355' N	1° 40.309' W	47.3	56° 32.035' N	1° 41.156' W	49.6	2597.8
	SN-K24	SN-K25	56° 32.484' N	1° 37.697' W	52.5	56° 32.193' N	1° 36.827' W	53.3	1042.1
	SN-K25	SN-K26	56° 32.193' N	1° 36.827' W	53.3	56° 31.902' N	1° 35.957' W	54.9	1042.1
J	SN-A13	SN-A12	56° 31.029' N	1° 54.995' W	56.1	56° 31.318' N	1° 55.867' W	58.6	1042.5
	SN-B14	SN-A13	56° 31.257' N	1° 53.267' W	51.5	56° 31.029' N	1° 54.995' W	56.1	1820.9
	SN-C16	SN-B14	56° 31.196' N	1° 50.669' W	54.0	56° 31.257' N	1° 53.267' W	51.5	2667.8
	SN-D17	SN-C16	56° 31.422' N	1° 48.941' W	52.0	56° 31.196' N	1° 50.669' W	54.0	1821
	SN-E18	SN-D17	56° 31.649' N	1° 47.213' W	46.4	56° 31.422' N	1° 48.941' W	52.0	1821
	SN-F20	SN-E18	56° 31.585' N	1° 44.614' W	46.4	56° 31.649' N	1° 47.213' W	46.4	2667.6
	SN-J18	SN-F20	56° 33.710' N	1° 43.781' W	50.3	56° 31.585' N	1° 44.614' W	46.4	4033.6
	SN-K15	SN-J18	56° 35.094' N	1° 45.537' W	55.2	56° 33.710' N	1° 43.781' W	50.3	3135.5

String	Array Layout		Start Point			End Point			Route Length (m)
	Start	End	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT	
K	SN-D16	SN-E15	56° 31.711' N	1° 49.812' W	53.1	56° 32.516' N	1° 49.827' W	50.6	1493.3
	SN-E15	SN-G14	56° 32.516' N	1° 49.827' W	50.6	56° 33.837' N	1° 48.984' W	54.7	2986.5
	SN-E17	SN-D16	56° 31.938' N	1° 48.084' W	44.9	56° 31.711' N	1° 49.812' W	53.1	1821
	SN-C14	SN-B13	56° 33.837' N	1° 48.984' W	54.7	56° 31.546' N	1° 54.139' W	57.0	1821
	SN-G18	SN-E17	56° 32.679' N	1° 45.498' W	54.1	56° 31.938' N	1° 48.084' W	44.9	2986.6
	SN-J15	SN-J16	56° 34.579' N	1° 46.396' W	47.7	56° 34.289' N	1° 45.524' W	51.3	1042.1
	SN-J16	SN-G18	56° 34.289' N	1° 45.524' W	51.3	56° 32.679' N	1° 45.498' W	54.1	3192.2
	SN-K15	SN-J15	56° 35.094' N	1° 45.537' W	55.2	56° 34.579' N	1° 46.396' W	47.7	1299.2
L	SN-G6	SN-H5	56° 36.147' N	1° 55.968' W	46.6	56° 36.952' N	1° 55.985' W	42.2	1493.6
	SN-G7	SN-G6	56° 35.859' N	1° 55.095' W	47.4	56° 36.147' N	1° 55.968' W	46.6	1042.2
	SN-H5	SN-J4	56° 36.952' N	1° 55.985' W	42.2	56° 37.757' N	1° 56.002' W	43.5	1493.4
	SN-J11	SN-G7	56° 35.736' N	1° 49.886' W	47.9	56° 35.859' N	1° 55.095' W	47.4	5367.8
	SN-J13	SN-J11	56° 35.158' N	1° 48.141' W	49.0	56° 35.736' N	1° 49.886' W	47.9	2341.1
	SN-J4	SN-L2	56° 37.757' N	1° 56.002' W	43.5	56° 39.367' N	1° 56.036' W	52.6	2986.7
	SN-K15	SN-J13	56° 35.094' N	1° 45.537' W	55.2	56° 35.158' N	1° 48.141' W	49.0	2667.7
	SN-L2	SN-M1	56° 39.367' N	1° 56.036' W	52.6	56° 40.172' N	1° 56.053' W	50.4	1493.4
M	SN-H7	SN-J5	56° 36.375' N	1° 54.237' W	45.1	56° 37.469' N	1° 55.128' W	41.0	2223.7
	SN-J12	SN-J9	56° 35.447' N	1° 49.013' W	50.5	56° 36.314' N	1° 51.633' W	46.3	3218
	SN-J5	SN-K4	56° 37.469' N	1° 55.128' W	41.0	56° 38.273' N	1° 55.145' W	43.2	1493.5
	SN-J8	SN-H7	56° 36.603' N	1° 52.506' W	46.0	56° 36.375' N	1° 54.237' W	45.1	1821
	SN-J9	SN-J8	56° 36.314' N	1° 51.633' W	46.3	56° 36.603' N	1° 52.506' W	46.0	1042.1
	SN-K15	SN-J12	56° 35.094' N	1° 45.537' W	55.2	56° 35.447' N	1° 49.013' W	50.5	3617.9
	SN-K4	SN-M3	56° 38.273' N	1° 55.145' W	43.2	56° 39.595' N	1° 54.303' W	46.8	2597.8

