VATTENFALL

European Offshore Wind Deployment Centre

Cable Laying Strategy

(incorporating the Cable Attenuation Report and the Cable Protection Plan)

Submitted for approval pursuant to the discharge of Section 36 Consent Condition 25 and the Marine Licence Conditions 3.2.1.2 & 3.2.1.7

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Revision	Date	Revision changes
1	27/01/2017	First issue

Cable Laying Strategy Overview

Purpose and objectives of the Plan

This Cable Laying Strategy (CLS) has been prepared to address the specific requirements of the relevant condition attached to the Section 36 Consent (S.36) and Marine Licence issued to Aberdeen Offshore Wind Farm Limited (AOWFL).

The Marine Licence issued to AOWFL requires the approval of a Cable Attenuation Plan (Condition 3.2.1.2) and a Cable Protection Plan (CPP) (Condition 3.2.1.7). It has been agreed with the Marine Scotland - Licensing and Operations Team (MS-LOT) that both the Cable Attenuation Plan and the CPP can form part of the CLS document. As such, the term 'Cable Laying Strategy' or 'CLS' used throughout this document refers to the information provided in relation to the requirements of the conditions relating to the CLS, the Cable Attenuation Plan and the CPP.

The overall aim of this CLS is to set out the procedures for the installation of the Inter-array cables and Offshore Export Cables (OECs), and details relating to cable layout and specifications.

This CLS confirms that the Cables (Inter-array and OECs) to be installed and the installation processes employed align with those considered in the original Application, and that construction-related mitigation measures detailed in the Application will be applied during installation.

All relevant method statements developed by contractors involved in the European Offshore Wind Deployment Centre (EOWDC) must comply with the procedures set out in this CLS.

Scope of the Plan

This CLS covers, in line with the requirements of the S.36 Consent and Marine Licence conditions, the following:

- Details of the location and construction methods for the Inter-array cables and OECs (including the method of burial and protection);
- The technical specification of the cables;
- Electromagnetic Field (EMF) attenuation of the Cables;
- The results of survey work including intertidal habitat and relevant species surveys that have informed cable routing (and also geophysical, geotechnical and beach topography surveys);
- Monitoring of cables during the operational life of the Development and measures to address exposure of cables; and
- Confirmation that the construction methods described within this CLS align with those considered in the Environmental Statement (ES), Supplementary Environmental Information Statement (SEIS), Marine Licence, S.36 Consent and Marine Licence Application.

Structure of the Plan
This CLS is structured as follows: Sections 1 and 2 set out the scope and objectives of the CLS and set out statements of compliance. Section 3 sets out the process for making updates and amendments to this document. Section 4 provides an overview of the Development. Section 5 provides detail on the key constraints considered and the detail on the surveys conducted to inform cable routing. Section 6 details the location and layout of cables and the micro-siting tolerances. Section 7 provides the technical specification of the cables and their components. Section 8 presents the Cable Attenuation Plan describing EMF attenuation. Section 9 provides detail of the installation procedures and cable laying methodology. Section 10 presents the Cable Protection Plan describing the cable protection that will be required. Section 11 describes the inspection procedures and maintenance surveys to be carried out after installation and during operation. Section 12 provides information to demonstrate compliance with the original Application, and how the mitigation proposed in the Application will be delivered. Appendix A demonstrates compliance with the original Application and mitigation set out in the ES and SEIS, and Appendix B details the ES and SEIS commitments relevant to this CLS.

Plan Audience
This CLS is intended to be referred to by relevant personnel involved in the construction of the EOWDC, including AOWFL personnel, Key Contractors and Subcontractors. Compliance with this CLS will be monitored by AOWFL and reported to the Marine Scotland Licensing and Operations Team.

Plan Locations
Copies of this CLS are to be held in the following locations: - At AOWFL Head Office; - At the premises of any agent, Key Contractor or Subcontractor (as appropriate) acting on behalf of AOWFL; - At the AOWFL Marine Coordination Centre at Aberdeen Harbour; and - With the Ecological Clerk of Works (ECoW(s)).

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LIST OF ABBREVIATIONS AND DEFINITIONS

Defined Terms

Term	Definition / Description
Application	The Application and Environmental Statement submitted to the Scottish Ministers, by the Company on 1st August 2011 and Supplementary Environmental Information Statement submitted to the Scottish Ministers by the Company on 6th August 2012 for consent under section 36 of the Electricity Act 1989 and for a Marine Licence under 20(1) of the Marine (Scotland) Act 2010, for the construction and operation of the European Offshore Wind Deployment Centre (EOWDC) electricity generating station approximately 2 km off the coast of Aberdeenshire in Aberdeen Bay with a generation capacity of up to 100 MW.
Cables	Offshore Export Cables and Inter-array cables
Cable Laying Strategy (CLS)	The Strategy to be submitted for approval under Condition 25 of the section 36 Consent.
Cable Protection Plan (CPP)	The Plan to be submitted for approval under Condition 3.2.1.7 of the Marine Licence.
Company	Aberdeen Offshore Wind Farm Limited (AOWFL). AOWFL is wholly owned by Vattenfall. AOWFL has been established to develop, finance, construct, operate, maintain and decommission the European Offshore Wind Deployment Centre.
Construction	As defined by the Section 36 Consent, (as per section 64(1) of the Electricity Act 1989, read with section 104 of the Energy Act 2004), construction is defined as follows: “construct”, in relation to an installation or an electric line or in relation to a generating station so far as it is to comprise renewable energy installations, includes: • placing it in or upon the bed of any waters; • attaching it to the bed of any waters; • assembling it; • commissioning it; and • installing it.
Construction Method Statement (CMS)	The Statement to be submitted for approval under Condition 13 of the section 36 Consent.
Contractor	Any Contractor/Supplier (individual or firm) working on the project, hired by AOWFL.
Design Envelope (Rochdale Envelope)	Describes a number of components and all permanent and temporary works required to generate or transmit electricity to the National Grid including the wind farm and the offshore export cable.
Development	The European Offshore Wind Deployment Centre electricity generating station in Aberdeen Bay, approximately 2 km east of Blackdog, Aberdeenshire, as described in Annex 1 of the section 36 Consent.
Development Area	The area which includes the wind turbine generators, the Inter-array cables and part of the Offshore Export Cable Corridor, including any other works, as shown in Part 4 of the Marine Licence (named as Lease Boundary in the Marine Licence).

Ecological Clerk of Works (ECoW)	Ecological Clerk of Works as required under condition 3.2.1.4 of the Marine Licence. primarily, but not exclusively, for environmental liaison to establish and maintain effective communications between the Licensee, contractors, stakeholders, conservation groups and other users of the sea during the period in which licensed activities authorised under this licence are undertaken.
Environmental Statement (ES)	The Statement submitted by the Company on 1 August 2011 as part of the Application.
Inter-array cables	Electricity cables connecting the WTGs.
Key Contractors	The contractors appointed for the installation of the individual components of the Development such as Cables and WTGs.
Marine Licence	Licence issued by the Scottish Ministers under Part 4 of the Marine (Scotland) Act 2010 for construction works and deposits of substances or objects in the Scottish Marine Area in relation to the Offshore Wind Farm and Export Cable Corridor.
Offshore Consents	• Consent granted under section 36 of the Electricity Act 1989 for the construction and operation of the EOWDC; • Declarations granted under section 36A of the Electricity Act 1989 to extinguish public rights of navigation so far as they pass through those places within the territorial sea where structures forming part of the Offshore Wind Farm are to be located; and • Marine Licence under Part 4 of the Marine (Scotland) Act 2010 for construction works and deposits of substances or objects in the Scottish Marine Area in relation to the Offshore Wind Farm and Export Cable Corridor.
Offshore Export Cables (OECs)	The offshore export cables (and all associated cable protections) connecting the wind farm to the onshore export cables.
Offshore Export Cable Corridor (OECC)	The consented area within which the offshore export cables will be laid up to MHWS.
Offshore Export Cable Corridor Landfall	The location where the offshore export cables come ashore.
Onshore export cables	The cables connecting the offshore export cables from the land fall to the onshore substation.
Section 36 Consent	Consent granted under section 36 of the Electricity Act 1989 for the construction and operation of the EOWDC.
Subcontractor	Any Contractor/Supplier (individual or firm) providing services to the project, hired by the Key Contractors (not AOWFL).
Supplementary Environmental Information Statement (SEIS)	The Statement submitted to the Scottish Ministers by the Company on 6th August 2012 as part of the Application.
Target Burial Depth	The burial depth that is planned for the cables to be installed to (distance from the sea bed level to the top of the cable).
Vessel Management Plan (VMP)	The Plan to be submitted for approval under Condition 24 of the Section 36 Consent.

Acronym Definitions

Term	Definition
AC	Alternating Current
AGDS	Acoustic Ground Discrimination System
AOWFL	Aberdeen Offshore Wind Farm Limited
CLS	Cable Laying Strategy
CLV	Cable Laying Vessel
CMS	Construction Method Statement
CPP	Cable Protection Plan
CPS	Cable Protection System
CPT	Cone Penetration Test
DDV	Drop Down Video
ECoW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EOWDC	European Offshore Wind Deployment Centre
ES	Environmental Statement
EUNIS	European Nature Information System
HDD	Horizontal Directional Drilling
HDPE	High Density Polyethylene
km	Kilometre
KP	Kilometre Point
LAT	Lowest Astronomical Tide
MCA	Maritime and Coastguard Agency
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MoD	Ministry of Defence
MS-LOT	Marine Scotland - Licensing and Operations Team
MW	Megawatt
OEC	Offshore Export Cable
OECC	Offshore Export Cable Corridor

Term	Definition
OEMP	Offshore Environmental Management Plan
OTJB	Onshore Transition Joint Bay
PLGR	Pre-Lay Grapnel Run
ROV	Remotely Operated Vehicle
S.36	Section 36 Consent
SEIS	Supplementary Environmental Information Statement
SHE	Safety, Health and Environment
UXO	Unexploded Ordnance
VMP	Vessel Management Plan
WTG	Wind Turbine Generator
XLPE	Cross-Linked Polyethylene

1 INTRODUCTION

1.1 Background

On 26 March 2013, Aberdeen Offshore Wind Farm Limited (AOWFL) received consent from the Scottish Ministers under Section 36 (S.36) of the Electricity Act 1989 for the construction and operation of the European Offshore Wind Deployment Centre (EOWDC - also known as the Aberdeen Offshore Wind Farm) and on 15 August 2014 a marine licence was attained under section 25 of the Marine (Scotland) Act 2010 (reference 04309/16/0). This Marine Licence was most recently varied on 30 September 2016 (reference 04309/16/1).

The Development is located approximately 2 to 4.5 km offshore to the north east of Aberdeen, Scotland, within Aberdeen Bay. The Offshore Export Cables (OECs) will each be between 3.7 – 4.4 km long (maximum total length ~8 km) and will reach landfall at the adjacent coastline in Aberdeen Bay (at one of two landfall options located at Blackdog) (Figure 1).

A further overview of the Development is contained in Section 4 of this document.

Aberdeen Offshore Wind Farm Limited (AOWFL) is a company wholly owned by Vattenfall and was established to develop, finance, construct, operate, maintain, and decommission the EOWDC.

1.2 Objectives of this Document

The S.36 Consent and Marine Licence contain a variety of conditions that must be discharged through approval by the Scottish Ministers/Licensing Authority prior to the commencement of any offshore construction works. These requirements include the approval of a Cable Laying Strategy, a Cable Attenuation Plan and a Cable Protection Plan. The aims of these plans are to set out the specifications and the procedures for the installation of the OECs and the Inter-array cables (Cables), provide details of the attenuation of field strengths of both OECs and Inter-array cables, and set out details of any cable protection required.

The relevant conditions setting out the requirements for a Cable Laying Strategy, a Cable Attenuation Plan and a Cable Protection Plan for approval, that are to be discharged by this document, are presented in full in Table 1.

It has been agreed with MS-LOT that both the Cable Attenuation Plan and the Cable Protection Plan can form part of the Cable Laying Strategy document. As such, the term ‘Cable Laying Strategy’ or ‘CLS’ used throughout this document refers to the information provided in relation to the requirements of the conditions relating to the Cable Laying Strategy, the Cable Attenuation Plan and the Cable Protection Plan.

This CLS has been prepared in order to satisfy the relevant conditions attached to the Offshore Consents and therefore focuses solely on the offshore and intertidal elements of the Development.

Figure 1 Location of the Development Area and the Offshore Export Cable Corridor.

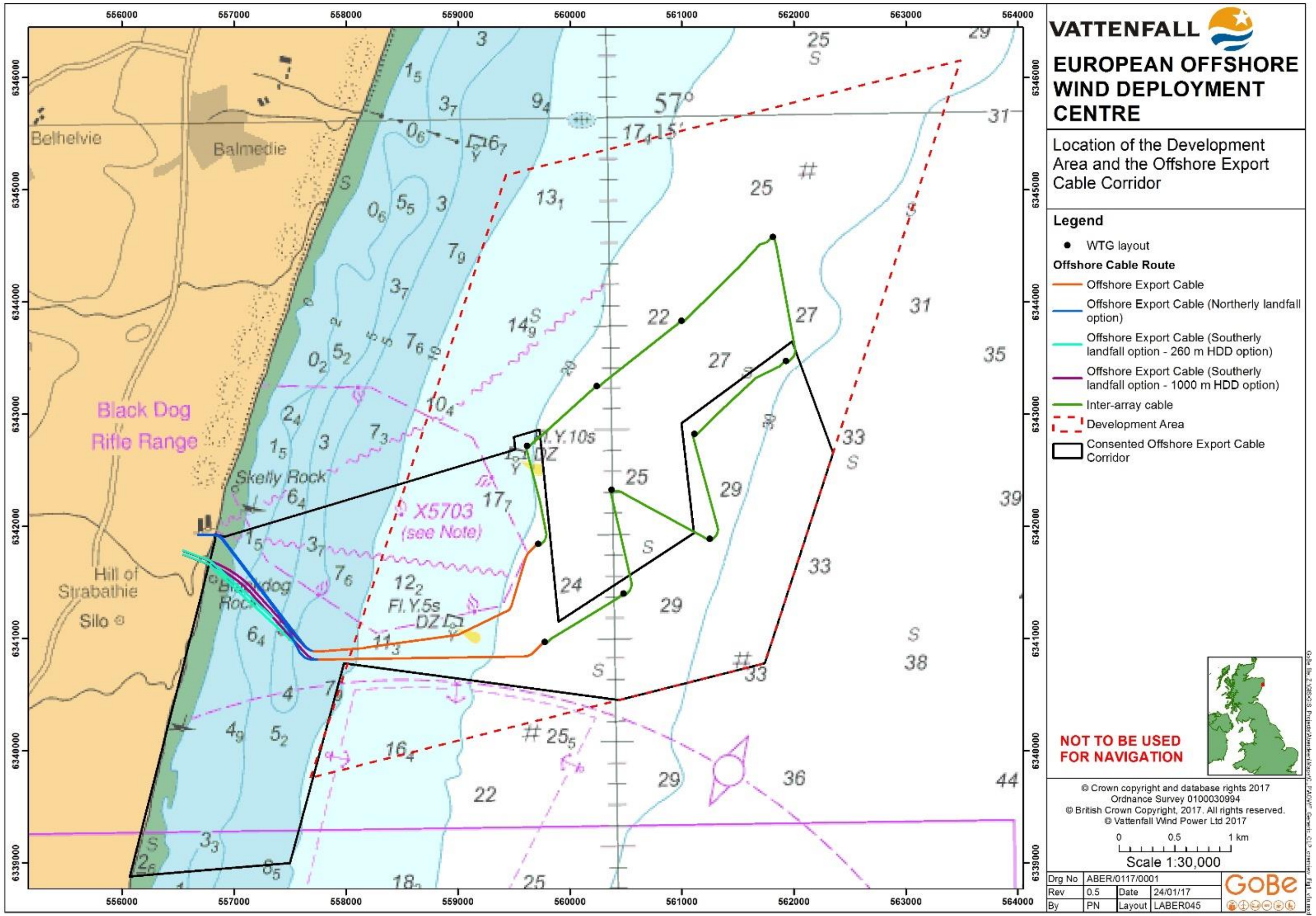


Table 1 - Consent conditions to be discharged by the CLS

Consent Document	Condition Reference	Condition Text	Where Addressed
S.36 Consent	Condition 25	No later than six months prior to the commencement of cable laying, a Cable Laying Strategy (“the Strategy”) must be submitted by the Company to the Scottish Ministers for approval by the Scottish Ministers following consultation with SNH and any such other advisors as may be required at the discretion of the Scottish Ministers.	This document sets out the CLS for approval by the Scottish Ministers. Consultation to be undertaken by Scottish Ministers.
		The Strategy must include the details of the location, the construction methods, and the monitoring methods for the grid export cables and cable landfall site.	Section 6 (location), Section 9 (construction methods) and Section 11 (monitoring methods).
		The Strategy must also include the survey results of an inter-tidal habitat and relevant species survey which will help inform the cable routing location.	Section 5
		The Development must be constructed and operated in accordance with the Strategy.	Section 2
	Reason	*To safeguard coastal processes in the wider Aberdeen Bay. To ensure all environmental issues are considered in the location and construction of the export and inter array cables. This must include coastal processes and benthic and intertidal habitats.*	Section 5
Marine Licence	Condition 3.2.1.2	The Licensee must, no later than six months prior to the Commencement of the Works, provide the Licensing Authority for their written approval a report detailing current 'best practice' relating to the attenuation of field strengths of cables by shielding or burial designed to minimise effects on electro-sensitive and migratory fish species.	Section 8 sets out information on the attenuation of field strengths of cables for approval by the Scottish Ministers.
		Such 'best practice' guidance as is identified must be incorporated into the Construction Method Statement and the Cable Laying Strategy, in respect of which conditions 13 and 25 respectively of the Section 36 consent relates.	Section 8 and incorporated into Construction Method Statement (CMS) and CLS (this document).
Marine Licence	Condition 3.2.1.7	In the event that cable protection is required the Licensee must, as soon as is practicable following the Licensee learning that it is required, submit a Cable Protection Plan (‘CPP’) to the Licensing Authority for their approval, in consultation with SNH, MCA, NLB and any other advisors as required by the Licensing Authority.	Details on the need for cable protection is provided in Section 9, with details of the cable protection provided in Section 10 for approval by the Scottish Ministers. Consultation to be undertaken by Scottish Ministers.

