

**Moray Offshore Windfarm (West) Limited  
Wind Farm Cable Plan**



8460005-DBHA10-MWW-PLN-000001

**MORAY OFFSHORE WINDFARM (WEST) LIMITED**

## **Wind Farm Cable Plan**

**Document Name: 8460005-DBHA10-MWW-PLN-000001**

**Revision: 1**

**Status: Final**

**Date: 26-10-2022**

**Moray Offshore Windfarm (West) Limited**  
**Wind Farm Cable Plan**



8460005-DBHA10-MWW-PLN-000001

Version Control				
Revision	Date	Status	Revision Description	Distribution List
0	12-09-2022	Draft	Submission to Moray West for review	Moray West
1	26-10-2022	Final	Submission to MS-LOT	MS-LOT

Document Approval				
Prepared by:	ECoW Review by:	Legal Review by:	Approved by:	Approved by:
Moray West	RHDHV (Anna Sweeney)	Shepherd and Wedderburn (Scott McCallum)	Catarina Rei (Senior Development Manager)	Pete Geddes (EPCI Director)

## Plan Overview

### Purpose and Objectives of the Plan

This Wind Farm Cable Plan (CaP) has been prepared to address the specific requirements of the relevant conditions attached to the Section 36 (S36) consent and Wind Farm Marine Licence issued to Moray Offshore Windfarm (West) Limited.

The overall objective of the Wind Farm CaP is to ensure all environmental and navigational issues are considered for the location and construction of the inter array cables (IACs) and Offshore Substation Platform (OSP) inter-connector cable.

The Wind Farm CaP confirms the location of the IACs and OSP inter-connector cable and methods of installation, burial and protection. It explains how cable routing has been, and will be, informed by survey work that has identified constraints within the Development. The Wind Farm CaP also confirms the anticipated technical specification of the IACs and the OSP inter-connector cable.

All Moray West personnel and Contractors involved in the Development must comply with this Wind Farm CaP.

### Scope of the Plan

In line with the requirements of the S36 consent and Wind Farm Marine Licence conditions, along with industry standards and good practice, the Wind Farm CaP covers the following:

- the location and layout of the IACs and OSP inter-connector cable routes;
- the duration and timings of the licensed activities;
- the results of monitoring or data collection work (including geophysical, geotechnical and benthic surveys) which will help inform cable routing;
- technical specification of IACs and OSP inter-connector cable, including a desk-based assessment of attenuation of electro-magnetic field strengths and shielding;
- IACs and OSP inter-connector cable installation methods including vessel requirements, preparatory works, and cable installation techniques;
- IACs and OSP inter-connector cable burial risk assessment, to ascertain burial depths and where necessary alternative protection measures, and a mechanism for risk-based approach to protection measures where target burial has not been achieved;
- IACs and OSP inter-connector cable burial techniques, including measures to bury and protect cables where target burial has not been initially achieved;
- measures to ensure the remediation, where practicable, of any seabed obstacles created during construction;

# Moray Offshore Windfarm (West) Limited

## Wind Farm Cable Plan



8460005-DBHA10-MWW-PLN-000001

- survey methodologies and planning (e.g., inspection, over trawl, post-lay) for IACs and OSP inter-connector cable through their operational life; and
- measures to address and report to the Licencing Authority any exposure of IACs and OSP inter-connector cable or risk to users of the sea from cables.

### Plan Audience

The Wind Farm CaP is intended to be referred to by personnel involved in the construction and operation of the Development, including Moray West personnel and Contractors. All method statements produced in relation to the Development must comply with this Wind Farm CaP.

Compliance with this Wind Farm CaP will be monitored by the Moray West Development Team, Moray West's Environmental Clerk of Works (ECoW), and Marine Scotland Licensing Operations Team (MS-LOT).

### Plan Locations

The latest version of this Wind Farm CaP can be obtained from Moray West's document management system, Viewpoint For Projects and from the Marine Scotland website<sup>1</sup>. Copies of this Wind Farm CaP are to be held in the following locations:

- Moray West's main project office in Edinburgh;
- With the Moray West Marine Coordinator (MC); and
- with the ECoW(s).