String	Array Layout		Start Point			End Point			Route Length (m)
	Start	End	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT	
	SN-M3	SN-N3	56° 39.595' N	1° 54.303' W	46.8	56° 39.595' N	1° 54.303' W	46.8	1298.9
N	SN-K15	SN-L12	56° 35.094' N	1° 45.537' W	55.2	56° 36.478' N	1° 47.296' W	45.3	3135.5
	SN-L10	SN-L9	56° 37.057' N	1° 49.042' W	46.9	56° 37.346' N	1° 49.916' W	49.3	1042.1
	SN-L12	SN-L10	56° 36.478' N	1° 47.296' W	45.3	56° 37.057' N	1° 49.042' W	46.9	2084.1
	SN-L6	SN-N5	56° 38.212' N	1° 52.538' W	48.6	56° 39.533' N	1° 51.694' W	47.6	2598
	SN-L9	SN-L6	56° 37.346' N	1° 49.916' W	49.3	56° 38.212' N	1° 52.538' W	48.6	3126.2
	SN-N5	SN-N6	56° 39.533' N	1° 51.694' W	47.6	56° 39.244' N	1° 50.820' W	57.7	1042.1
	SN-N6	SN-N8	56° 39.244' N	1° 50.820' W	57.7	56° 38.666' N	1° 49.071' W	50.9	2084.2
	SN-N8	SN-N9	56° 38.666' N	1° 49.071' W	50.9	56° 38.377' N	1° 48.198' W	55.2	1042
P	SN-K15	SN-L13	56° 35.094' N	1° 45.537' W	55.2	56° 36.189' N	1° 46.423' W	45.7	2223.7
	SN-L13	SN-N10	56° 36.189' N	1° 46.423' W	45.7	56° 38.088' N	1° 47.324' W	52.6	3642.2
	SN-N10	SN-N11	56° 38.088' N	1° 47.324' W	52.6	56° 37.798' N	1° 46.451' W	51.7	1042.1
	SN-N11	SN-N12	56° 37.798' N	1° 46.451' W	51.7	56° 37.509' N	1° 45.577' W	53.3	1042
	SN-N12	SN-Q11	56° 37.509' N	1° 45.577' W	53.3	56° 38.829' N	1° 44.730' W	55.8	2597.8
	SN-Q11	SN-R10	56° 38.829' N	1° 44.730' W	55.8	56° 40.149' N	1° 43.882' W	53.9	1493.4
	SN-R10	SN-S10	56° 39.634' N	1° 44.743' W	57.1	56° 40.149' N	1° 43.882' W	53.9	1299.1
Q	SN-K15	SN-L14	56° 35.094' N	1° 45.537' W	55.2	56° 35.899' N	1° 45.551' W	50.1	1493.5
	SN-L14	SN-N14	56° 35.899' N	1° 45.551' W	50.1	56° 36.929' N	1° 43.832' W	49.2	2597.8
	SN-N14	SN-Q14	56° 36.929' N	1° 43.832' W	49.2	56° 37.959' N	1° 42.111' W	49.7	2597.8
	SN-Q12	SN-S12	56° 38.539' N	1° 43.857' W	51.6	56° 39.569' N	1° 42.135' W	50.9	2597.7
	SN-Q13	SN-Q12	56° 38.249' N	1° 42.984' W	51.1	56° 38.539' N	1° 43.857' W	51.6	1042.1
	SN-Q14	SN-Q13	56° 37.959' N	1° 42.111' W	49.7	56° 38.249' N	1° 42.984' W	51.1	1042.1
	SN-S12	SN-S11	56° 39.569' N	1° 42.135' W	50.9	56° 39.859' N	1° 43.009' W	49.0	1042.1