Consent Document	Condition Reference	Condition Text	Where Addressed
		The CPP must include surveys that will be undertaken to identify scour protection / armouring works required to protect the cable. The CPP must be incorporated into the Construction Method Statement, in respect of which condition 13 of the Section 36 consent relates. The installation of any cable protection must not commence until the CPP has been agreed in writing by the Licensing Authority.	Details on the need for cable protection is provided in Section 10, which has been informed by the surveys detailed in Section 5.

1.3 Linkages with other Consent Plans

This CLS sets out the specifications, layout, and installation methods of the Cables, and any associated cable protection. Ultimately, however, it will form part of a suite of approved documents that will provide the framework for the construction process – namely the other Consent Plans required under the S.36 Consent and the Marine Licence.

Indeed, Condition 3.2.1.2 and Condition 3.2.1.7 of the Marine Licence (see Table 1 above) requires this CLS (and those documents incorporated into the CLS) to be, so far as is reasonably practicable, consistent with another specifically named consent plan: The Construction Method Statement (CMS) (required under Condition 13 of the S.36 consent). The purpose of the CMS is to detail the methods that will be implemented during the construction of the EOWDC, including Inter-array cables and the OECs.

The CMS will be submitted for approval by the Scottish Ministers and consistency between the CMS and the CLS (and those documents incorporated into the CLS) will be achieved by ensuring that all relevant documents are consistent with the terms of any previously submitted or approved documents.

1.4 Structure of this Cable Laying Strategy

In response to the specific requirements of the S.36 Consent and Marine Licence conditions, this CLS has been structured so as to be clear that each part of the specific requirements has been met and that the relevant information to allow the Scottish Ministers to approve the CLS has been provided. The document structure is set out in Table 2.

Table 2 - CLS document structure

Section		Summary of Content
1	Introduction	Background to consent requirements and overview of the CLS scope and structure; and Identifies those other Consent Plans relevant to the CLS and provides a statement of consistency between this CLS and those plans.
2	Statements of Compliance	Sets out the AOWFL statements of compliance in relation to the CLS and the broader construction process.
3	Updates and Amendments to this CLS	Sets out the procedures for any required updating to or amending of the approved CLS and subsequent further approval by the Scottish Ministers.
4	Development Overview	Provides an overview of the Development.
5	Cable Route and Installation Considerations	Provides information on the Offshore Export Cable and Inter-array cable route and key constraints considered. It also provides detail on the geophysical, geotechnical, benthic (subtidal and intertidal), and beach topographical surveys conducted to inform cable routing.
6	Location and Layout of Inter-array and Offshore Export Cables	Provides detail on the location of the Offshore Export Cables and Inter-array cables and micro-siting provisions.
7	Technical Specification of Cables	Details the cable specifications.
8	Cable Attenuation Plan	Provides details of electromagnetic field attenuation.
9	Cable Installation Methodology	Summaries the installation procedures associated with the Offshore Export Cables and the Inter-array cables.
10	Cable Protection Plan	Provides detail on the required scour protection and armouring works to protect the cable.
11	Cable Operation and Maintenance	Sets out the operation and maintenance programme and remedial procedures in the event that the cables become exposed.
12	Compliance with Application and Associated Addendum	Sets out how the details in this CLS are in accordance with those assessed in the original Application and associated Addendum; and how the mitigation measures related to construction identified in the ES and Addendum are to be delivered.
Appendix A – Compliance with ES Rochdale Envelope Parameters		Demonstrates compliance with the original Application and mitigation set out in the ES and SEIS.
Appendix B – Compliance with Mitigation Measures		Details the ES and SEIS commitments relevant to this CLS.

2 STATEMENTS OF COMPLIANCE

2.1 Introduction

The following statements are intended to reaffirm the AOWFL commitment to ensuring that the Development is constructed and operated in such a manner as to meet the relevant requirements set out by the Offshore Consents, as well as other broader legislative requirements.

2.2 Statements of Compliance

AOWFL, in undertaking the construction and operation of the EOWDC, will ensure compliance with this CLS as approved by the Scottish Ministers (and as updated or amended from time to time following the procedure set out in Section 3 of this CLS).

AOWFL, in undertaking the construction and operation of the EOWDC, will ensure compliance with other relevant Consent Plans, as approved by the Scottish Ministers, and as identified in Section 1.3 above.

AOWFL, in undertaking the construction and operation of the EOWDC, will ensure compliance with the limits defined by the original application and the project description defined in the Environmental Statement (ES) and Supplementary Environmental Information Statement (SEIS) and referred to in Annex 1 of the S.36 Consent in so far as they apply to this CLS (unless otherwise approved in advance by the Scottish Ministers / the Licensing Authority).

AOWFL, in undertaking the construction of the EOWDC, will comply with AOWFL Safety, Health and Environment (SHE) systems and standards, the relevant SHE legislation and such other relevant legislation and guidance so as to protect the safety of construction personnel and other third parties.

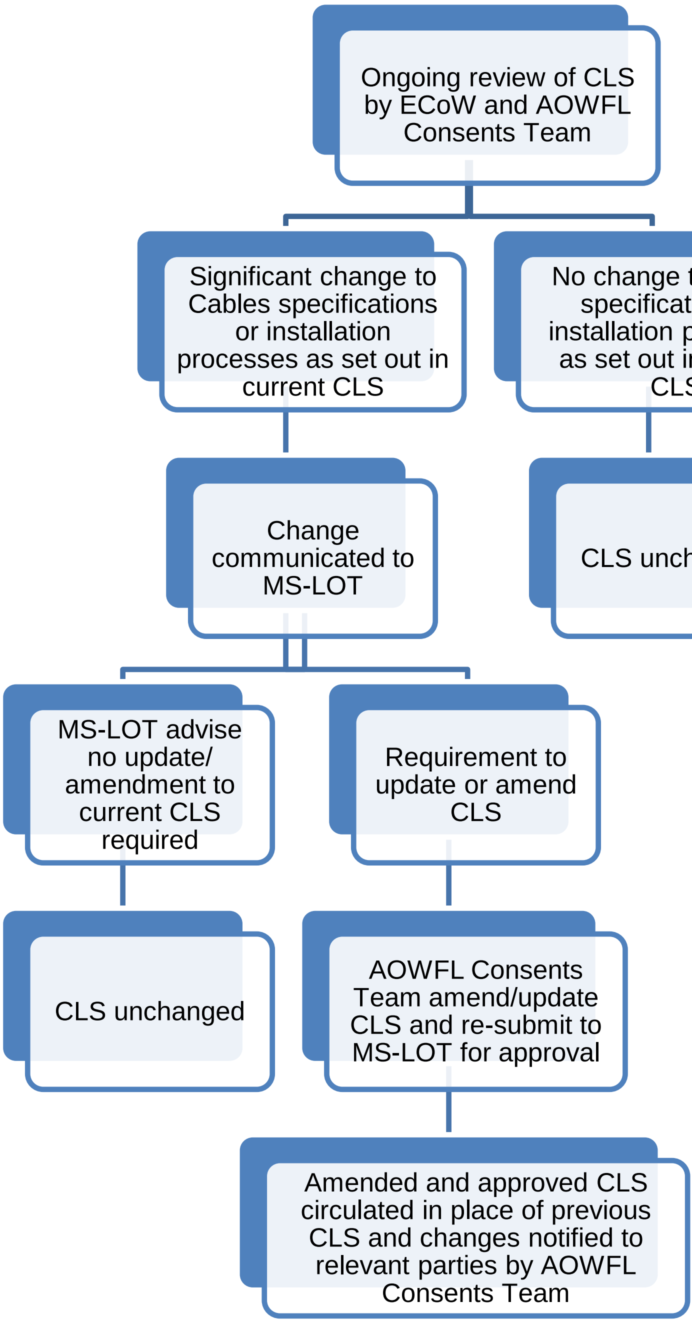
AOWFL will, in undertaking the construction of the EOWDC, ensure compliance with all other relevant legislation and require that all necessary licences and permissions are obtained by the Key Contractors and Subcontractors through condition of contract and by an appropriate auditing process.

3 UPDATES AND AMENDMENTS TO THIS CABLE LAYING STRATEGY

This CLS sets out the specifications and the procedures for the installation of the Cables, provides details of the attenuation of field strengths of the Cables and set out details of any cable protection required.

Where it is necessary to update this CLS in the light of any significant new information related to the Inter-array cables and/or OECs, AOWFL proposes to use the change management process set out in Figure 2; identifying such information, communicating such change to the Scottish Ministers, redrafting the CLS if required, seeking further approval for the necessary amendments or updates and disseminating the approved changes/amendments to responsible parties.

Figure 2 CLS Change Management Procedure



4 DEVELOPMENT OVERVIEW

4.1 Introduction

This section provides a brief overview of the EOWDC relevant to the CLS. Figure 1 shows the location of the Development in Aberdeen Bay.

4.2 Development Overview

The Development will have a total generating capacity not exceeding 92.4 Megawatt (MW) and will consist of the following main components:

- Eleven Wind Turbine Generators (WTGs);
- Three legged jacket substructures each installed on suction bucket foundations;
- A network of circa 9.7 km of Inter-array cables; and
- Up to two buried or mechanically protected, subsea OECs, totalling up to ~8 km in length, to transmit the electricity from the Wind Turbine Generators (WTGs) to one of two cable landfall locations[1] at Blackdog, within Aberdeen Bay, and connecting to the onshore buried OEC for transmission to the onshore substation and connection to the National Grid network.

Further details of the wind farm layout and design will be set out, for approval, in the Design Statement.

[1] Two landfall options are currently under consideration within the Consented Offshore Export Cable Corridor; the final landfall option will be chosen prior to construction and notified to the Licensing Authority (see Section 6 for more information on the landfall options).

5 CABLE ROUTE AND INSTALLATION CONSIDERATIONS

5.1 Introduction

The reason stated for the requirement of a CLS within the S.36 Consent Condition is in order to ensure that all environmental issues are considered in the location and construction of the Cables. As such, this section provides information on the key constraints that have determined cable routing, installation and protection methods including the results derived from relevant survey work.

5.2 Key Constraints Identified

The routing of the OEC has been driven fundamentally by the location of the point of connection to the National Grid and the new onshore substation that forms part of the Development.

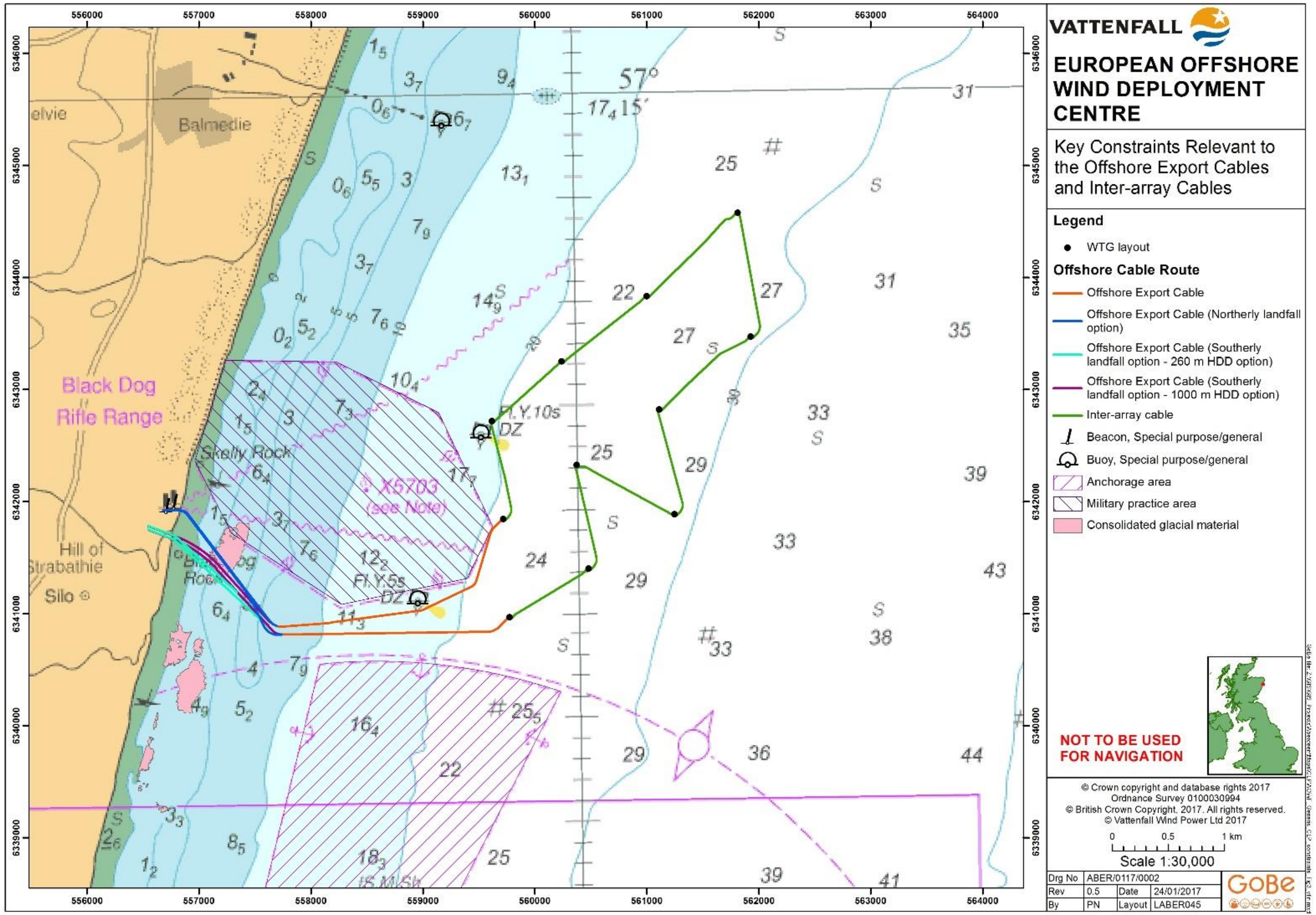
There are a small number of physical spatial constraints within the Development Area and the Offshore Export Cable Corridor (OECC) and the surrounding area. The following constraints have been taken into account in defining the route for the OEC and/or Inter-array cables, and are shown in (Figure 3):

- The Ministry of Defence (MoD) Back Dog Firing Range – a small arms firing range on the coast, with an associated exclusion zone at sea;
- The Maritime and Coastguard Agency (MCA) designated anchorage area just to the north of the Aberdeen Harbour boundary;
- The presence of layers of consolidated glacial material; and
- The location of navigation buoys.

Several features of potential archaeological interest were also identified by geophysical surveys which have informed the route of the OEC and Inter-array cables.

The following sections summarise the surveys that have provided data relevant to assessing potential constraints on cable routing (or installation methodologies) and provides a brief overview of the results of each survey.

Figure 3 Key Constraints relevant to the Offshore Export and Inter-array cables



5.3 Constraints to Cable Routing and Installation Identified by Surveys

A series of geotechnical, geophysical, benthic (subtidal and intertidal) and beach topographical surveys have been commissioned by AOWFL to understand conditions within the Development Area and the Offshore Export Cable Corridor (OECC). The results of these surveys have been considered in defining the routing and installation of the OEC and Inter-array cables. A summary of relevant pre-construction surveys conducted is provided in Table 3 below.

Table 3 - Summary of pre-construction baseline surveys conducted in relation to the Development Area and the Offshore Export Cable Corridor.