<sup>1</sup> <https://marine.gov.scot/ml/moray-west-offshore-windfarm>

## Table of Contents

1	Introduction .....	10
1.1	Background .....	10
1.2	Objectives of the Plan .....	10
1.3	Linkages with other Consent Plans .....	10
1.4	Document Structure and Control.....	12
1.4.1	Document Structure.....	12
1.4.2	Document Control and Management of Change.....	12
2	Location and Layout of Inter Array Cables.....	14
2.1	Site Investigations and Survey Results.....	16
2.1.1	Site Investigations .....	16
2.1.2	Survey Results .....	18
2.2	Cable Routing and Constraints.....	20
2.3	Routing Constraints.....	20
2.4	Exclusion Zones .....	21
2.5	Route Engineered Locations .....	21
2.6	Route Deviations.....	21
3	Timing of Construction Works .....	22
4	Technical Specification of the IACs and OSP Inter-connector Cable.....	23
4.1	Key Cable Data .....	23
4.2	Cable Components .....	26
4.2.1	Power Cores .....	26
4.2.2	Fibre Optic Data Cable .....	26
4.2.3	Cable Armouring and Outer Sheathing.....	26
4.2.4	Armour Wires and Outer Roving.....	26
4.3	Electromagnetic Fields .....	27
4.4	Cable Protection System Specification .....	28
5	Cable Installation Method.....	29

# Moray Offshore Windfarm (West) Limited

## Wind Farm Cable Plan



8460005-DBHA10-MWW-PLN-000001

5.1	Vessel-Related Requirements .....	29
5.2	Pre-Installation Preparatory Works .....	31
5.2.1	OSP and WTG Preparation .....	31
5.2.2	Pre-Lay Grapnel Run .....	31
5.2.3	Cable Route Pre-Lay Inspection .....	32
5.2.4	Boulder and Debris Clearance.....	33
5.2.5	Third-Party Crossing Preparation.....	33
5.2.6	Unexploded Ordnance .....	35
5.3	Cable Installation .....	35
5.3.1	IACs and OSP Inter-connector Cable Loadout and Transportation .....	35
5.3.2	Cable Installation.....	36
5.3.3	First End Pull In.....	36
5.3.4	Cable Lay .....	36
5.3.5	Second End Pull In .....	37
5.3.6	Post-Installation Survey .....	39
5.3.7	Termination and Testing .....	39
6	Cable Burial and Protection .....	40
6.1	Cable Burial Risk Assessment .....	40
6.1.1	Method .....	41
6.1.2	Sediment Mobility.....	43
6.1.3	Fishing Gear Interaction .....	44
6.1.4	Shipping Anchor Interaction .....	44
6.1.5	CBRA Findings .....	44
6.2	Cable Burial Techniques .....	45
6.2.1	Jet Trenching .....	45
6.3	Cable Protection.....	46
6.3.1	Remedial Protection .....	46
6.3.2	Planned Protection (Non-Trenched Sections) .....	48
7	Operation and Maintenance.....	49

Moray Offshore Windfarm (West) Limited  
Wind Farm Cable Plan



8460005-DBHA10-MWW-PLN-000001

7.1 Ongoing Cable Inspections..... 49

7.2 Overtrawl Surveys ..... 49

7.3 Risk of Scour Locations..... 49

7.4 Further Remedial Actions ..... 49

8 Reporting Measures..... 52

Appendix A – Defined Terms ..... 53

Appendix B – Development Background Information ..... 55

## Abbreviations and Acronyms

Acronym / Abbreviation	Description
AC	Alternating Current
ALARP	As Low As Reasonably Practicable
CaP	Wind Farm Cable Plan
CBRA	Cable Burial Risk Assessment
CLV	Cable Lay Vessel
CMS	Construction Method Statement
CoP	Construction Programme
CPT	Core Penetration Tests
CPS	Cable Protection System
DoC	Depth of Cover
DoL	Depth of Lowering
DDV	Drop Down Video
DSLP	Design Specification and Layout Plan
ECOW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EMP	Environmental Management Plan
FPV	Fall Pipe Vessel
HDD	Horizontal Directional Drilling
HVAC	High Voltage Alternating Current
IAC	Inter Array Cables (inc. OSP interconnector cable)
ISV	Installation Support Vessel
LAT	Lowest Astronomical Tide
MBES	Multibeam Echosounder
MC	Marine Coordinator
MCA	Maritime and Coastguard Agency
MPCP	Marine Pollution Contingency Plan
MS-LOT	Marine Scotland Licensing Operations Team
NLB	Northern Lighthouse Board
NtM	Notice to Mariners
O&M	Operations and Maintenance
OD	Outer Diameter
OEC	Offshore Export Cable
OfTI	Offshore Transmission Infrastructure
OFTO	Offshore Transmission Owner
OMP	Operation and Maintenance Programme
OSP	Offshore Substation Platform