String	Array Layout		Start Point			End Point			Route Length (m)
	Start	End	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT	
R	SN-F16	SN-E16	56° 32.743' N	1° 48.098' W	54.3	56° 32.227' N	1° 48.955' W	45.5	1298.9
	SN-F17	SN-F16	56° 32.453' N	1° 47.227' W	49.7	56° 32.743' N	1° 48.098' W	54.3	1042.1
	SN-G17	SN-F17	56° 32.969' N	1° 46.369' W	49.2	56° 32.453' N	1° 47.227' W	49.7	1298.9
	SN-H13	SN-H15	56° 34.353' N	1° 48.126' W	54.8	56° 34.063' N	1° 47.254' W	57.6	1042.1
	SN-H15	SN-H16	56° 34.063' N	1° 47.254' W	57.6	56° 33.774' N	1° 46.383' W	57.4	1042.1
	SN-H16	SN-H17	56° 33.774' N	1° 46.383' W	57.4	56° 33.484' N	1° 45.511' W	54.3	1042.1
	SN-H17	SN-G17	56° 33.484' N	1° 45.511' W	54.3	56° 32.969' N	1° 46.369' W	49.2	1298.9
S	SN-C13	SN-C12	56° 32.062' N	1° 53.284' W	56.3	56° 32.351' N	1° 54.156' W	48.6	1042.1
	SN-D14	SN-C13	56° 32.289' N	1° 51.555' W	49.8	56° 32.062' N	1° 53.284' W	56.3	1821
	SN-E14	SN-D14	56° 32.805' N	1° 50.699' W	50.6	56° 32.289' N	1° 51.555' W	49.8	1298.9
	SN-F14	SN-E14	56° 33.321' N	1° 49.842' W	49.5	56° 32.805' N	1° 50.699' W	50.6	1298.9
	SN-F15	SN-F14	56° 33.032' N	1° 48.970' W	54.4	56° 33.321' N	1° 49.842' W	49.5	1042.1
	SN-G15	SN-G16	56° 33.548' N	1° 48.112' W	55.7	56° 33.258' N	1° 47.241' W	52.8	1042.1
	SN-G16	SN-F15	56° 33.258' N	1° 47.241' W	52.8	56° 33.032' N	1° 48.970' W	54.4	1821
	SN-H13	SN-G15	56° 34.353' N	1° 48.126' W	54.8	56° 33.548' N	1° 48.112' W	55.7	1493.4
T	SN-D11	SN-D10	56° 33.156' N	1° 54.172' W	50.4	56° 33.444' N	1° 55.045' W	51.0	1042.1
	SN-D12	SN-D11	56° 32.867' N	1° 53.300' W	51.1	56° 33.156' N	1° 54.172' W	50.4	1042.1
	SN-D13	SN-D12	56° 32.578' N	1° 52.427' W	50.0	56° 32.867' N	1° 53.300' W	51.1	1042.1
	SN-E13	SN-D13	56° 33.094' N	1° 51.571' W	51.0	56° 32.578' N	1° 52.427' W	50.0	1298.9
	SN-F13	SN-E13	56° 33.610' N	1° 50.714' W	44.3	56° 33.094' N	1° 51.571' W	51.0	1298.9
	SN-G14	SN-F13	56° 33.837' N	1° 48.984' W	54.7	56° 33.610' N	1° 50.714' W	44.3	1821
	SN-H13	SN-G14	56° 34.353' N	1° 48.126' W	54.8	56° 33.837' N	1° 48.984' W	54.7	1298.9
U	SN-E10	SN-E9	56° 33.960' N	1° 54.188' W	48.8	56° 34.249' N	1° 55.061' W	46.8	1042.1