Date	Contractor	Survey Type	Comments
Sept 2007	EMU	Geophysical & Seabed Habitat Assessment Swath bathymetry, sidescan sonar, seismic profiling, magnetometry, Acoustic Ground Discrimination System (AGDS) and the collection of seabed samples and video.	Geophysical survey works were undertaken in 2007 to inform the Environmental Impact Assessment (EIA) and inform OEC route options. The survey was undertaken to determine and report on the seabed and sub-bottom conditions.
Sept 2010	Osiris	Geophysical Survey Swath bathymetry, sidescan sonar, seismic profiling and magnetometry.	Geophysical survey works were undertaken in 2010 in order to further inform the EIA and to also inform OEC route options. The survey was undertaken to determine and report on the seabed and sub-bottom conditions.
Oct 2010	CMACS	Benthic Survey Day grab samples, Drop Down Video (DDV), and epibenthic beam trawls.	Benthic survey works were undertaken in 2010 to characterise the benthic environment within the Development Area and along the OECC in order to inform the EIA.
2011	SLR	Intertidal Ecology Survey Phase 1 mapping of the intertidal area at the northern cable landfall location 1 at Blackdog in Aberdeen Bay.	Ecology surveys were undertaken in 2011 to characterise the intertidal environment.
May 2013	Fugro Geo-Consulting	Geotechnical survey 4 boreholes with 4 Cone Penetration Tests (CPTs) alongside it to 30-35 m at 4 WTG locations. Associated laboratory testing.	Reconnaissance geotechnical survey at the corners of the Development Area to identify key geological units and correlate with geophysical seismic datasets.
March 2016	Fugro Geo-Consulting	Geotechnical survey 3 boreholes, 22 CPTs and 11 seismic CPTs to 25-30 m covering all WTG locations. Associated laboratory testing.	Detailed geotechnical survey at individual WTG locations to provide information for detailed design of wind farm elements, to include WTG foundation, jack-up operations and Inter-array cable burial risk assessment.
July 2016	Fugro Geo-Consulting	Geotechnical survey 7 vibrocores and 7 shallow CPTs along export cable route. Associated laboratory testing	Geotechnical survey along the potential OEC route alignment to provide further information for OEC burial risk assessment and cable design.
Aug 2016	Fugro Geo-	Geotechnical Survey	Geotechnical survey to inform ge-

Date	Contractor	Survey Type	Comments
	Consulting	8 CPTs at foundation trial installation locations	otechnical aspects of foundation trial installation.
Sept – Nov 2016	Fugro EMU	Geophysical Survey Swath bathymetry and seismic profiling.	Geophysical seismic survey to identify buried objects (e.g. boulders) at WTG foundation locations and improve the ground model. Further bathymetry data was collected using MBES and backscatter to assist in detailed Inter-array cable and OEC route engineering.
Oct 2010 - Sept 2016	ABPmer	Beach Monitoring Survey Topographic profiles from Mean Low Water Springs (MLWS) to Mean High Water Springs (MHWS); and photographs taken at profile lines at Aberdeen Bay and the Blackdog site.	A programme of beach topographic surveys works was undertaken along the coast adjacent to the EOWDC, initially in order to support the coastal process study for the EIA, to investigate seasonal trends in beach topography
December 2016	SLR	Intertidal Ecology Survey Phase 1 mapping of the intertidal area at the southern cable landfall location 2 at Blackdog in Aberdeen Bay.	Ecology surveys were undertaken in 2016 to characterise the intertidal environment.

The sections below summarise the findings of these surveys as relevant to the OEC and Inter-array cable routing (as set out in Section 6 this CLS) or installation methods (as set out in Section 9 of this CLS) as appropriate.

5.3.1 Geophysical Surveys of the Development Area and the OECC

The general bathymetry of the Development Area and OECC is characterised by sloping seabed as you move offshore, deepening to the east north-east. The depths within the 2010 bathymetry survey range from 0.8 m to 35.1 m below Lowest Astronomical Tide (LAT).

In the shallow inshore section, depths increase from 0.8 m to 6 m in an irregular channel. To the east of this channel, there is a series of linked narrow bank features running parallel to the shore. In places, the depth decreases to 2 m below LAT. These banks are asymmetrical, with the steeper side facing west. The seabed then slopes east-south-east with decreasing gradient, continuing to decrease further offshore.

Surface geology identified from geophysical surveys determined that the sediments over most of the Development Area and OECC were predominantly slightly silty sands, which are frequently shelly. In the inshore region of the OECC there are outcrops of glacial (clayey) till (Figure 4).

Depositional ripple features are apparent towards the intertidal area, with megaripples within the gravel areas and other features in the silty sand up to 1,500 m from the shoreline.

Surveys of the Development Area and OECC conducted in 2010 detected a total of 262 magnetic anomalies. These included three outfall pipes running out from shore and the route of a disused telecoms cable. There were numerous small magnetic anomalies across the

Development Area. Given the possibility of ordnance in the area these may indicate small metallic objects such as unexploded ordnance (UXO).

The 2007 surveys confirmed a surface veneer of sandy sediments within the Development Area, although absent in some locations nearshore (where the till outcrops at the surface), which increases in thickness (up to 8.5 m) with increasing distance offshore. Within the nearshore area, maximum sandy sediment thickness is apparent in the region characterised by sand bar features.

The purpose of the geophysical survey carried out in 2016 was to obtain detailed sub-bottom profiler data covering 400 m x 400 m survey boxes at all 11 WTG locations. Additional bathymetry data was collected covering a 200 m wide corridor of the Inter-array cable and the OEC routes. Surveyed depths ranged from approximately 0.7 m above LAT to 32.6 m below LAT across the survey area. From the sub-bottom profiler data, four seismic horizons were interpreted throughout the site, which confirmed that seabed sediments consisted predominantly of sandy sediments underlain by clay. The thickness of the sandy sediments increased from approx. 1 m below seabed level at the shallowest WTG location, to 8.5 m at the deepest WTG location.

5.3.2 Geotechnical Surveys of the Development Area and OECC

The offshore geotechnical surveys carried out between 2013 and 2016 have revealed that the seabed generally comprises of very loose to dense sand (Forth Formation), normally 1-2 m thick, but at the deeper side of the site the thickness increases to as much as 8.5 m. The surface sands (top 1-2 m) tend to be densified probably as a result of wave action.

The sand layer is underlain by glaciomarine clays (St Abbs Formation) and has been identified across most of the site to a maximum thickness of approximately 15 m. Underneath this formation lies the Wee Bankie glacial till (clayey with boulders, cobbles and gravel), which at the nearshore section outcrops at seabed and extends to the rockhead of the Old Red Sandstone. From geophysical seismic datasets it can be inferred that the rockhead tends to dip towards east-northeast (ENE) direction from 2-5 m below seabed in the nearshore section to 25-30 m BSB at the farthest part of the site.

5.3.3 Intertidal Ecology Survey

Intertidal ecology surveys of the northern **cable landfall location 1** were undertaken in 2011 using standardised Phase 1 mapping methodology. Habitats along the intertidal zone were mapped using European Nature Information System (EUNIS) habitat classes to level 3. Biotopes or other notable features such as species of conservation concern, covering less than 5 m^2 were recorded using referenced target notes.

The results of these surveys were reported in the Onshore Environmental Statement and indicated that the intertidal zone was dominated by two zoned habitats which have been categorised as B1 and B1.1 according to the EUNIS database:

- EUNIS B1 Coastal dunes and sandy shores: The intertidal zone is dominated by very exposed littoral sands which extended into the infralittoral zone and which also provide sediment for the sand dune system present in the supralittoral zone.
- EUNIS Habitat type code B1.1 sand beach driftline: This narrow habitat band occurs just above the normal tide limit providing material for embryonic sand dune development. There was scant evidence of such development although some sea rocket and isolated patches of marram grass were evident.

The beach is described as exposed and undergoes constant aeolian shifting. There are few associated habitats and thus few opportunities for a diversity of intertidal marine fauna, the only evidence of shellfish being discarded shells of common cockle (*Cerastoderma edule*), pod razor shell (*Ensis siliqua*), common tortoiseshell limpet (*Yectura tessulata*) and white furrow shell (*Abra alba*) indicating the presence of shellfish beds beyond the littoral zone. Mobile crustaceans such as amphipods were also noted along the shoreline and in particular beneath drift material.

The limited boulder areas recorded in some locations at the low tide mark provided holdfast opportunities for seaweeds such as bladder wrack (*Fucus vesiculosus*) and gut weed (*Ulva intestinalis*). The only other recorded species were communities of barnacles (*Balanus sp*.).

An ecological survey of the **southerly landfall location 2** was undertaken in 2016. The intertidal zone was dominated by EUNIS B1 Coastal Dunes and Sandy Shores habitat. The exposed littoral sands were found to extend into the infra-littoral zone providing the sediments for the sand dune system at the supralittoral zone.

For the most part the sands were fine-grained with few gravels or stones (occurring as tidal bands down the shore) and belts of shell fragments associated with offshore shellfish beds e.g. common mussel (*Mytilus edulis*), common cockle (*Cerastoderma edule*), pod razor shell (*Ensis siliqua*), common whelk (*Buccinum undatum*), white furrow shell (*Abra alba*) and common otter shell (*Lutraria lutraria*). Excavated samples down the shoreline found no evidence of living shellfish or other intertidal zone species within the sediments. A number of sea gooseberry (*Ctenophora sp*.) were recorded along the lower shoreline.

EUNIS Habitat type code B1.1 sand beach drift-line to the north of the HDD corridor was not in evidence within or outside the HDD corridor although the erosion of the sand dunes has led to small clumps of marram grass occurring within the supralittoral zone.

The infralittoral zone consisted of fine sands with gravels and boulders. The boulders ranged in size up to 1.5 m diameter and provided holdfast opportunities for gut weed (*Ulva intestinalis*), laver (*Porphyra umbilicalis*) and communities of common mussel and barnacles (*Balanus sp*.).

5.3.4 Subtidal Benthic Surveys of the Lease Boundary and OECC

A subtidal benthic survey was conducted in 2010, which indicated that the seabed consisted of fine and muddy sand. Inshore areas had lower mud content than the deeper stations further offshore. The predominant species present were the polychaete worm *Notomastus* *latericeus*, and the bivalves *Nucula nitidosa* and *Tellina fabula*. The infaunal communities increased in diversity and numbers with distance from the shore and are characterised by two biotopes: *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand (SS.SSA.IFiSa.NcirBat) in inshore areas and *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (SS.SSA.CMuSa.AalbNuc) further offshore.

Trawl sampling indicated that *Crangon crangon* (brown shrimp), *Ophiura ophiura* (brittlestar) and *Liocarcinus holstatus* (a swimming crab) were the most dominant epifaunal invertebrate species. The distribution of these species was associated with muddier sediment types. The three most abundant fish species were dab (*Limanda limanda*), plaice (*Pleuronectes platessa*) and whiting (*Merlangius merlangus*); all three of which are commercial species. Plaice and dab were caught in greater numbers at the sandier inshore stations, especially plaice.

The 2010 subtidal benthic survey did not find evidence of any rare or protected subtidal benthic species or habitats in the Development Area and OECC.

5.3.5 Beach Topographical Monitoring Surveys

Shoreline topographic surveys were carried out in spring (April) and autumn (October or November), between 2010 and 2016, to investigate seasonal trends in beach topography and covering an area encompassing both landfall location options. The observed changes in beach morphology along Aberdeen Bay evidenced from these surveys can, for the most part, be explained in terms of intra-annual (seasonal) variations in incident wave energy. For the September 2016 survey, this is particularly evident in the formation of a berm on the upper foreshore along the frontage. This is evident and visible along a number of cross shore profiles along Aberdeen Bay and locally within the Blackdog area.

However, some of the largest changes observed within the beach profiles, over the surveys to date, have occurred as a result of burn migration across the backshore/foreshore, rather than as a direct response to wave action. This is particularly evident in the case of the profiles in the vicinity of Blackdog Burn. Changes at these locations included dune retreat between 2013 and April 2016, which were likely driven by both fluctuations in fresh water flow volumes and local beach topography determined by the wave climate. No further dune retreat was observed between April and September 2016. At the same time no dune advance was observed over the same period. Based on field observations on the dune extent since 2010, significant dune toe advance is not expected in the short to medium term in the Blackdog area.

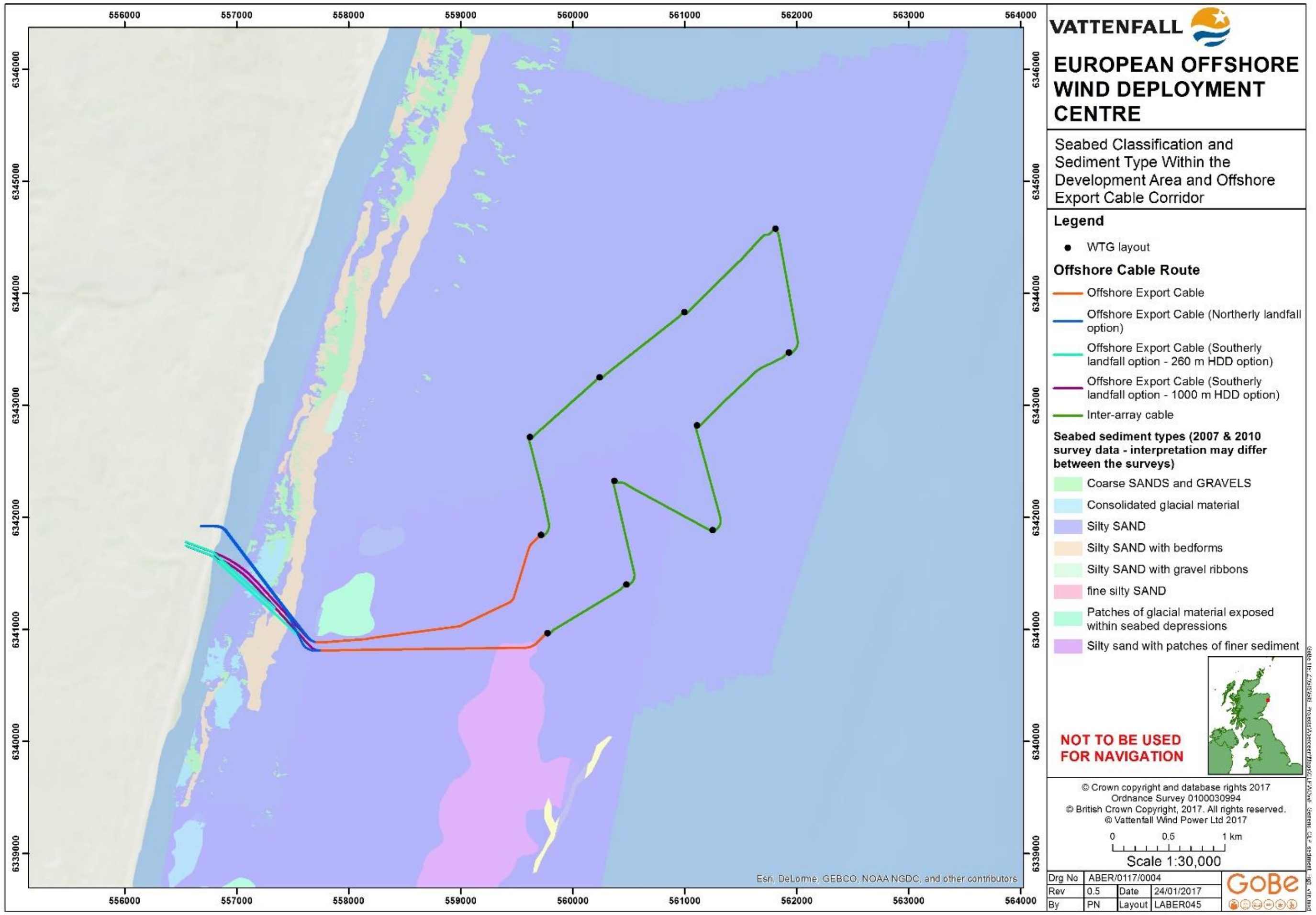
5.4 Summary of Key Constraints Identified by the Surveys

Geophysical and geotechnical surveys have indicated that in some areas of the OECC consolidated glacial sediments are present which may need to be avoided as a result of the difficulties associated with the use of burial tools (particular jetting burial tools) through this material.

A review of benthic survey data within the Development Area and along OECC and intertidal ecology survey data did not identify any sensitive habitats or species that are considered to be a constraint with regards to cable routeing or installation procedures.

The beach topographic surveys have demonstrated that the changes observed in beach morphology are consistent with the conceptual understanding of this coastline provided in 2012 by ABPmer, together with the more detailed engineering studies completed. The topographical survey data are being used to inform the ongoing OEC routing and installation engineering design process for the cable landfall location options.

Figure 4 Seabed classification and sediment type within the Development Area and along the Offshore Export Cable Corridor



6 LOCATION AND LAYOUT OF INTER-ARRAY AND OFF-SHORE EXPORT CABLES

6.1 Introduction

Condition 25 of the S.36 Consent requires that the CLS must include details of the following:

> *"**the location**, the construction methods, and monitoring methods for the grid export cables and cable landfall site"*

The following sections describe the layout and location of the OEC, taking into account any constraints identified in Section 5. In addition, given that the reason for Condition 25 in the S36 consent makes reference to Inter-array cables, the layout and location of the Inter-array cables is also presented.

Cable laying techniques are described in Section 9 of this CLS.

6.2 Location and Layout

6.2.1 Offshore Export Cables

Two buried 66 kV subsea OECs will be installed to transmit the electricity from the WTGs to the landfall at Blackdog where they are then connected to the onshore export cables at the onshore transition joint bay (OTJB). The onshore export cables then run underground from landfall at Blackdog to the substation site.