# Moray Offshore Windfarm (West) Limited

## Wind Farm Cable Plan



8460005-DBHA10-MWW-PLN-000001

Acronym / Abbreviation	Description
OSV	Offshore Support Vessel
PAD	Protocol for Archaeological Discoveries
PLGR	Pre-Lay Grapple Run
PSA	Particle Size Analysis
QHSE	Quality, Health, Safety and Environment
RPL	Route Position List
ROV	Remotely Operated Vehicle
S36	Section 36
SBP	Sub Bottom Profiler
SFF	Scottish Fishermen's Federation
SSS	Side Scan Sonar
TI	Transmission Infrastructure
TSV	Trenching Support Vessel
UXO	Unexploded Ordnance
VMNSP	Vessel Management Plan
WTG	Wind Turbine Generators
XLPE	Cross-linked polyethylene

# 1 Introduction

## 1.1 Background

The Moray West Offshore Wind Farm and associated Offshore Transmission Infrastructure (OfTI) (referred to as ‘the Development’) is being developed by Moray Offshore Windfarm (West) Limited (known as ‘Moray West’; see Appendix A for defined terms). Consent for the Development was granted on 14 June 2019 under Section 36 (S36) of the Electricity Act 1989 (as amended), Part 4 of the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 from Scottish Ministers. One S36 consent was granted by Scottish Ministers for the wind farm (012/OW/MORLW-8) and two Marine Licences were granted by Scottish Ministers, one for the Wind Farm and another for the OfTI.

Variations of the S36 consent and Wind Farm Marine Licence were granted by the Scottish Ministers on 7 March 2022, and further variations of the Wind Farm Marine Licence (licence number: MS-00009774) and OfTI Marine Licence (licence number: MS-00009813) were granted on 11 April 2022. The revised S36 consent and associated Marine Licences are referred to collectively as ‘offshore consents’.

Further details of Moray West and the Development can be found in Appendix B.

## 1.2 Objectives of the Plan

Conditions attached to the S36 consent and Wind Farm Marine Licence require the production of a Cable Plan (CaP; Condition 19 of S36 and Condition 3.2.2.16 of Marine Licence MS-00009774).

The purpose of the Wind Farm CaP is to provide supporting descriptions, data, and evidence that the planning for the installation and operation of the Inter Array Cables (IACs) and the Offshore Substation Platforms (OSPs) inter-connector cable within the Moray West Site are in accordance with the required consent conditions.

The relevant conditions setting out the requirement for a CaP for approval, and which are to be discharged by this report, are presented in full in Appendix B.

## 1.3 Linkages with other Consent Plans

The consent condition that requires the development of a CaP does not explicitly identify linkages between this and other consent plans; however, other conditions require consistency with this Wind Farm CaP, and these plans are identified in Table 1.1.