	Array Layout		Start Point			End Point			Route Length (m)
String	Start	End	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) Below LAT	
	SN-E11	SN-E10	56° 33.672' N	1° 53.316' W	49.0	56° 33.960' N	1° 54.188' W	48.8	1042.1
	SN-E12	SN-E11	56° 33.383' N	1° 52.443' W	51.5	56° 33.672' N	1° 53.316' W	49.0	1042.1
	SN-E9	SN-E8	56° 34.249' N	1° 55.061' W	46.8	56° 34.537' N	1° 55.934' W	45.3	1042.1
	SN-F12	SN-E12	56° 33.899' N	1° 51.586' W	47.9	56° 33.383' N	1° 52.443' W	51.5	1298.9
	SN-G13	SN-F12	56° 34.126' N	1° 49.857' W	50.9	56° 33.899' N	1° 51.586' W	47.9	1821
	SN-H13	SN-G13	56° 34.353' N	1° 48.126' W	54.8	56° 34.126' N	1° 49.857' W	50.9	1821
V	SN-F9	SN-F8	56° 34.765' N	1° 54.205' W	47.8	56° 35.054' N	1° 55.078' W	49.4	1042.1
	SN-G10	SN-G9	56° 34.993' N	1° 52.475' W	52.0	56° 35.282' N	1° 53.348' W	50.2	1042.1
	SN-G11	SN-G10	56° 34.704' N	1° 51.602' W	49.9	56° 34.993' N	1° 52.475' W	52.0	1042.1
	SN-G12	SN-G11	56° 34.415' N	1° 50.729' W	47.9	56° 34.704' N	1° 51.602' W	49.9	1042.1
	SN-G9	SN-F9	56° 35.282' N	1° 53.348' W	50.2	56° 34.765' N	1° 54.205' W	47.8	1298.9
	SN-H13	SN-G12	56° 34.353' N	1° 48.126' W	54.8	56° 34.415' N	1° 50.729' W	47.9	2667.7

5. Compliance with the ES and ES Addendum

The relevant conditions of the S36 Consents, including S36 Consent variation pertaining to removal of capacity limit granted in 2018, require that the Seagreen Project be constructed in accordance with the methods assessed in the Application Sections 5.1 and 5.2 set out information from the ES and ES Addendum with regard to:

- Compliance with the construction methods assessed; and
- Construction related mitigation and management.

5.1 Compliance with Construction Methods Assessed in the ES and ES Addendum

The ES and ES Addendum for the Seagreen Project described the range of methods that could be applied during the construction of the Development. This was presented as a 'Design Envelope' incorporating a variety of options in relation to the development design and the approach to installation. In each case, the worst case design option was assessed in respect of each impact.

Since the grant of the consents for the Seagreen Project, the design of the Project and the approach to installation has been substantially refined, as set out within this OWF DSLP and which has informed the approach to this OWF DSLP. To demonstrate compliance with those methods assessed within the ES and ES Addendum, Appendix D provides a tabulated comparison of project construction parameters and methodologies as presented in the ES and ES Addendum with this OWF DSLP.

5.2 Delivery of Construction-related Mitigation Proposed in the ES and ES Addendum

The ES and ES Addendum for the Seagreen Project detailed several mitigation commitments specific to construction and installation activities. Appendix E presents the commitments made by Seagreen in the ES and ES Addendum for mitigation measures relative to construction methods and processes set out in this OWF DSLP. The table provides details of the commitments and a cross-reference to where each commitment is implemented.

6. References

Table 6.1 sets out those documents relevant to this OWF DSLP for the Seagreen Project in relation to either Consent Plans or other reference documents.

Table 6.1 Seagreen Document References

SWEL Document Number	Title
LF000009-CST-OF-MST-0001	Offshore Wind Farm Construction Method Statement
LF000009-CST-OF-PLN-0002	Marine Archaeological Written Scheme of Investigation & Protocol for Archaeological Discoveries
LF000009-CST-OF-PLN-0005	Offshore Transmission Asset Development Specification and Layout Plan
LF000009-CST-OF-PLN-0008	Offshore Wind Farm Cable Plan
LF000009-CST-OF-PLN-0010	Offshore Lighting and Marking Plan
LF000009-CST-OF-PLN-0011	Fisheries Management and Mitigation Strategy
LF000009-CST-OF-PLN-0013	Offshore Design Statement
LF000009-CST-OF-PLN-0014	Offshore Construction Environmental Management Plan
LF000009-CST-OF-PLN-0022	Offshore Wind Farm Piling Strategy
LF000009-CST-OF-PRG-0002	Offshore Construction Programme
N/A	Seagreen Alpha and Seagreen Bravo Offshore Windfarms Collision Risk Modelling Update Report
N/A	MCA guidance note, MGN 543, Safety of Navigation: Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response