Two landfall locations are currently being considered within the consented OECC (Figure 5). These two options are being explored with the relevant stakeholders and for technical feasibility. The licensing authority will be notified of the final landfall location once decided.

For **landfall location 1** by the Blackdog Burn (the northern option), two High Density Polyethylene (HDPE) ducts for the OEC will be installed by trenching methods between the OTJB and the offshore Kilometre Point (KP) 0.25 which will cross the Blackdog Burn, a small stream running on the beach parallel to the water line. The ducts will be approximately 150 m long, with the option of duct extensions of approximately 850 m in length currently being considered.

For **landfall location 2** (the southern option), Horizontal Directional Drilling (HDD) methodologies will be used to install two HDPE ducts under the beach. The following three options are currently being considered for this process:

- Short HDD (ducts approximately 260 m in length);
- Short HDD (ducts approximately 260 m in length) with duct extensions (approximately 750 m in length); and
- Long HDD (ducts approximately 1000 m in length).

For these three HDD options, the entry points for the HDD will be located in the onshore substation area. In this case, the cables may be terminated in the onshore substation, which may omit the need for onshore export cables.

The OECs indicative configuration coordinates for **landfall location 1** are presented in Table 4 below, with the layout of OECs presented in Figure 5.

Table 4 – OEC arrangements for landfall location 1

Layout		Start Point		End Point	
Start	End	Easting	Northing	Easting	Northing
Offshore Export Cable 1					
Landfall	WTG AWF05	556680.9346	6341925.709	559703.3296	6341837.757
Offshore Export Cable 2					
Landfall	WTG AWF09	556680.4738	6341921.886	559760.4019	6340962.948

The OECs indicative configuration coordinates, in the event that **landfall location 2** is utilised, are presented in Table 5 below, with the layout of OECs presented in Figure 5.

Table 5 – OEC arrangements for landfall location 2

Layout		Start Point		End Point	
Start	End	Easting	Northing	Easting	Northing
Offshore Export Cable 1					
Landfall	WTG AWF05	556547	6341781	559703.3296	6341837.757
Offshore Export Cable 2					
Landfall	WTG AWF09	556547	6341748	559760.4019	6340962.948

6.2.2 Inter-array Cabling

The 66 kV subsea Inter-array cables will be installed to connect the WTGs together. The indicative Inter-array cables configuration coordinates are presented in Table 6 below, with the layout of Inter-array cables presented in Figure 5.

Table 6 – Inter-array cable arrangements

Layout		Start Point		End Point	
Start	End	Easting	Northing	Easting	Northing
AWF09	AWF10	559787.8516	6340955.593	560464.2066	6341395.707
AWF06	AWF11	560386.0814	6342312.785	561231.9564	6341882.474
AWF10	AWF06	560492.8221	6341388.039	560357.9159	6342320.332
AWF03	AWF04	561010.9744	6343819.26	561795.4482	6344571.752
AWF02	AWF03	560253.0269	6343237.625	560982.3588	6343826.928
AWF01	AWF02	559630.4156	6342705.579	560225.725	6343244.94
AWF05	AWF01	559730.7793	6341830.402	559604.2342	6342712.594
AWF07	AWF08	561123.6976	6342808.564	561913.2206	6343467.041
AWF11	AWF07	561261.9174	6341874.446	561094.3402	6342816.431
AWF04	AWF08	561824.8056	6344563.886	561943.1817	6343459.013

6.3 Route Refinement and Micrositing

As detailed in Section 6.2.1, the Licensing Authority will be notified of the final landfall location once decided.

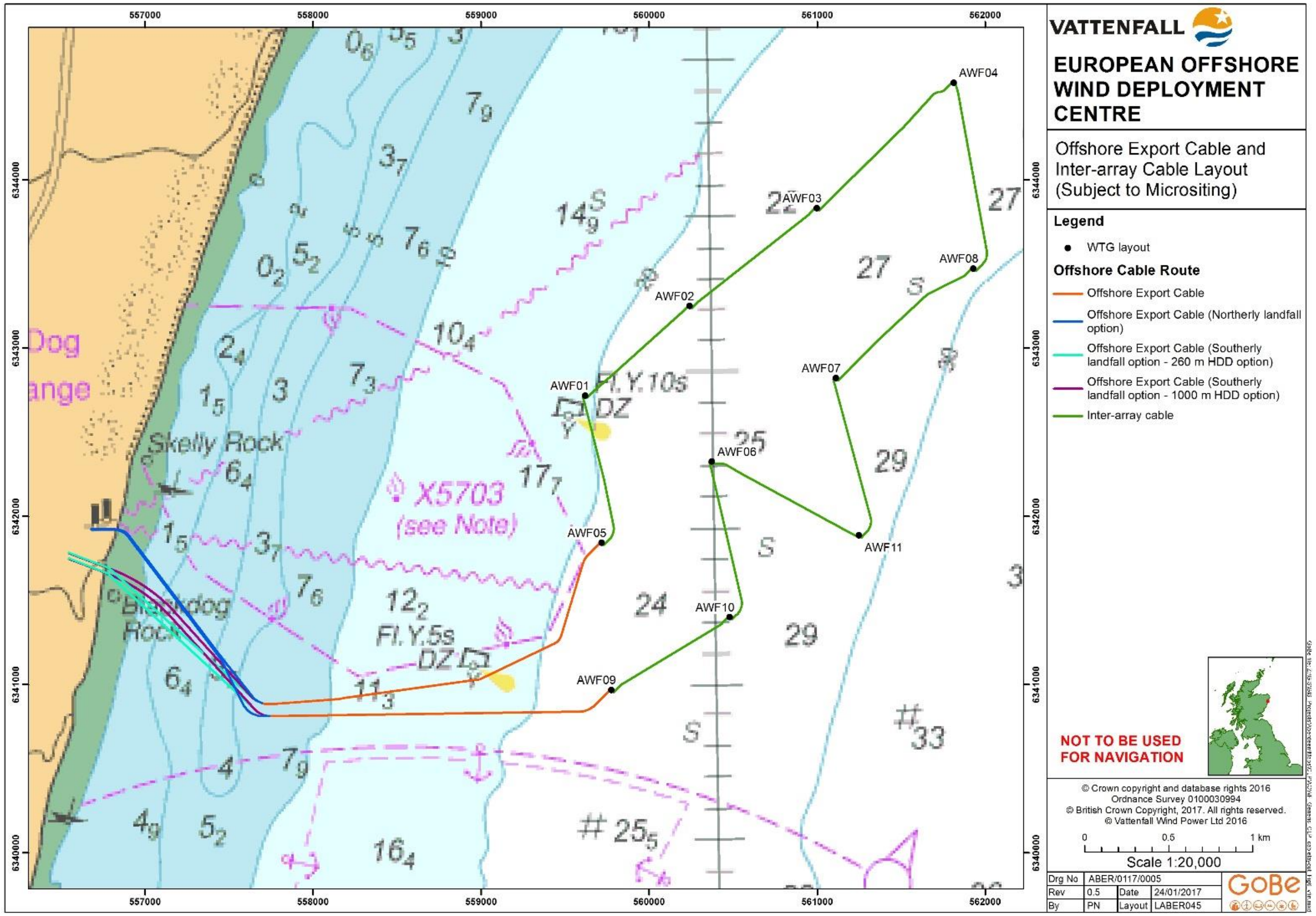
The final locations and layout of the OECs and the final layout of the Inter-array cables remains subject to possible minor route refinement.

Prior to cable installation, an in survey will be completed by the Key Contractor or Subcontractor to confirm there are no additional unknown hazards present (such as boulders and UXO). A Remotely Operated Vehicle (ROV) may be used during the in survey but this is yet to be confirmed. Should any hazards be identified, further minor modifications to the location or protection of cables may be proposed These will not constitute significant changes to this CLS and these minor modifications are referenced as cable micrositing.

A pre-lay survey will be undertaken a couple of weeks prior to the start of the installation of the Cables to determine the reference level for the cable burial and any further micro-siting requiements.

With the PLGR (Pre lay Grapnel Run) any nets or other objects might be removed from the cable route just prior (approximately one month) the cable installation campaign.

Figure 5 Offshore Export Cables layout and Inter-array cable layout (subject to micrositing)



7 TECHNICAL SPECIFICATION OF CABLES

7.1 Introduction

The OECs and Inter-array cables will all be three core 66 kV steel sheathed, armoured submarine power cables. The cables will be made up of a three copper-core conductor of either a 400 mm^2 (inter-array and export cables to land fall location 1), or 500 mm^2 or 630 mm^2 cross section (as an option for the export cables to landfall location 2).

7.2 Cable Components

Figure 6 shows the key components of the 66 kV Cables and the main features of the Cables are described below (the example shown is for a 400 mm^2 cross section cable; the 500 mm^2 and 630 mm^2 cable would be of identical construction apart from having slightly larger copper cores).

7.2.1 Power Cores

The Cables will be comprised of three power cores of copper. The cross-sectional area of each core will be indicatively either 400 mm2 500 mm2, or 630 mm2 The cores will be insulated with crosslinked polyethylene (XLPE). For waterproofing each core will have an outer aluminium foil laminate sheath.

7.2.2 Fibre Optic Element

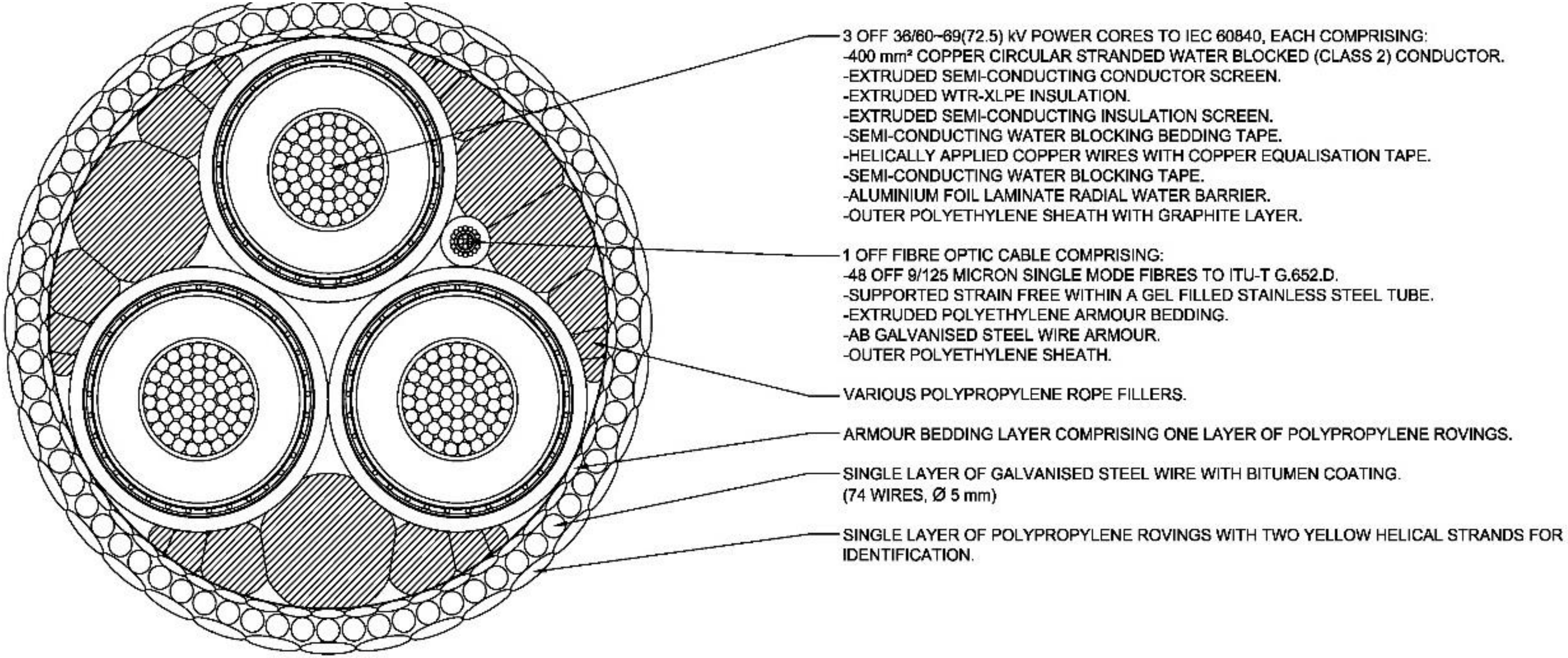
The cables will be fitted with a fibre optic core, within cable interstices, to provide the necessary functionality for WTG control and instrumentation systems.

7.2.3 Assembly

Appropriate filler materials (e.g. ropes or extruded polymeric profiles) will be included within the cable interstices to provide a robust and stable base for the application of armouring.

The cables will have a galvanised steel wire outer armour layer protected from corrosion using a bitumen based compound. The armour layer encloses the cores, the fibre optic cable and any fillers. A serving wrapped over the armour layer will be comprised of polypropylene yarns (antifriction) appropriately specified and sized to meet installation and operational requirements.

Figure 6 Cross section of a 66 kV cable (example shown 3 x 400 mm^2 copper-core subsea cable)



8 CABLE ATTENUATION PLAN

8.1 Introduction

Condition 3.2.1.2 of the Marine Licence requires that the Cable Attenuation Plan must comprise the following:

> *"a report detailing current 'best practice' relating to the attenuation of field strengths of cables by shielding or burial designed to minimise effects on electro-sensitive and migratory fish species"*

The following section provides details of the attenuation of electromagnetic field strengths of the cables that will be installed at the EOWDC. As detailed in Section 7, it is important to note that the same specification of Cables will be used for both OECs and Inter-array cables (with only a potential variation in the size of the coper conductors for export cables installed to landfall location 2 as described in Section 7 above). As such, the following information is considered to be representative of the EMF characteristics of the cables that will be installed at EOWDC.

8.2 Current Industry Best Practice

In relation to the current 'best practice' on EMF, National Policy Statement EN-3 refers to the assessment of EMFs in relation to fish (Paragraph 2.6.75). The document suggests that where mitigation is applied, it is expected that the residual effects of EMF on sensitive species from cable infrastructure during operation are likely to be not significant. The mitigation described (Paragraph 2.6.76) includes the use of armoured cables and cable burial to a sufficient depth (with indicative burial depths of up to 1.5 m for OEC and 1.0 m for Inter-array cables, dependent on geological conditions), both of which are suggested for the EOWDC. It is also important to note that the construction and shielding of the cables to be used at the EOWDC will be in line with current industry standards.

8.3 Electromagnetic Fields

This section summarises the results of a desk based assessment on the attenuation of electromagnetic fields associated with the OECs and Inter-array cables, using the 400 mm^{2,} 500 mm^2 and 630 mm^2 core cables as a basis for field attenuation calculations.

The study calculated the magnetic field magnitudes at a given distance from the 66 kV cables at indicative burial depths of 0.6, 1 and 2 m. The insulation and sheathing of the cable power cores, and the burial of the cables, encourage shielding of EMF.

The magnetic field generated by a single conductor at a given point was calculated using the Biot-Savart Law. When there are three conductors (a three core cable) such as the Inter-array cables and OECs being used for the EOWDC, the magnetic field can be calculated using the superposition of fields of a single conductor.

The predicted EMF attenuation from the 400 mm^2 cables are shown in Figure 7-9 below The predicted EMF attenuation values from the 400 mm^2, 500 mm^2 and the 600 mm^2 cables are shown in Table 7. The x axis on Figure 7-9 indicates the horizontal distance in the model, with the cable situated at the mid-point arc length of 30,000 mm (30 m), and the y axis indicates the magnetic field strength (μTesla). The plots also show the magnitude of magnetic field at multiple heights from the seabed (0 m, 5 m and 10 m).