# Moray Offshore Windfarm (West) Limited

## Wind Farm Cable Plan



8460005-DBHA10-MWW-PLN-000001

Table 1.1: Wind Farm CaP linkage with other Consent Plans	
Other Consent Plans	Linkage with Wind Farm CaP
Construction Programme and Construction Method Statement (CoP & CMS)	Specifies the Development's construction programme and construction methods, setting out good practice construction measures and how agreed mitigation measures from the Environmental Impact Assessment (EIA) report, associated documents, consents and those stated within this Wind Farm CaP are implemented during construction. Marine Licence MS-00009744 states the CMS must, so far as is reasonably practicable, be consistent with this Wind Farm CaP.
Decommissioning Programme (DP)	Gives background information on the Development, from the associated effects the decommissioning of the infrastructure will have on the surrounding environment to the current known methods to undertake the decommissioning.
Design Specification and Layout Plan (DSLPL)	Details provided on the design, layout and specifications of the IACs and OSP inter-connector cable.
Environmental Management Plan (EMP)	The EMP sets out the environmental framework for the construction and operation of the Development. It also contains the Marine Pollution Contingency Plan (MPCP) which sets out the procedure should an oil spill occur during construction. The installation and operation of the IACs and OSP inter-connector cable described within this Wind Farm CaP will be undertaken in line with the environmental management measures as described in the EMP.
Wind Farm Operation and Maintenance Programme (OMP)	Sets out the procedures and good working practices for the operation and maintenance (O&M) phase of the Development. Marine Licence MS-00009744 states the OMP must, so far as is reasonably practicable, be consistent with this Wind Farm CaP.
Protocol for Archaeological Discoveries (PAD)	Provides procedures for reporting and investigation unexpected archaeological discoveries found during site investigations and construction.
Vessel Management and Navigational Safety Plan (VMNSP)	Provides the management and coordination of vessels to mitigate the impact of vessels.
Fisheries Management and Mitigation Strategy (FMMS)	The FMMS provide information on mitigation measures to be followed during construction and operation, including a Code of Good Practice for Contracted Vessels and Commercial Fishing Interaction Standard Operating Procedures.

## 1.4 Document Structure and Control

### 1.4.1 Document Structure

The structure of this Wind Farm CaP is provided in Table 1.2.

Table 1.2: Wind Farm CaP document structure		
Section	Title	Summary of Content
1	Introduction	An overview of the Development and its associated consent requirements.
2	Location and Layout of the Cables	Provides information on the site investigation surveys, cable routing and relevant key constraints considered.
3	Timing of Construction Works	Sets out the key construction milestones.
4	Technical Specification of the Cables	Provides details of the cable specifications.
5	Cable Installation Method	Sets out the manner of preparatory works prior to cable installation, cable installation methods management, and coordination, including type and use of vessels.
6	Cable Burial and Protection	Provides a summary of the cable burial risk assessment, cable burial techniques, and information on cable protection methods.
7	Operation and Maintenance	Survey methodologies and planning (inspection, over trawl, post-lay) for the cables through their operational life.
8	Reporting Measures	Measures to address and report to the Licensing Authority any exposure of cables or risk to users of the sea from cables, as well as regular reporting requirements throughout the construction phase of the Development.
Appendix A	Defined Terms	Defines the terms to be used throughout this document.
Appendix B	Project Background Information	Provides detailed information of the Development. Including the construction programme, key stakeholders and legal context associated with the Development.

### 1.4.2 Document Control and Management of Change

This Wind Farm CaP is a 'live document' and will be revised as relevant to ensure the information is kept up to date. Linkages exist between a number of offshore consent plans as highlighted in in Table 1.1. As plans are updated, there will be a review of inter-linkages with other consent plans to ensure these are

## Moray Offshore Windfarm (West) Limited Wind Farm Cable Plan



8460005-DBHA10-MWW-PLN-000001

also updated as relevant. The document is controlled via Viewpoint for Projects, an electronic document management system.

Should there be a reason to modify methodologies brought about during the engineering stages of the project, such changes will be made to this document and resubmitted for approval through the review process. As required by the Marine Licence conditions, any updates or amendments made by the Licensee, will be submitted, in writing, by the Licensee to the Licensing Authority for their written approval.

No later than three months prior to final commissioning of the Development, this Wind Farm CaP will be updated to cover Operations and Maintenance (O&M) activities for the Moray West Offshore Wind Farm to the Scottish Ministers for their written approval. The operational CaP will reflect the working practices and potential environmental management issues set out in the approved Wind Farm Operation and Maintenance Plan (OMP). The updated CaP will focus on the activities associated with the O&M of the Development and incorporate any findings or lessons learned during the construction phase.

## 2 Location and Layout of Inter Array Cables

Figure 2.1 shows the layout of the Development, including the layout of the wind turbine generators WTGs and OSPs. The IACs connect the WTGs in a series of arrays or 'strings' and also provide the connection from the WTGs to the OSP. The OSP inter-connector cable connects the two OSPs together. The full cable arrangement, along with the specifications of the WTGs and OSPs and the location coordinates of each structure, is provided in the DSLP (8460005-DBHA05-MWW-PLN-000001)

This section describes the layout, the location of the IACs and OSP inter-connector cable and the information that has been used to inform cable routing.