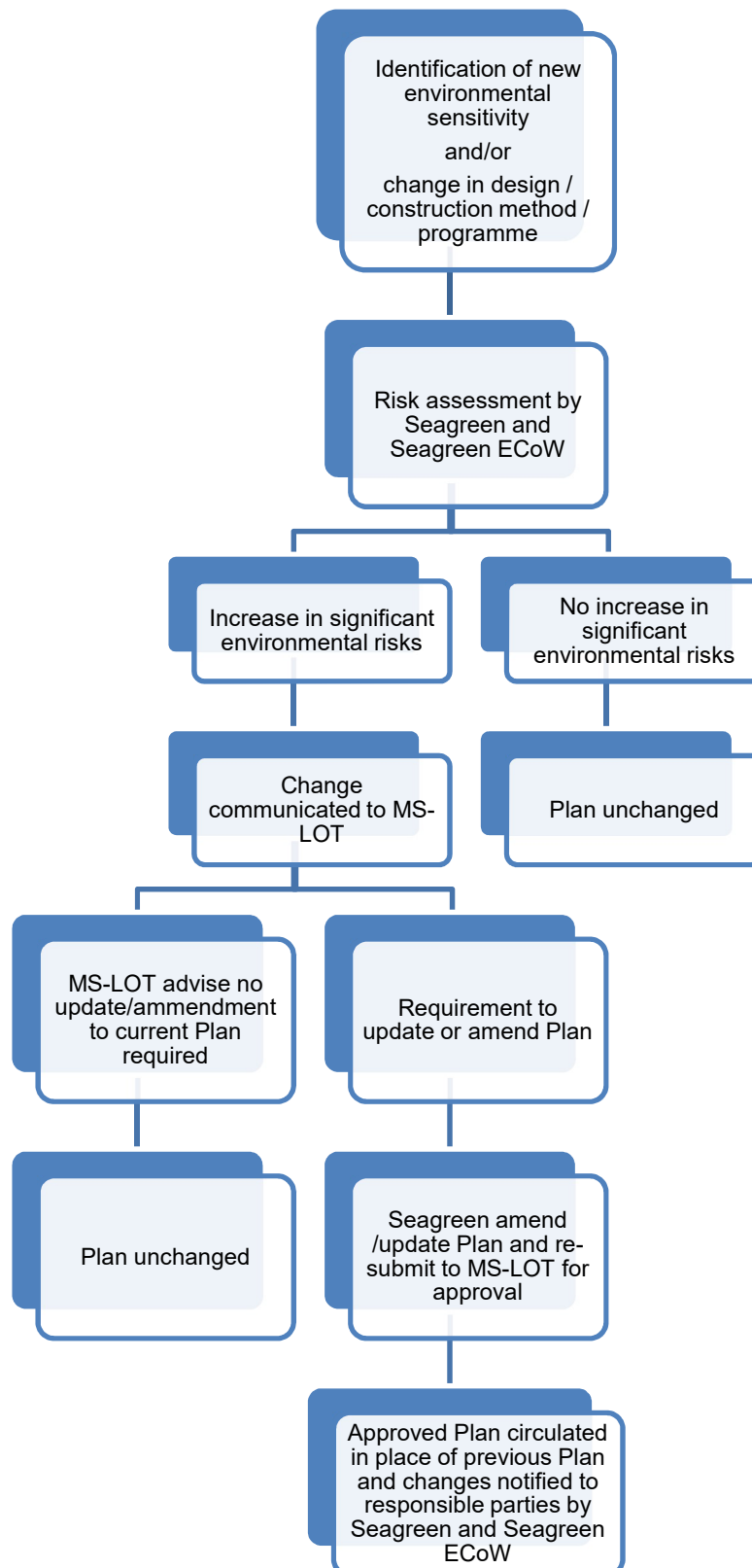
Appendix A –List of Abbreviations and Definitions