Figure 7 The magnetic field expected from 400 mm^2 66 kV export cable assuming 0.6 m burial depth

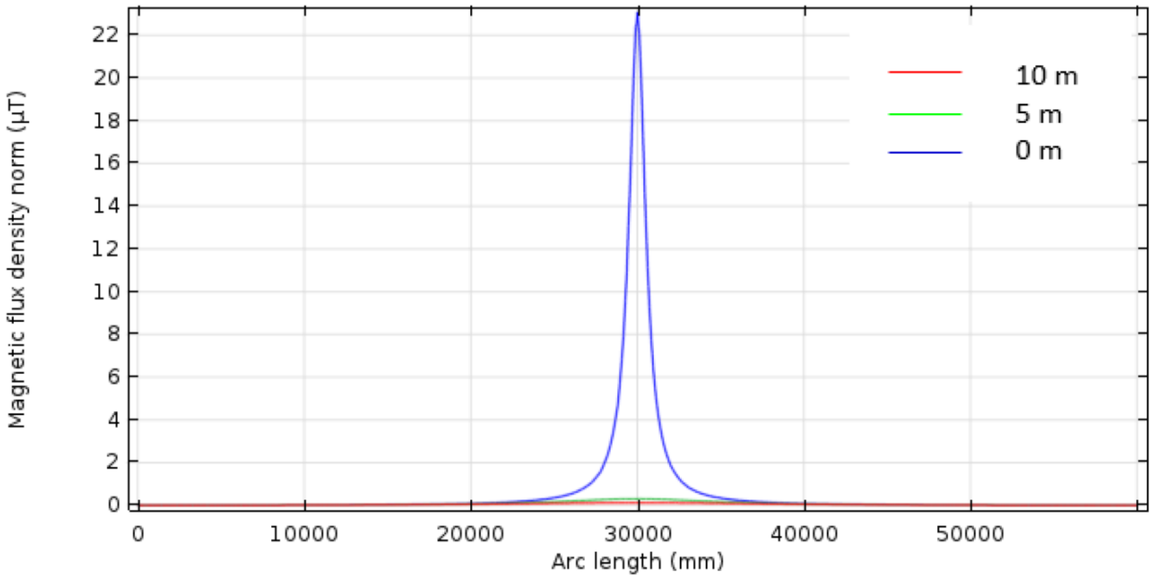


Figure 8 The magnetic field expected from 400 mm^2 66 kV export cable assuming 1 m burial depth

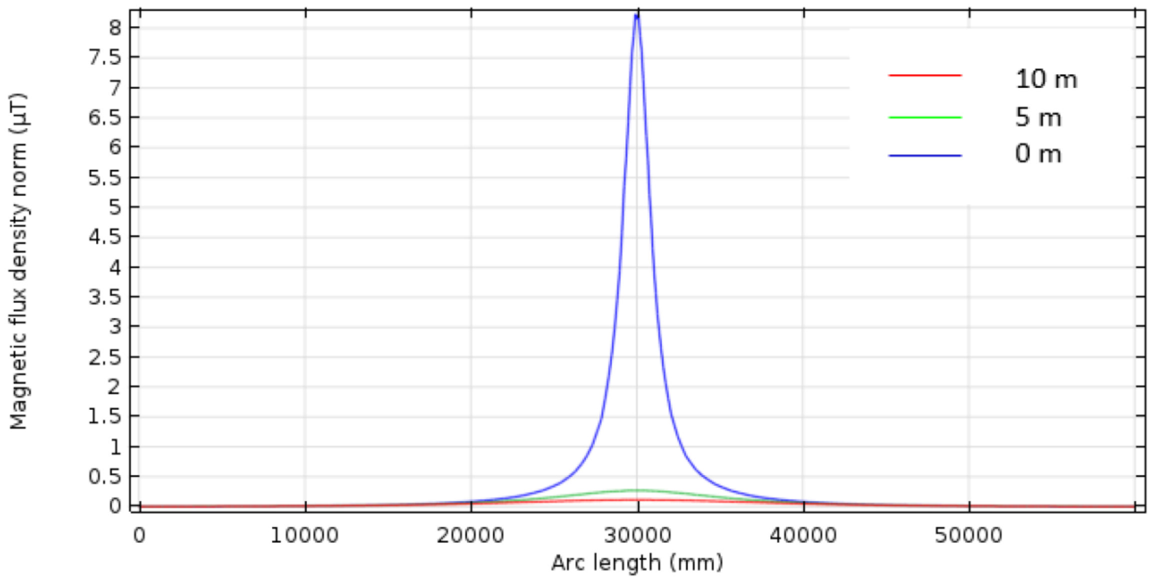


Figure 9 The magnetic field expected from 400 mm² 66 kV export cable assuming 2 m burial depth

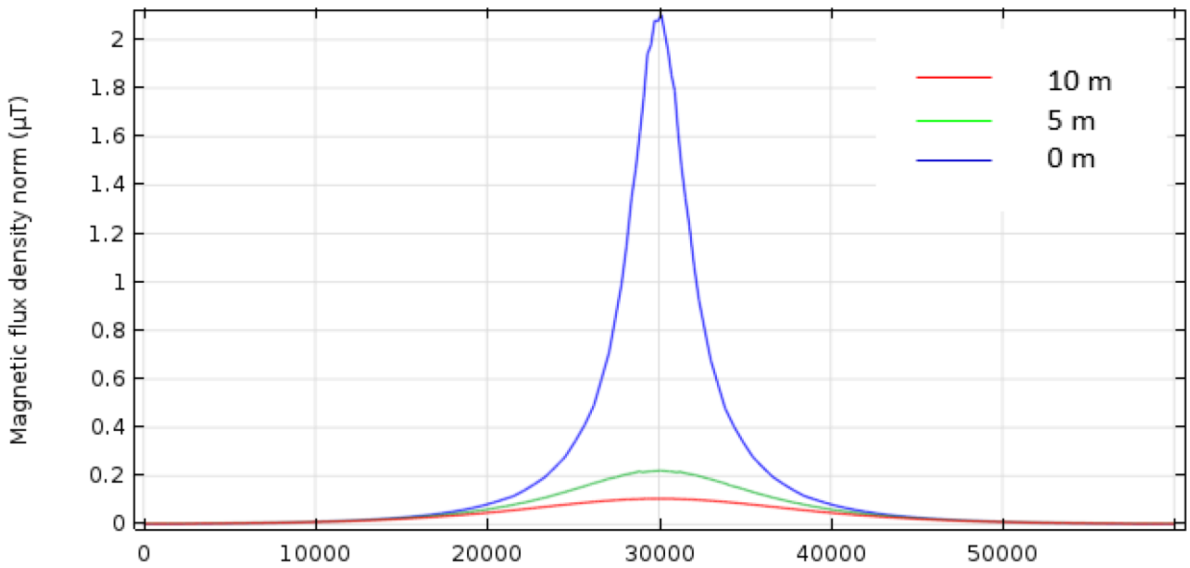


Table 7 - Magnetic field strength of cables – 400 mm², 500 mm² and 630 mm² copper core 66 kV cables

Burial Depth (m)	2 m			1 m			0.6 m		
Distance from Cable (m)	0	5	10	0	5	10	0	5	10
400 mm² (µT)	2.067	0.218	0.104	8.096	0.264	0.111	22.647	0.298	0.115
500 mm² (µT)	2.133	0.225	0.108	8.375	0.275	0.115	23.409	0.308	0.119
630 mm² (µT)	2.155	0.227	0.109	8.468	0.277	0.116	23.666	0.31	0.12

The predicted magnetic field of any of the cables buried to 0.6 m is expected to be below the earth's magnetic field (assumed to vary between 25 µT and 65 µT). As such, at the indicative target burial depths of the Inter-array cables of up to 1.0 m, and OECs of up to 1.5 m, EMF emissions at the seabed are expected to be significantly lower than the earth's magnetic field (Table 7).

9 CABLE INSTALLATION METHODOLOGY

9.1 Introduction

Condition 25 of the S.36 Consent requires that the CLS must include details of the following:

> *"the location, **the construction methods**, and monitoring methods for the grid export cables and cable landfall site"*

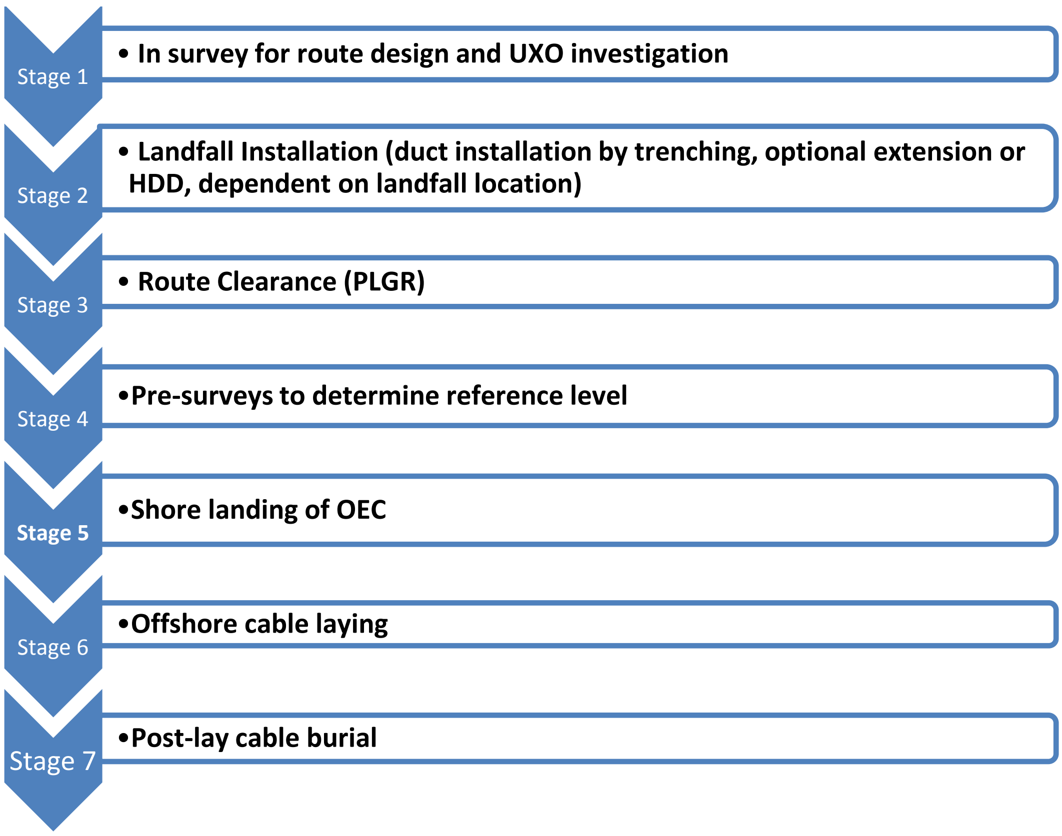
The following sections set out the cable laying techniques for the OECs and the Inter-array cables.

9.2 Offshore Export Cable Installation and Preparation Works

An indicative installation sequence for the OECs is presented in Figure 10.

Greater detail on each of the stages in the installation process (Stages 1 – 7) is then provided in the subsequent sections

Figure 10 Offshore Export Cables Installation Sequence



All Cables will be transported to site direct from the point of manufacture by sea on the Cable Laying Vessel (CLV).

Details of the proposed construction vessels are set out in the Vessel Management Plan (VMP) (required under Condition 24 of the S.36 Consent).

9.2.1 Stage 1 – In survey

An in survey will be conducted to determine the seabed conditions and to identify possible UXO's. An ROV may be used during the in survey but this is yet to be confirmed. This data will be used to finalise the detailed cable routes.

9.2.2 Stage 2 - Landfall installation

As detailed in Section 6, this CLS describes a number of different methodologies that are being considered by AOWFL for the installation of the OECs at the two landfall locations. Due to ongoing engineering studies, AOWFL is currently unable to confirm which methodology will be employed and as such, are presenting several options for approval. The final, selected landfall installation methodology will be taken forward once engineering studies are complete and will be notified to the Licensing Authority prior to the commencement of the landfall installation works.

The following methodologies are being considered for installation of the OECs at **landfall location 1**:

1. Onshore ducts, crossing the Blackdog Burn (approximately 150 m in length) installed by trenching and float in of cable; and
2. Onshore ducts (approximately 150 m in length) installed by trenching with a duct extension (approximately 850 m in length).

The following methodologies are being considered for installation of the OECs at **landfall location 2**:

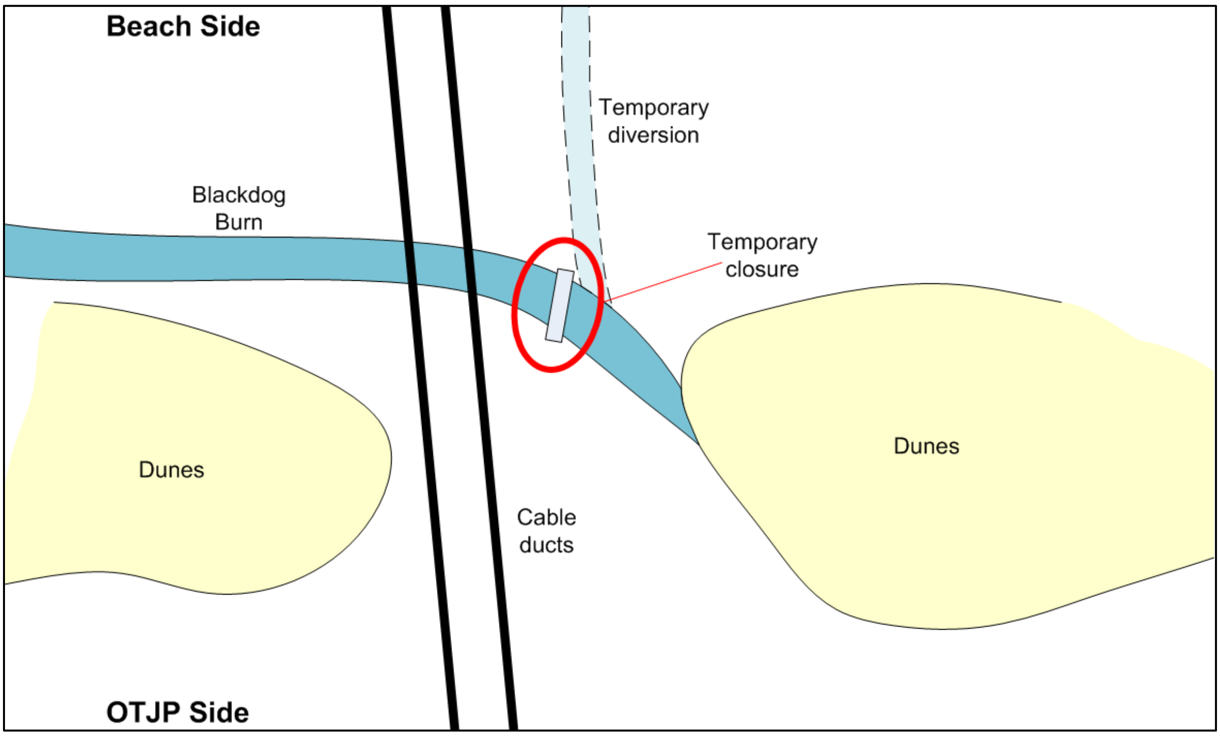
3. Short HDD (ducts approximately 260 m in length);
4. Short HDD (ducts approximately 260 m in length) and duct extensions (approximately 750 m in length); and
5. Long HDD (ducts approximately 1000 m in length).

Option 1 – Onshore duct and float in

Between the OTJB and the beach, a duct for the OECs of approximately 150 m in length will be installed. A trench will be made by excavators and the prefabricated duct will be lowered into the trench to reach the indicative target cable burial depth of up to 1.5 m. The onshore duct has to cross the Blackdog Burn, a small stream running on the beach parallel to the water line. For this crossing the course of the Blackdog Burn will be redirected towards the sea before the ducts are installed (Figure 11). A temporary closure of the burn will be put in place made of big bags filled with sand and supported with sand from the excavated trench. Sheet piles may also be used for the temporary closure. When the redirection is complete, the trench for the pipes will be excavated and the pipes will be installed. Pumps will be available on site to dewater the trench if necessary.

During the onshore pull in of the cable, floatation devices will be attached to the cable. The cable will be floated towards the shore and pulled through the onshore duct to the OTJB.

Figure 11 Schematic overview of the proposed Blackdog Burn crossing



Option 2 – Onshore duct and duct extension

This duct will be extended to the -5 m LAT line (circa 850 m), where the CLV will remain afloat independent of the tidal cycle. The duct will be produced in one length and towed to a temporary storage location At the same time a backhoe dredger will excavate two trenches parallel to each other. The depth of the trenches will be determined based on an indicative target burial depth of up to 1.5 m. The duct will be pulled into the trench. After the installation of the duct, the trench will be 50 % backfilled (Figure 12). The end of the duct will be at -5 m LAT. This is the location where the CLV always stays afloat. Approximately 150 m of ducting will be installed onshore between the OTJB and the beach and connected to the offshore part of the duct.

During the onshore pull in of the cable, the end of the pipe will be recovered and the cable will be pulled directly into the duct to the OTJB (Figure 13). After completion of the pull in the pipe end will either buried or covered with rock bags/mattresses.