# Moray Offshore Windfarm (West) Limited Wind Farm Cable Plan



8460005-DBHA10-MWW-PLN-000001

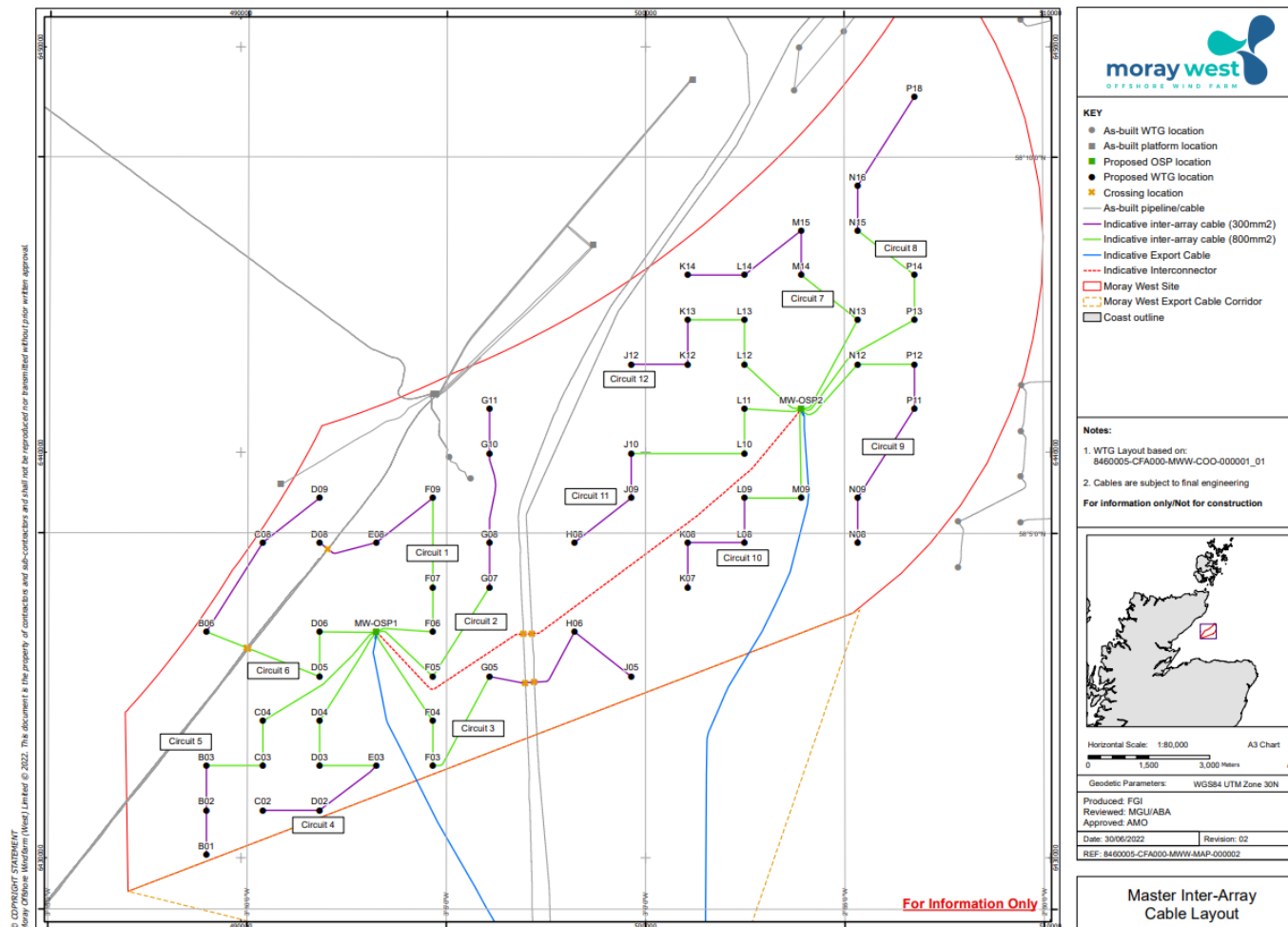


Figure 2.1: Moray West Site, Indicative IAC and OSP inter-connector cable Layout

## 2.1 Site Investigations and Survey Results

### 2.1.1 Site Investigations

A series of site investigation surveys (geophysical, geotechnical, and benthic) have been commissioned by Moray West to understand the seabed and subsurface conditions within the Moray West Site in order to initially define, and then refine the IAC and OSP inter-connector cable routes and determine the most appropriate installation methodologies. A summary of the surveys that have already been carried out, as well as known future surveys are provided in Table 2.1.