Term	Description
Alpha Marine Licence	Marine licence granted by the Scottish Ministers under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 in respect of Seagreen Alpha Wind Farm on 10 October 2014 as amended by the revised marine licence granted by the Scottish Ministers on 28 August 2018 (reference 04676/18/0) and subsequently varied on 12 December 2019 (reference 04676/19/0).
Bravo Marine Licence	Marine licence granted by the Scottish Ministers under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 in respect of Seagreen Bravo Wind Farm on 10 October 2014 as amended by the revised marine licence granted by the Scottish Ministers on 28 August 2018 (reference 04677/18/0) and subsequently varied on 12 December 2019 (reference 04677/19/0).
CAA	Civil Aviation Authority
commitments register	A register that sets out all commitments to manage and mitigate potential environmental impacts made by SWEL
(the) consents	Collective term used to describe the Section 36 consents and Marine Licences issued to SAWEL, SBWEL and SWEL
Contractor	A contractor as appointed by SWEL
CoP	Construction Programme as required under Alpha and Bravo Section 36 Condition 9
CoS	Chamber of Shipping
CRM	Collision Risk Monitoring
ECow	Ecological Clerk of Works as required under Alpha and Bravo Section 36 Condition 29.
EIA	Environmental Impact Assessment
ES	Environmental Statement
ES Addendum	Environmental Statement Addendum
GIS	Geographic Information System
IAC	Inter-Array Cable. The electrical cables that connect the WTGs to the OSPs
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide (LAT)
LMP	Lighting and Marking Plan, required under Condition 19 of the S36 Consents
Marine Licences	The three marine licences for the Seagreen Project, comprising the Alpha Marine Licence, the Bravo Marine Licence, the OTA Marine Licence as granted by the Scottish Ministers under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 on 10 October 2014, and as subsequently varied, in the case of the Seagreen Alpha Offshore Wind Farm Marine Licence and the Seagreen Bravo Offshore Wind Farm Marine Licence, on 29 August 2018, 6 March 2019 and subsequently on 12

Term	Description
	December 2019 and in respect of the OTA Marine Licence as varied under the Marine (Scotland) Act 2010 on 6 March 2019.
MCA	Maritime and Coastguard Agency
MHWS	Mean High Water Springs
MS-LOT	Marine Scotland Licensing and Operations Team
Offshore CEMP	Offshore Construction and Environmental Management Plan as required under Alpha and Bravo Section 36 Consent Condition 14
OTA	Offshore Transmission Asset, comprising the OSPs and the transmission cable required to connect the Wind Farm Assets to the Onshore Transmission Works (OnTW) from the OSPs to the MHWS at the landfall at Carnoustie
OTA DSLP	Development Specification and Layout Plan as required under the Offshore Transmission Asset Marine Licence Condition 3.2.2.6
OTA Marine Licence	Marine licence granted by the Scottish Ministers under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 in respect of the Seagreen Offshore Transmission Asset on 10 October 2014 as amended by the revised marine licence granted by the Scottish Ministers on 6 March 2019 (reference 04678/19/0)
OSP	Offshore Substation Platform means an alternating current Offshore substation platform which is a standalone modular unit that utilises the same substructure and foundation design as a wind turbine generator
OWF	Collective term used to describe the Wind Farm Assets and OTA
OWF CaP	Cable Plan, as required for approval under Alpha and Bravo Section 36 Condition 18
OWF DSLP	Development Specification and Layout Plan as required under Alpha and Bravo Section 36 Condition 12
OWF PS	Piling Strategy, as required under Alpha and Bravo Section 36 Condition 11
S36 Consents	Consent under section 36 of the Electricity Act 1989 granted by the Scottish Ministers on 10 October 2014 in respect of the Seagreen Alpha and Seagreen Bravo offshore wind farms, both as varied by the Scottish Ministers by decision letter issued pursuant to an application under section 36C of the Electricity Act 1989 on 28 August 2018 and, in respect of the Seagreen Bravo S36 Consent, as assigned, with the consent of the Scottish Ministers from SBWEL to SAWEL by assignment dated 22 November 2019 and intimated to the Scottish Ministers by intimation dated 27 November 2019.
SAWEL	Seagreen Alpha Wind Energy Limited, a company with registered number 07185533 and having its registered office at No1 Forbury Place, 43 Forbury Road, Reading, United Kingdom RG1 3JH