Figure 12 Trench Backwashing

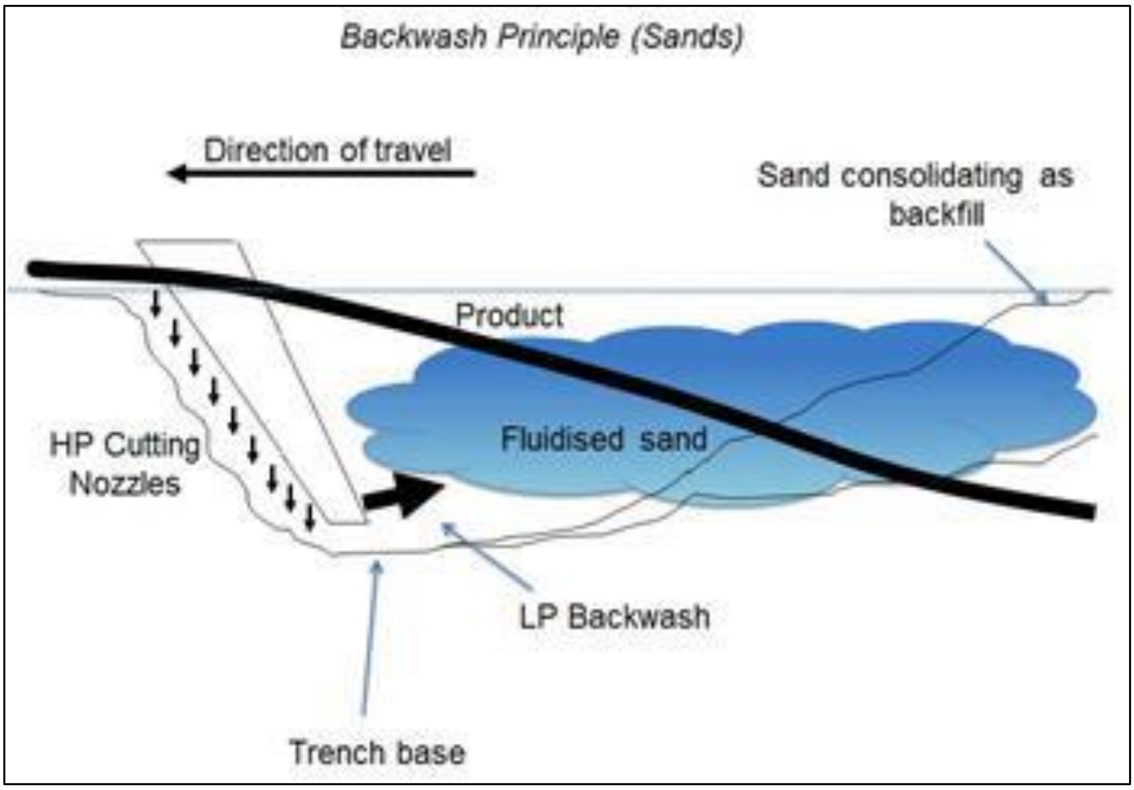
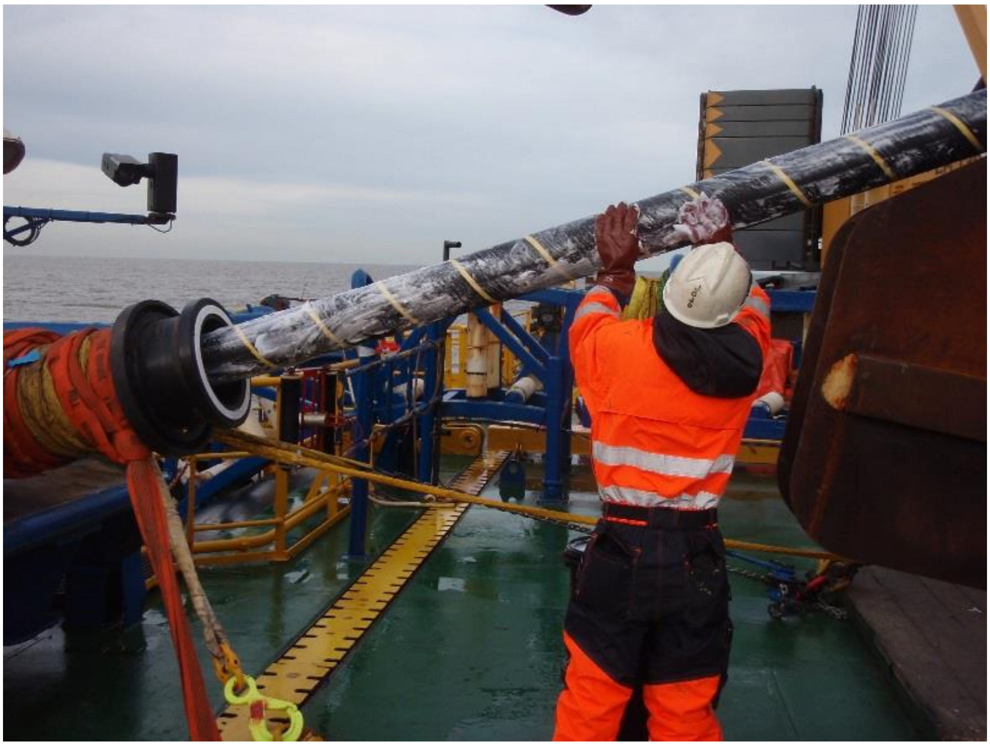


Figure 13 Example of a cable pull in into a HDPE duct end



Option 3 – Short HDD and float in

Between the substation area and the beach an HDD of approximately 260 m length will be installed. The pipe will be either pushed into the borehole from the HDD site or pulled back into the borehole using the HDD rig. If the pipes are pulled back into the borehole, marine assistance will be required. The pipe is floated towards the beach and connected to the punched out drilling assembly. The HDD rig will pull back the HDPE pipe into the drilled borehole (Figure 14, Figure 15).

During the onshore pull in of the cable, floatation devices will be attached to the cable. The cable will be floated towards the shore and pulled through the short HDD duct to the substation area.

The HDD will pass underneath the Burn and dunes and as such will have limited ecological impact.

Figure 14 Example connection of a HDPE pipe with typical drill assembly

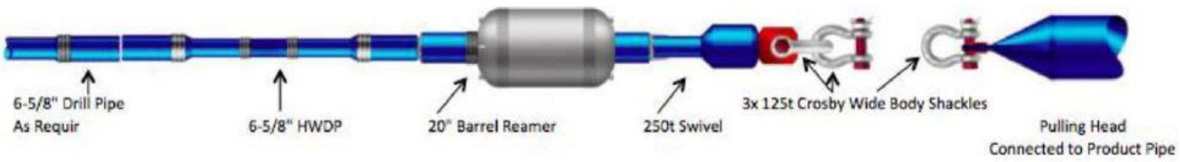
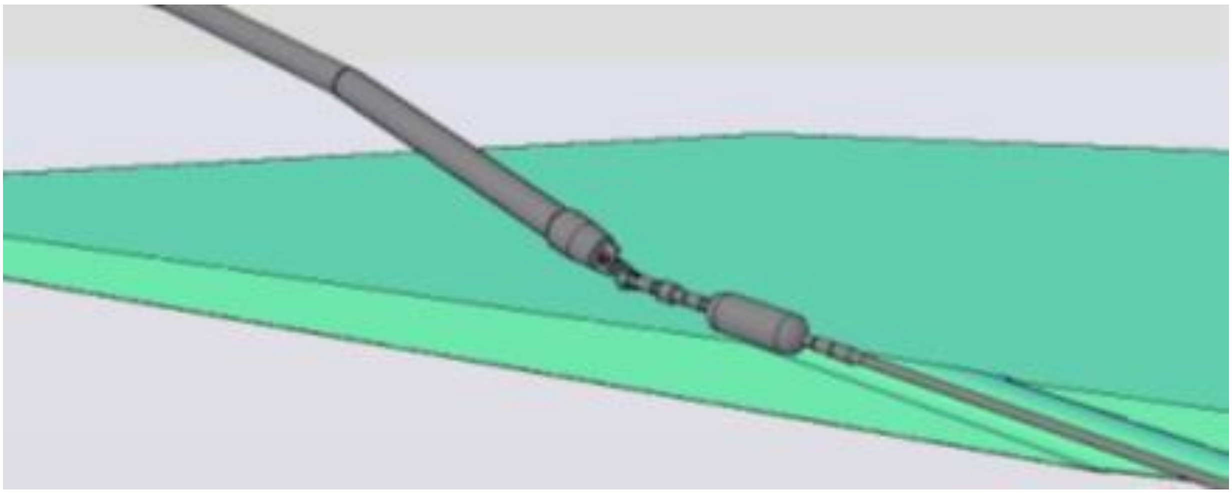


Figure 15 Example diagram of a pipe being pulled into the bore



Option 4 – Short HDD and duct extension

For this option, the short HDD with the exit points on the beach will be extended to the -5 m LAT line. In this case the length of the extension is approximately 750 m. The extension and the short HDD will be installed as described in option 2 and 3 respectively. The connection between the HDD and the extension will be made on the beach.

During the onshore pull in of the cable, the end of the pipe will be recovered and the cable pulled directly into the duct to the substation area. After completion of the pull in the pipe end will be either buried or covered with rock bags/mattresses.

Option 5– Long HDD

The entry points of the long HDD will be in the substation area. The exit points will be approximately at the -5 m LAT line. This will result in a length of HDD of approximately 1000 m. The HDPE pipes will be installed in the HDD boreholes from the water. After punch out of the drill string, the pipe will be connected to the drill string and pulled into the borehole with the HDD rig. A support vessel will be used as a platform to guide the pipe into the borehole. The support vessel will be positioned on anchors near the planned exit points of the HDDs.

During the onshore pull in of the cable, the end of the pipe will be recovered and the cable pulled directly into the duct to the substation area. After completion of the pull in the pipe end will be either buried or covered with rock bags/mattresses.

9.2.3 Stage 3 – Route clearance (PLGR)

Seabed debris, such as fishing gear and abandoned wires or chains, can be detrimental to cable lay and cable burial operations and there is a risk that the cable installation tools, intended to be used to bury the cables, could become entangled or stuck. Therefore, approximately one month prior to the start of cable laying operations, the OECC will be cleared of any surface debris crossing the cable routes by the use of a Pre-Lay Grapnel Run (PLGR).

A vessel will be mobilised together with any required positioning equipment and a grapnel assembly. A variety of grapnel types are available, and suitable pre-determined grapnel will be selected prior to PLGR.

The PLGR vessel will tow a seabed deployed grapnel along the centreline of the cable route (re-runs will be conducted where the grapnel has not stayed within the target corridor). The grapnel tow winch will be fitted with a strain gauge which will detect the rise in tension when it encounters debris. Any debris encountered will be recovered to the deck of the vessel wherever possible for appropriate licensed disposal ashore.

9.2.4 Stage 4 – Pre-surveys to determine reference level

A couple of weeks prior to the installation of the OECs, the survey vessel will perform a pre-lay survey. This will be undertaken prior to the CLV being loaded with the cable and arriving at the site. The pre-lay survey is designed to ensure no changes to the seabed have occurred that will affect the cable installation since the previous in surveys and inform any further micro-siting requirements.

9.2.5 Stage 5 – Shore Landing of OECs

Once the HDPE ducts have been installed on the beach, and the pre-lay surveys have been completed, installation of the OECs will commence. Cable installation will be undertaken by the CLV where the OEC lengths will be loaded onto a cable carousel.

As detailed above, the following methodologies are being considered for the landfall of the OEC at the two landfall options:

1. Onshore duct, crossing the Blackdog Burn (approx 150 m) and float in
2. Onshore duct (approx 150 m) and duct extension (approx 850 m)
3. Short HDD (approx 260 m) and float in
4. Short HDD (approx 260 m) and duct extension (approx 750 m)
5. Long HDD (approx 1000 m)

Float in (options 1 and 3)

For options 1 and 3, the cables will be a floating pull in from the CLV to the beach. The CLV will set up on anchors at approximately KP 1.0 (-5 m LAT line). The burial tool will be over boarded and driven towards the duct end on the beach. The onshore winch will pull the cable towards the shore while on the CLV floatation devices will be attached to the cable and the cable will be paid out. During the float in the burial tool will be located on the beach and the cables will be pulled through the tool.

When the cables have reached the shore, an excavator will guide the cable head into the simultaneous lay and burial tool, if necessary. The excavator can later help the cable into the duct entry if necessary. To reduce the required pull forces the cables can be lubricated with vaseline (environmental friendly) before it enters the onshore duct if required.

Once the cable has been pulled in and the required overlength of a minimum of 10 m is at the OTJP (in the case of pulling to the substation area the overlength is not yet defined), the floatation devices will be removed and the cable will be positioned on the seabed. The cable will remain secured to the winch. The winch will keep tension on the cable, while the simultaneous lay and burial tool starts burying the cable using the chain cutter mode from the beach towards the CLV. The simultaneous lay and burial tool, will be recovered when it has passed the consolidated glacial material area (approximately KP 1.0). The remainder of the cable will be surface laid and post lay buried.

Pull in through duct (options 2, 4 and 5)

For options 2, 4 and 5 a duct will be installed to the position where the CLV will be anchored. The end of the duct will be recovered onto the chute of the CLV and the cable will be pulled through the duct with the onshore winch. To reduce the required pull forces the cable can be lubricated with vaseline (environmental friendly) before it enters the duct end on the CLV if required.

During the pull in the burial tool will be located on the deck of the CLV. After completion of the shore landing the OEC will be surface laid. The entire route will be post lay buried. After completion of the OEC installation the pipe end will be either buried or covered with rock bags/mattresses.

9.2.6 Stage 6 – Offshore Cable Laying

Once the landfall operation is completed, the CLV will move off along the cable route for surface laying of the OECs. The CLV will move along the cable route and the carousel and tensioner will pay out the OECs in line with the speed of the CLV.

Prior to load out of the jacket foundations, equipment and materials for the pull in and termination operation will be stored and fastened on/in the WTG jacket. The messenger wire for the cable installation will be pre-installed in the yard.

The CLV will position itself near to the receiving wind turbine (AWF05 or AWF09) to install the cable through the WTG Internal J-tubes. The internal J-tubes are steel tubes that allow the installation of cables by providing a conduit through which the cables can be pulled. A tower team will be transferred to the jacket prior to the CLV's arrival, after which the CLV will position itself at a stand-off distance from the structure. The messenger wire will then be recovered onto the deck of the CLV.

The OEC will then be connected to the messenger wire, and the Cable Protection System (CPS) will be mounted on the cable during cable pay out to the WTG. The cable will be protected from the outside of the bellmouth into the seabed. The cable will be pulled into the WTG jacket and secured for subsequent stripping and termination into the turbines junction boxes.

If visibility allows, an ROV will carry out a final visual inspection of the installed CPS and cable. Once completed, the pull in cable trenching and burial will commence.

9.2.7 Stage 7 – Post-Lay Cable Burial

Subsea cables are exposed to a range of threats from both natural and anthropogenic sources. Cables can be protected by armouring and by seabed burial. The most reliable form of cable protection is generally recognised as being burial into the seabed. The level of protection required for a cable is a function of the nature of the external threat, the strength of the seabed soils and the depth of burial. During installation, the surface laid OECs will be trenched into the seabed to an indicative target burial depth of up to1.5 m by a trencher from the CLV vessel. The Inter-array cables will have an indicative target burial depth of up to 1.0 m.

During cable trenching operations, a seabed trenching tool will be launched from the CLV. The surface laid cable will be straddled by the trencher to engage the water jetting swords. The seabed trenching tool will then complete a first trenching run to bury the cable. Progress of the burial operation will be largely dependent on the nature of the seabed sediments.

It is anticipated that cable burial will be primarily achieved by the use of a water jetting seabed trenching vehicle capable of performing jet trenching in softer sediments or cutting in stiffer soils (Figure 16, Figure 17). Such jet trenching vehicles will use nozzles mounted on jet swords to inject water at high pressure into the soil surrounding the cable which fluidises the seabed in the immediate vicinity allowing the cable to sink under its own weight, before the soil re-settles over the top. To maximise post-trenching cable cover and to minimise the disturbance of sediment away from the trench, site specific trencher settings will be derived based on the soil conditions to ensure disturbed sediment is monitored and managed efficiently throughout operations.

When a section of the cable is not lowered to the required trenching depth during the first jetting pass, a second and/or third jetting pass can be performed to lower the cable to the required depth.