Term	Description
SBWEL	Seagreen Bravo Wind Energy Limited, a company with registered number 07185543 and having its registered office at No1 Forbury Place, 43 Forbury Road, Reading, United Kingdom RG1 3JH
SFF	Scottish Fishermen's Federation
Site	The area outlined in red in both Figure 1 attached to the S36 consent Annex 1 and the figure contained in Part 4 of the Marine Licences 04676/19/0, 04677/19/0 and 04678/19/0.
SNH	Scottish Natural Heritage
SPA	Special Protection Area, protected sites classified in accordance with Article 4 of the EC Birds Directive
SSE	Scottish and Southern Energy
Seagreen	Seagreen Wind Energy Limited (SWEL), the parent company of Seagreen Alpha Wind Energy Ltd (SAWEL) and Seagreen Bravo Wind Energy Ltd (SBWEL), (company number 06873902) and having its registered office at No.1 Forbury Place, 43 Forbury Road, Reading, United Kingdom, RG1 3JH
SWEL	Seagreen Wind Energy Ltd
UKHO	United Kingdom Hydrographic Office
WFA	Wind Farm Assets, the Offshore array development as assessed in the ES including wind turbine generators, their substructures and foundations, and associated inter-array cabling
WGS84	World Geodetic System 1984
WSI/PAD	Marine Archaeological Written Scheme of Investigation & Protocol for Archaeological Discoveries as required under Section 36 Consent Condition 33 and Marine Licence Condition 3.2.1.2
WTG	Wind Turbine Generator

Appendix B – The OWF DSLP Change Management Procedure



Appendix C – GIS information to Support the OWF DSLP

Provided as a separate accompanying ZIP file containing a shapefile. This a geographic information system (“GIS”) shape file using World Geodetic System 1984 (“WGS84”) format and details latitude and longitude coordinates accurate to three decimal places of minutes of arc for each WTG.

Appendix D – Compliance with ES parameters and processes

Key parameter/process	ES/ ES Addendum	OWF DSLP
<i>Jacket substructure / foundations</i>		
<p>There are three main substructure and foundation options defined within the Design Envelope for supporting the WTG structures. These are:</p> <p>A four leg steel jacket with driven piles;</p> <p>A four leg steel jacket with suction piles; and</p> <p>a Gravity Base System.</p> <p>Other substructure design variants may be considered, including a three leg steel jacket design and a tripod or quadropod design supporting a monopole, with driven or suction pile foundations</p> <p>Up to 75 WTGs and supporting structures per project</p>	<p>ES 5.46</p> <p>ES 5.47</p> <p>ES Table 5.1</p>	<p>36 WTGs installed on piled foundation. Piles will be 45m long and 3m in diameter on up to 4 legged jacket constructed of steel.</p> <p>114 WTGs installed on suction bucket foundations on 3-legged (tripod) jacket constructed of steel.</p> <p>Total of 150 WTGs (75 per Project Alpha, 75 per Project Bravo)</p>
Primary material: steel	ES Table 5.5	Steel
<p>Foundation suction pile:</p> <p>Upturned bucket style design on each leg of jacket sunk into the seabed using vacuum pumps.</p>	ES Table 5.5	<p>Foundation suction pile:</p> <p>Upturned bucket style design on each leg of jacket sunk into the seabed</p>
<p>Suction pile:</p> <p>Max diameter 14 m / Max penetration depth 23 m</p>	ES Table 5.5	Diameter: 10.5m or 11.5m
<p>The maximum dimensions for foundation options will be as follows:</p> <p>Tubular pile maximum diameter = 3m, and maximum length = 35m;</p> <p>Suction pile maximum diameter = 14m, and maximum penetration depth = 23m.</p>	ES 5.49, Table 5.5, 5.54	Tubular pile maximum diameter = 3m, and maximum length ² = 45m

² The increased pile length compared to the 2012 ES has no material effect on the assessment conclusions. The key parameters in relation to potential impacts from pile installation are the maximum pile hammer energy, duration of pile driving at each location and the total duration of piling activities. These are presented in the OWF Piling Strategy and an updated assessment of underwater noise impacts in presented in Appendix C. This concluded that the predicted impacts were the same or less than as predicted in the 2012 ES.