Figure 16 Examples of seabed cable trenching tools (cutting and jetting)

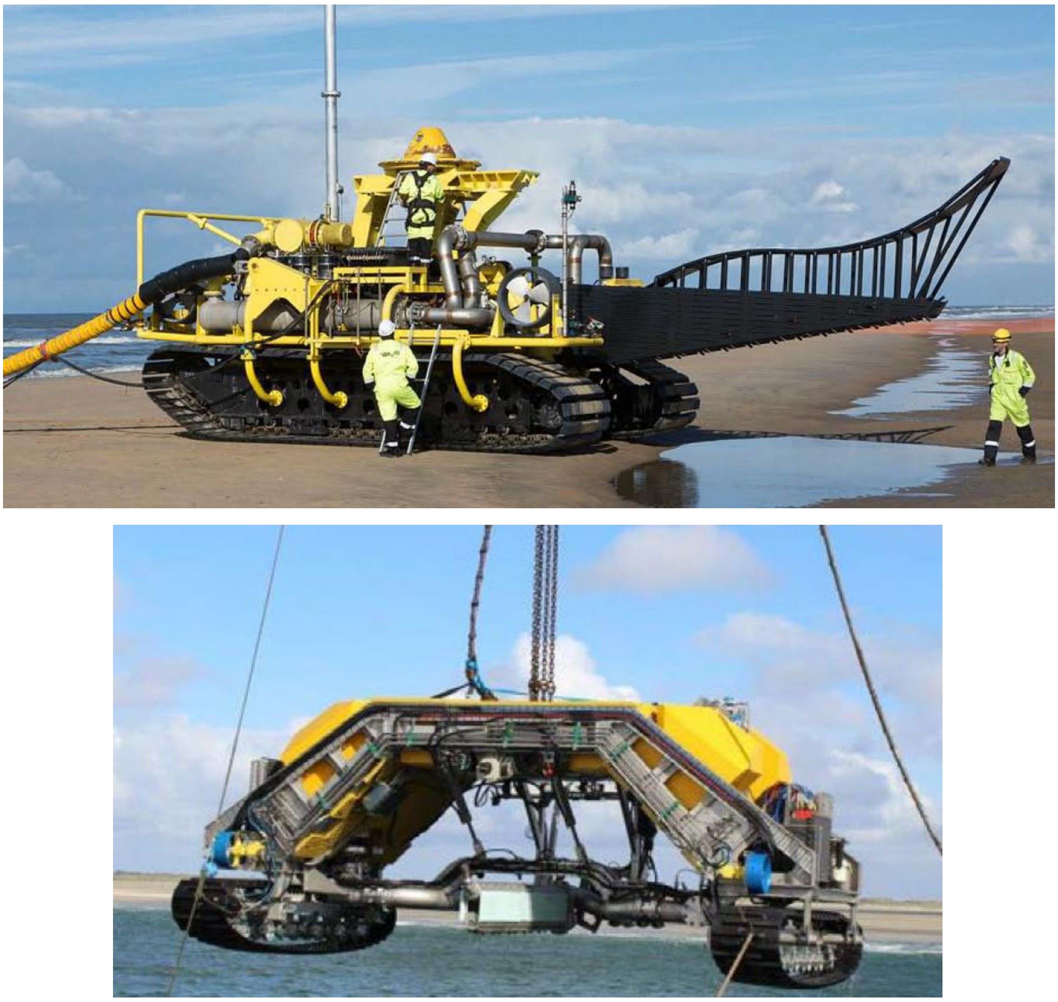
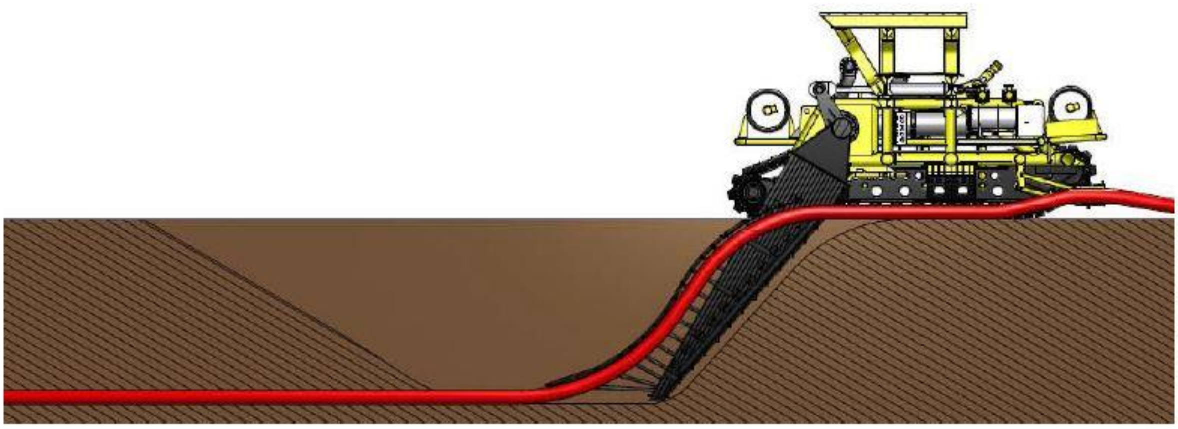
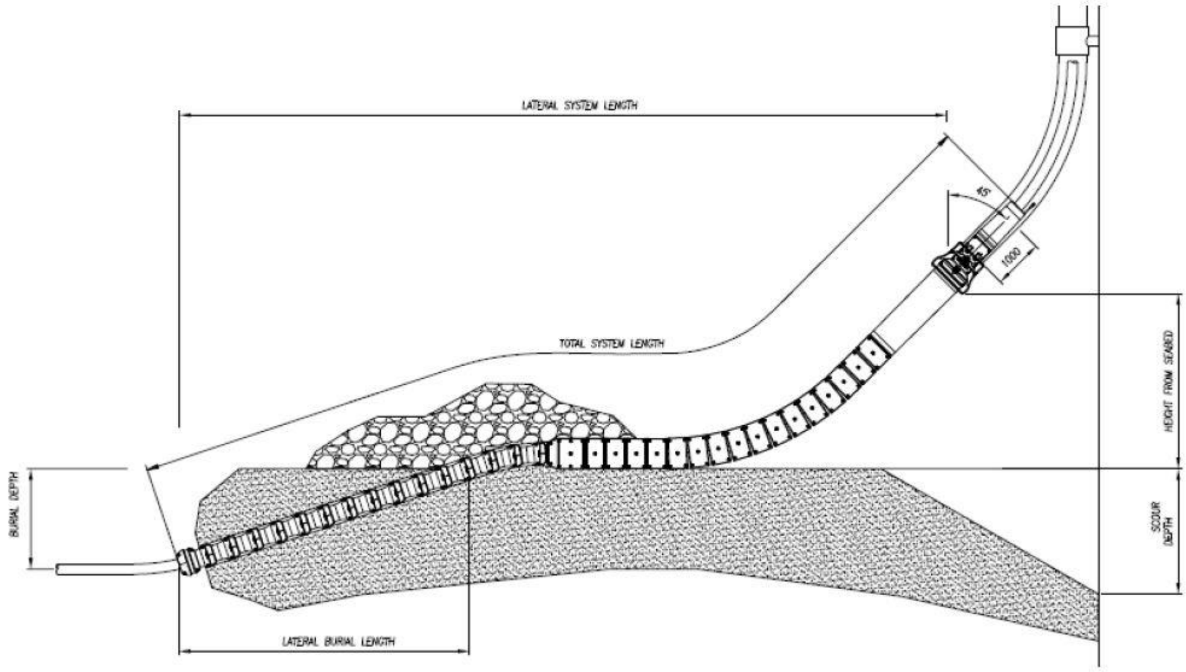


Figure 17 Trencher in jetting mode



A close fitting CPS will be installed on the OECs and Inter-array cables between the seabed and the J-tube interface to protect and stabilise the cable (Figure 18). The CPS will consist of articulated split pipes and bend restrictors to protect the cables from dropped objects, current induced fatigue, dynamic wave action, vibration and other local hazards at this interface.

Figure 18 Example of a CPS at a J-tube

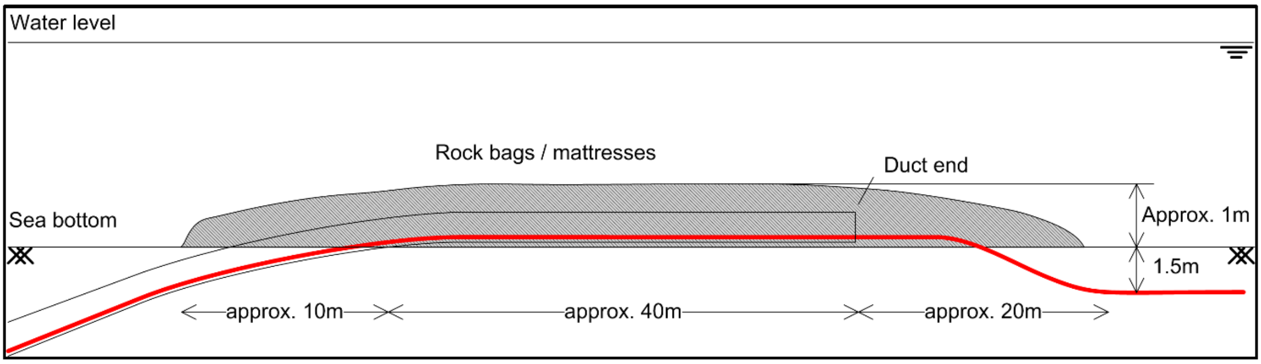


The anticipated approach to Offshore Export Cable burial is as follows:

Additional protection at duct end

If a duct is installed to KP , the end of the duct will be on the seabed after the completion of the pull in of the OECs (options 2, 4 and 5 for the shore landing). The section of the duct extruding from the seabed will be either protected with concrete mattresses or rock bags (Figure 19), buried after the installation of the cable using the trenching tool or lowered using Mass Flow Excavation.

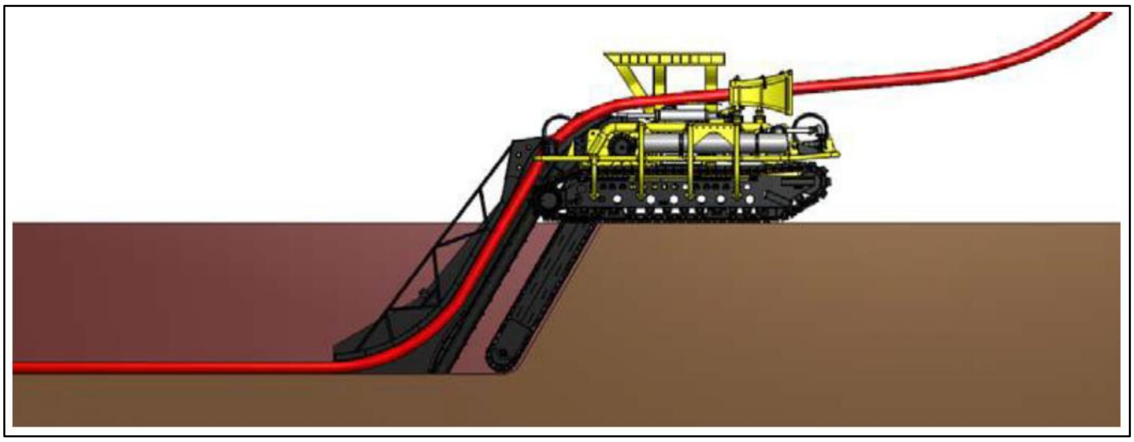
Figure 19 Indicative duct and cable protection



If a float in of the OECs is undertaken (option 1 and 3, Figure 20) the first section of cable (approximately KP 0.15 – KP 1.0) will be buried with the burial tool. Due to the consolidated glacial material located in the inshore area, a trencher fitted with a cutting tool (as shown in Figure 21) will be used up until the point where the trencher has passed the consolidated glacial material area. In chain cutting mode, the cable will run through the upper bellmouth and leave via the cutter depressor, above the chain. No additional cable protection will be required.

Figure 20 Example of a cable float in

Figure 21 Example trencher in chain cutting mode



KP 1.0 to WTG AWF05 & AWF09

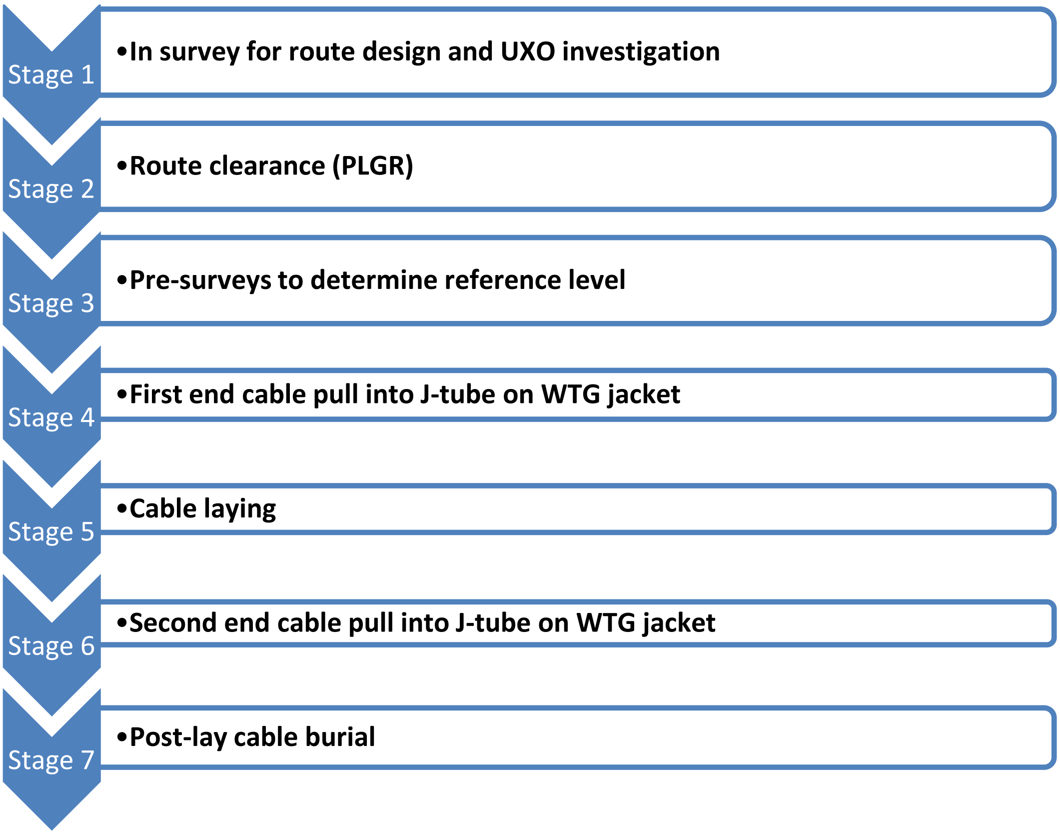
For this section of the cable route, the jetting tool will be used to bury the cables to an indicative target burial depth of up to 1.5 m. It is anticipated that the OECs will be buried along the entire route.

9.3 Inter-Array Cable Installation

An indicative installation sequence for the Inter-array cables is presented in Figure 22. Stages 1 – 3 of the sequence below will be undertaken in a single campaign in relation to both OECs and Inter-array cables. Details are provided in Section 9.2.1, 9.2.3 and 9.2.4.

Greater detail on each of the stages in the inter-array cable installation process (Stages 4 – 7) is then provided in the subsequent sections.

Figure 22 Inter-array Cable Installation Sequence



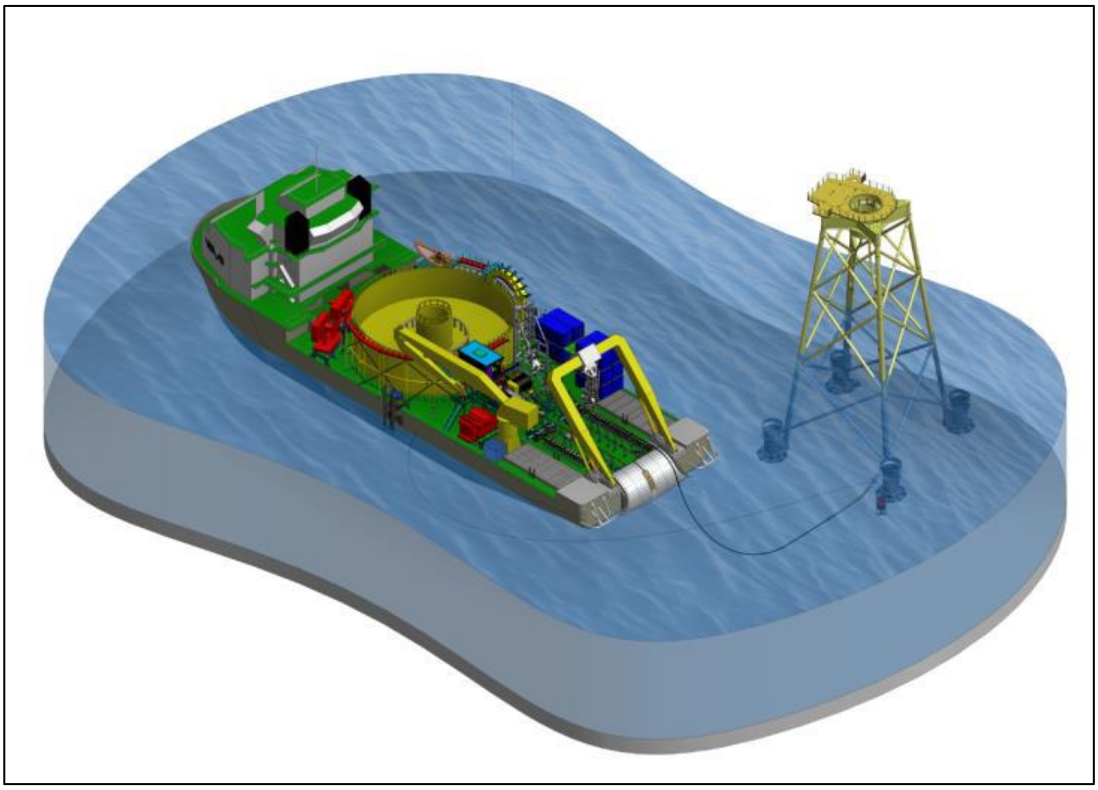
9.3.1 Stage 4 – First end cable pull in

Each first end pull in will consist of a direct transfer of the cable end from the CLV to the jacket (Figure 23). A brief summary of cable first end pull-in operations is provided below:

- Pull-in equipment and personnel will be transferred to the jacket;
- Prior to pull-in, a cable protection system (CPS) (as described in Section10) will be fitted to the cable end on board the CLV. The CPS will provide stability to the cable and protect its integrity both during and post-installation;
- The CLV will recover a pre-installed messenger wire from the jacket which will be attached to a winch wire, and the wire will be winched to the deck of the CLV and connected to the CPS;
- The CLV will then pay out the cable and CPS as the pull-in team on the jacket take in the pull-in winch wire;
- Cable payout from the CLV will continue until the CPS reaches the J-tube bellmouth. J-tubes are steel tubes mounted to the jacket structure that allow the installation of cables by providing a conduit through which the cables can be pulled. The tubes will run from the cable termination points on the jacket down inside the support structure and bend outwards in a ‘J’ shape terminating in a wide bell mouth at the seabed. An ROV could be used to monitor the position of the CPS in relation to the J-Tube bellmouth; and

- When the CPS is orientated correctly, payout from the CLV will continue and the CPS will be latched into the bellmouth. Cable pull in will continue until sufficient overlength is pulled onto the jacket platform.