Key parameter/process	ES/ ES Addendum	OWF DSLP
WTGs		
Up to 150 WTGs and supporting structures	ES 5.11	150 WTGs
Rotor diameter (122 – 167m)	ES 5.32	164m
Blade chord (4.2 – 5.4m)	ES 5.32	5.4m
Minimum blade clearance above water level (Lowest Astronomical Tide (above LAT)) (26.1 – 42.7m) ³	ES 5.32	37m to 41m
Hub height (above LAT) (87.1m - 126.2m)	ES 5.32	119m to 123 m
Maximum Blade tip height (above LAT) (148.1m – 209.7m)	ES 5.32	201m to 205m
Nacelle Dimensions (Length x Breadth x Height) (15m x 4m x 4 m – 24 m x 12 m x 12 m)	ES 5.32	20.6m x 8.8m x 9.3m (including hub)
Minimum spacing between WTGs (5x rotor diameter) (610m – 835m), ⁴	ES 5.32	1,042m (excluding micro-siting)
The rotor, nacelle and upper tower section will be painted the semi -matt pale grey colour RAL 7035	ES 5.43	Each WTG (tower sections, nacelle and blades) will be finished in the standard light grey, RAL 7035
The lower tower section of each WTG, from 15 m above Highest Astronomical Tide (HAT) to the level of HAT, will be painted the high visibility yellow colour RAL 1004.	ES 5.43	The substructure will be finished in Traffic Yellow, RAL 1023. ⁵
Inter-array cables		
Array cable voltage: 33 – 66 kV (Alpha) and 33 – 66 kV (Bravo)	ES Table 5.8	66kV
Cable burial depth will be determined by a detailed hazard identification survey, which will assess the different locations and the various shipping and dredging activities.	ES 5.178	See Offshore Wind Farm Cable Plan (OWF CaP) (LF000009-CST-OF-PLN-0008)

³ Note this figure was revised within the S36 Consents to 29.8m (with a maximum blade tip clearance of 42.7m) above LAT.

⁴ Note this figure was revised within the S36 Consents to 1,000m.

⁵ RAL 1023 is considered to be the industry standard substructure paint colour and no discernible difference is anticipated from RAL 1004 specified within the ES.

Appendix E – Summary of mitigation commitments (out with Appendix D)

Source	Reference (ES Chapter and Paragraph)	Details of commitment	Implementation
ES	Chapter 5: Project Description, paragraph 5.21.	Final build plans of Project's Alpha, Bravo and Transmission Asset, to be sent to Marine Scotland, following consent approval and final detailed design.	This document alongside the separate OTA DSLP document.
ES	Chapter 17: Archaeology and Cultural Heritage, paragraph 17.56	Where cultural heritage assets may potentially be subject to direct effects, infrastructure will be micro-sited and temporary exclusion zones will be implemented to prevent invasive activities, such as WTG and array cable installation, and anchoring or deployment of jack-up legs. PA exclusion zones of at least 50m will be established around those of medium sensitivity HA14, HA25, HA43, HA47, HA64, HA77, HA106, HA112, HA132, HA225, HA230, HA248, HA268 and HA365.	Refer to approved Archaeology Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD). See also OWF constraints set out in Figure 3.4 of this OWF DSLP which show relevant archaeological AEZs in relation to the WTGs installation and Inter-array Cable routing.
ES	Chapter 17: Archaeology and Cultural Heritage, paragraph 17.71	Where cultural heritage assets may potentially be subject to direct effects, infrastructure will be micro-sited and temporary exclusion zones will be implemented to prevent invasive activities, such as WTG and cable installation, and anchoring or deployment of jack-up legs. PB exclusion zones of at least 100m will be established around HA1001, HA1004 and HA1008. PB exclusion zones of at least 50m will be established around those of medium sensitivity HA81, HA88, HA101, HA118, HA133, HA175, HA176, HA177 and HA409.	Refer to approved Archaeology Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD). See also OWF constraints set out in Figure 3.4 of this OWF DSLP which show relevant archaeological AEZs in relation to the WTGs installation and Inter-array Cable routing.