Figure 23 First end cable pull in



9.3.2 Stage 5 – Cable laying

The cable will then be laid by the CLV away from the J-tube on the first jacket towards the second jacket along the planned Inter-array cable route. The lay speed, vessel speed, cable departure angle and tension will be monitored and checked to ensure the cable integrity is maintained throughout the lay.

On completion of the route length, the end of the cable will then be cut, sealed and prepared for second end installation operations. Cutting will take place on the deck of the CLV. The second end will be temporarily laid down in readiness for pull-in through the J-tube of the second jacket structure.

9.3.3 Stage 6 – Second end cable pull in

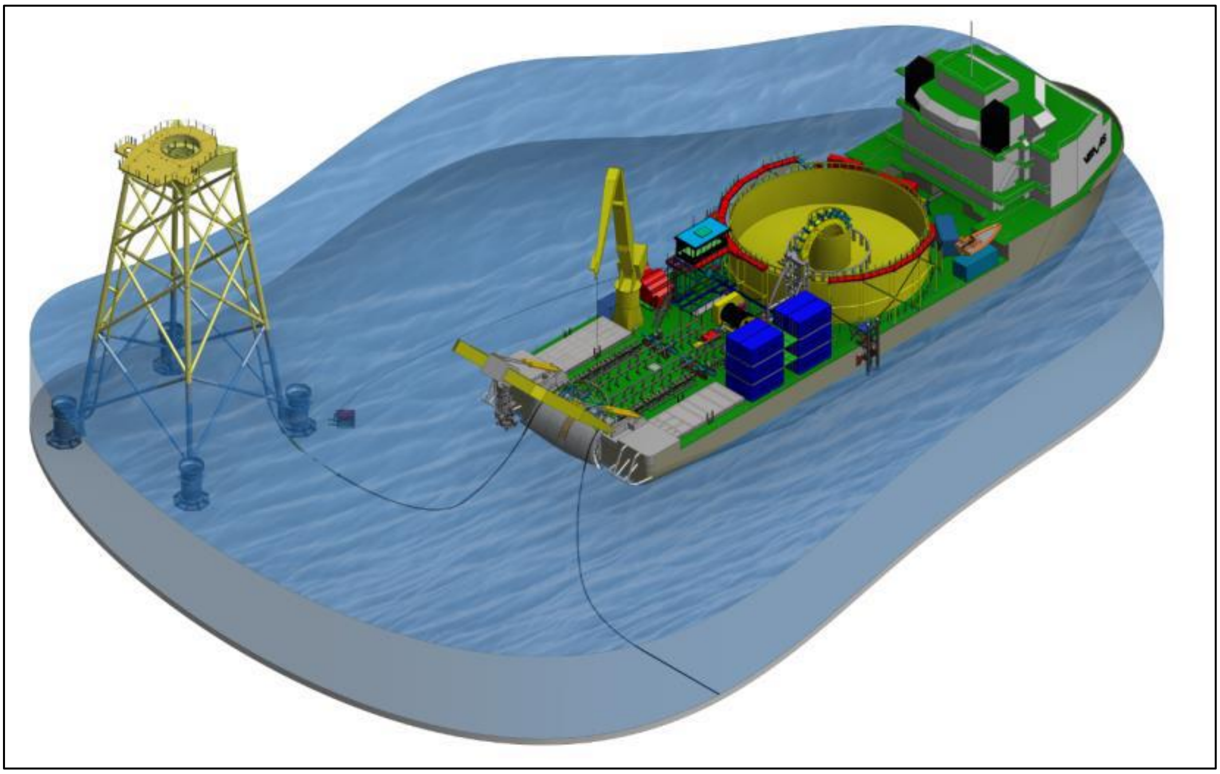
Once the CLV reaches the jacket at the second end, the following procedure will be followed during second end pull-in:

- As with first end pull-in, the pull-in equipment and personnel will be mobilised to the jacket;

- The CPS will be installed on the cut and sealed cable end on board the CLV;
- The CLV will then recover the messenger wire and attach the pull-in winch wire from the second jackets to the cable end. The cable and subsea quadrant will then be passed down the deck and over boarded;
- The cable will be fed into the J-tube bellmouth on the jacket structure and the CPS will be latched into the bellmouth. The subsea quadrant will be lowered as the cable is pulled in to the jacket. Finally, the quadrant will be tilted to lay the cable down on the seabed (Figure 24). The quadrant will then be retrieved and the final bight of cable will be pulled out to the jacket by the winch.

This process will then be repeated for the remaining Inter-array cable lengths, connecting the jackets.

Figure 24 Quadrant at chute



9.3.4 Stage 7 – Post-lay cable burial

The post-lay cable burial techniques for the Inter-array cable installation will be undertaken in the same manner as for the OECs. Section 9.2.7 provides information on the cable burial techniques that will be used. It should be noted that the indicative target burial depth of up to 1.0 m for the Inter-array cables differs from that of the OECs (up to 1.5 m).

10 CABLE PROTECTION PLAN

10.1 Introduction

Condition 3.2.1.7 of the Marine Licence requires that the Cable Protection Plan (CPP) must be submitted in the event that cable protection is required and must include the following details:

> *"The CPP must include surveys that will be undertaken to identify scour protection / armouring works required to protect the cable"*

In relation to the surveys to identify the need for scour protection and armouring works, Section 5 provides a summary of the surveys that have been undertaken to ascertain the need for cable protection for the OECs and Inter-array cables.

The following section provides details of the cable protection that will be installed.

10.2 Cable Protection Requirements

It is the intention to bury all of the OECs and Inter-array cables as described in section 9; burial of the cables will provide the most reliable form of cable protection and the need for additional protection is not currently anticipated along the main cable lengths.

In the unlikely event that the cables cannot be buried to a depth sufficient to provide adequate protection due to, for example, unexpected ground conditions, additional cable protection may be required along those sections where inadequate burial is achieved (in the form of, for example, rock protection or concrete mattressing). In this unlikely scenario, the Licensing Authority will be informed and further details on the proposed additional cable protection would be provided.

Where the cables approach the turbine structures, a close fitting CPS will be installed on the OECs and Inter-array cables between the seabed and the J-tube interface to protect and stabilise the cable (Figure 18). The CPS will consist of articulated split pipes and bend restrictors to protect the cables from dropped objects, current induced fatigue, dynamic wave action, vibration and other local hazards at this interface.

In addition, the OECs will be protected within the pre-installed HDPE or HDD duct from the OTJB, underneath the Blackdog Burn, out to the seaward duct exit point. The target burial depth of the duct will be up to 1.5 m below the seabed with the duct end laid down on the seabed. The section of the duct extruding from the seabed will be protected using either concrete mattresses or rock bags or buried after the installation of the cable using the trenching tool (Figure 19).

11 CABLE OPERATION AND MAINTENANCE

11.1 Introduction

Condition 25 of the S.36 Consent requires that the CLS must include details of the following:

> *"the location, the construction methods, and **monitoring methods** for the grid export cables and cable landfall site"*

The following sections set out the monitoring and inspections that will be undertaken during the lifetime of the Development. The OECs and Inter-array cables will be subject to periodic inspection and remote condition monitoring using a distributed temperature sensing (DTS) system. In the Operation Phase, further cable surveys will be undertaken to confirm that cables remain adequately buried.

11.2 Cable Inspection Procedures

Following installation, an assessment will be completed identifying areas of cable at potential risk of exposure in the future. Monitoring will focus on any 'at-risk' areas identified. Subject to the findings of the surveys, the frequency of these will be adapted to the appropriate level of risk exposure.

11.3 Corrective Actions

In the event of cable failure or exposure, cable sections will be replaced and/or re-buried or cable protection applied. Furthermore, the onshore consent (Aberdeenshire Council Planning Application No. APP/2011/2815) for the project dictates that the cable must be reburied if it becomes exposed on the beach.

12 COMPLIANCE WITH APPLICATION AND ASSOCIATED ADDENDUM

12.1 Introduction

In addition to the conditions presented in Table 1.1, Condition 7 of the S.36 Consent states:

> *"The Development must be constructed and operated in accordance with the terms of the Application and the accompanying Environmental Statement and the Supplementary Environmental Information Statement, except in so far as amended by the terms of the Section 36 consent and any direction made by the Scottish Ministers."*

Section 12.2 sets out how the design parameters of relevance to the CLS complies with the Application, ES, SEIS and Annex 1 of the S.36 Consent letter.

Section 12.3 sets out that the commitments made in the Application, ES and SEIS will be delivered.

Section 12.4 outlines the post-consent consultation that has been completed.

12.2 Compliance with the OECs and Inter-array Cable Installation Details Assessed in the Application, ES and SEIS

The ES and associated Supplementary Environmental Information Statement (SEIS) described a range of specification and layout options that could be applied during the construction and operation of the Development.

Since the S.36 Consent and Marine Licences were awarded, the design of the Development and approach to installation has been substantially refined to that described in this CLS (and in other relevant Consent Plans). In order to demonstrate compliance of this refined OECs design, installation methods and cable specifications described in the ES and associated SEIS are compared to the installation methods and specifications detailed within this CLS (see Appendix A).

Note that AOWFL proposes to use 66 kV cables rather than the 33 kV cables that were described in the ES and SEIS. Section 12.4 provides further detail on the consultation that has been undertaken in relation to this change and specifically in relation to EMF effects.

12.3 Delivery of the Cable Installation Related Mitigation Proposed in the ES

The ES and associated SEIS detailed a number of mitigation commitments relevant to the cable installation activities and operational phase. Appendix B sets out where each commitment has been addressed within this CLS.

12.4 Relevant Post-Consent Consultation

Since the award of the S.36 and Marine Licence, the project design optimisation process has progressed. As a result of this process, AOWFL is now proposing to use 66 kV cables rather than the 33 kV cables that were described in the ES and SEIS.

It is AOWFL's understanding that the 66 kV cables remain within the consented design envelope since the available evidence suggests that EMF field strength is proportional to the current in the conductor cables. The use of 66 kV cables rather than 33 kV cables will reduce the current by a factor of 2 for the same power transmission so that EMF will be correspondingly reduced and the potential impacts on the environment will be no greater than (or less than) those described in the original Application.

Consultation has been undertaken with MS-LOT in relation to the cable specifications. Confirmation has been received from MS-LOT that the 66 kV cables may be considered to lie within the consented envelope and are therefore acceptable (MS-LOT email dated 10/12/15).

13 REFERENCES

Aberdeenshire Council (2011) Onshore Consent Planning Application No. APP/2011/2815.

ABPmer (2016) Aberdeen Offshore Wind Farm. Beach Monitoring Survey (September 2016).

AOWFL (2011) European Offshore Wind Deployment Centre Environmental Statement

AOWFL (2012) European Offshore Wind Deployment Centre Environmental Statement Addendum (SEIS).

EMU Ltd. (2008) Geophysical and Seabed Habitat Assessment of the Proposed Aberdeen Offshore Wind Farm.

Fugro Geoconsulting (2013) Aberdeen Offshore Wind Farm Geotechnical Survey Report.

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Fugro Geoconsulting (2016a) Aberdeen Offshore Wind Farm Geotechnical Survey Report.

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Fugro Geoconsulting (2016c) Aberdeen Offshore Wind Farm Geotechnical Survey Report.

Marine Scotland (2013) Section 36 Consent Granted by the Scottish Ministers to Construct and Operate the European Offshore Wind Deployment Centre (EOWDC) Electricity Generating Station, Aberdeen Bay, Approximately 2 km Eats of Blackdog, Aberdeenshire.

Marine Scotland (2016) Marine Licence for Marine Renewables Construction Works and Deposits of Substances or Objects in the Scottish Marine Area. Reference 04309/16/1.

Osiris Ltd. (2011) Aberdeen Offshore Wind Farm Geophysical Survey Report – Volumes 2a and 2b 2010 CMACS Benthic survey.

SLR (2011) Aberdeen Offshore Wind Farm Intertidal Ecology Survey Report.

SLR (2017) Aberdeen Offshore Wind Farm- Onshore Electrical Cable Route. Ecology Assessment.

APPENDIX A – COMPLIANCE WITH ROCHDALE ENVELOPE PARAMETERS

Table A1 presents a comparison of consented parameters relevant to the cable installation, against the details set out in this CLS.

Table A1 – Comparison of OECs and Inter-array Cable parameters detailed within the ES, SEIS, Marine Licence, S.36 and Marine Licence Application and the parameters detailed within this CLS.

Offshore Export Cable and Inter-array Cable Parameters	Rochdale Envelope Parameters	Parameters as detailed in the CLS
Number of OEC cable trenches	4	2
Maximum length of Offshore Export Cables	26 km	Up to ~8 km
Maximum length of Inter-array cables	13 km	~9.7 km
Maximum cable core cross section of Offshore Export Cables and Inter-array cables	800 mm^2	400 mm^2 , 500 mm^2 or 630 mm^2
Maximum width of cable trench	10 m	Subsea burial tool: ~1 m Dredged trench for duct extension (option): ~8 m
Depth of cable trench	0.6 m -3 m	Indicative target burial depth of up to 1.5m for OECs and 1.0 m for the Inter-array cables.
Maximum number of cables per trench	1	1
Landfall installation method	Horizontal Directional Drilling (HDD) Dredged Cofferdam/ Open trenching Plough pulled off the beach	The following methods are considered as options: 1. Onshore duct, crossing the Blackdog Burn (approx 150 m) and float in 2. Onshore duct (approx 150 m) and duct extension (approx 850 m) 3. Short HDD (approx 260 m) and float in 4. Short HDD (approx 260 m) and duct extension (approx 750 m) 5. Long HDD (approx 1000 m)
Cable burial method	Ploughing Jetting Mass flow excavation	• Cutting and Jetting • Dredging with Backhoe dredger • HDD and Jetting • Mass flow Excavation
Specification of cables	33 kV Alternating Current (AC) cables	66 kV AC cables
Protection method	Burial Concrete mattressing	Burial (with rock bags or concrete mattressing at the seaward end of the HDPE duct). CPS mounted on the cables at the J-tube.

APPENDIX B - COMPLIANCE WITH ES MITIGATION MEASURES

Table B1 presents the commitments made by AOWFL in the ES and associated SEIS to mitigation measures relevant to this CLS.

Table B1 - ES and SEIS Construction-related Mitigation relevant to this CLS

Source and Reference	Details of Commitment	Implementation
ES - Project Description	Cables would be buried in the seabed to a sufficient depth, which would be determined by a burial protection study. Typical burial depths would be in the range of 0.6 m – 3 m.	Indicative target burial depth is up to 1.5 m for OECs and 1.0 m for the Inter-array cables. (Sections 9 and 10 of this CLS.)
ES - Project Description	Cable Installation All the subsea cables would be buried in order to provide protection from all forms of hostile seabed intervention, such as fishing activity (trawler and otter boards), dragging of anchors and the minor risk of dropped objects. The subsea cables are also buried to ensure stability in the tidal conditions and eliminate the risk of free-spans causing cable fatigue.	All cables will be buried where possible. (Sections 9 and 10 of this CLS.)
ES - Project Description	The periodic inspections would be carried out according to the supplier's and Development specifications. The work scope typically includes function and safety tests, visual inspections, analysis of oil samples, inspection of subsea cables and scour protection.	Section 11 of this CLS
ES- Commercial Fisheries	Operational mitigation: Damage to fishing gear/vessels from exposed cables- Cable burial to 0.6 m depth. Implementation and adherence to standard offshore procedures.	Indicative target burial depth is up to 1.5 m for OECs and 1.0 m for the Inter-array cables. (Sections 9 and 10 of this CLS).
ES- Marine and Maritime Archaeology	Avoidance, where practicable, is the preferred mitigation strategy for known cultural heritage assets. Minor amendments to the position of cable trenching and the configuration or placement of the foundation of WTG 8 (now called AWF07) were made prior to the submission of the ES. Best practice and effective monitoring may be partly achieved by implementing the Crown Estate reporting protocol. An Archaeological Plan will be included in the Offshore Environmental Management Plan (OEMP).	Surveys outlined in Section 5 demonstrate commitment to avoid known cultural heritage assets. Amendments to cable trenching position also made prior to ES being submitted. Archaeological Plan to be included in the OEMP.
ES- Salmon and Sea Trout	Cables will be buried	Indicative target burial depth is up to 1.5 m for OECs and 1.0 m for the Inter-array cables. (Sections 9 and 10 of this CLS).