Table 2.1: Site investigation surveys (completed surveys and anticipated surveys)		
Survey type	Description	Date
Geophysical	High-resolution swath bathymetric survey, side scan sonar survey, and sub-bottom seismic profiling survey used to inform site development and EIA.	1/04/2010 to 21/05/2010
Geotechnical	25 geotechnical boreholes plus cone penetration tests (CPT) from the Moray Firth Zone used to inform site development and EIA.	2/11/2010 to 14/12/2010
Benthic	Baseline information on the benthic communities within the Moray Firth Zone has been collected using grab samples and drop-down video (DDV). Grab samples were used for particle size analysis (PSA). This was used to inform site development and EIA.	2010 - 2017
Geotechnical	This survey comprised of 2 composite boreholes to depth of 60 m within the wind farm area	2018
Geophysical	The survey comprised of an Multibeam Echosounder (MBES) coverage of the full offshore site with line spacing of 100 m and 6 cross lines.	2019
Geophysical	Seismic coverage with Sub-Bottom Profiler (SBP) and Sparker equipment addressing the grid used to determine WTG locations with spacing of 1400 m (E-W) x 1100 m (N-S) and 4 diagonal lines across the whole site	2019
Geotechnical	42 composite boreholes to a depth of 40 m, 6 composite boreholes to a depth of 60 m	2019



# Moray Offshore Windfarm (West) Limited

## Wind Farm Cable Plan



8460005-DBHA10-MWW-PLN-000001

Table 2.1: Site investigation surveys (completed surveys and anticipated surveys)		
Survey type	Description	Date
	and 52 Seismic CPTs with target depth of 25 m	
Geotechnical	32 drilling seismic CPTs to a depth of 40 m carried out in positions not previously investigated or in positions where the soil profile was originally interpreted with difficulty.	2021
Geotechnical	14 drilling seismic CPTs to a depth between 40 m to 50 m carried out in positions not previously investigated or in positions where the soil profile was originally interpreted with difficulty.	2021
Geophysical	MBES, side scan sonar, SBP, and magnetometer undertaken along indicative inter-array cable routes	2021
Geotechnical	162 vibrocores and 140 CPTs, undertaken along indicative inter-array cable routes	2021
Geophysical	MBES, side scan sonar, SBP, and magnetometer, undertaken along inter-array cable routes (infill survey)	2022
Geotechnical	81 vibrocores and 81 CPTs, undertaken along inter-array cable routes (infill survey)	2022
An unexploded ordinance (UXO) Investigation	UXO specified survey at boxes (300 m x 300 m) centred on each WTG/OSP and safe haven location and a +/- 25 m coverage either side of the inter-array, inter-connector and export cable routes. Survey area shall also include Horizontal Directional Drilling (HDD) pop out area and the export cable route wet store areas.	2022
Pre-Lay Inspection Surveys	Bathymetry (MBES) and side scan sonar investigations of the engineered centreline of each IACs and OSP inter-connector cable route, plus detailed surveys of the crossing point to confirm their status (position and burial). Remotely operated vehicle (ROV) visual survey will also be carried out around the OSPs and WTGs foundation.	July 2023

Table 2.1: Site investigation surveys (completed surveys and anticipated surveys)		
Survey type	Description	Date
Cable Lay – Touchdown Monitoring	ROV video and ROV mounted MBES survey during lay to confirm cable touch down position	February to May 2024
Cable Pull-ins	ROV video monitoring of the entire cable pull-in operations	February to May 2024
Cable Burial - Post Trench Survey	Cable tracking and MBES to confirm as-trenched status	February to May 2024
Pre-Rock Placement Survey ( IACs and OSP inter-connector cable)	Pre-lay rock placement MBES, crossing and remedial trenching areas	June 2024
Post -Rock Placement Survey ( IACs and OSP inter-connector cable)	Post Lay rock placement MBES, crossing and remedial trenching areas. This may include interim surveys to support rock installation operations.	July 2024

## 2.1.2 Survey Results

### 2.1.2.1 Geophysical and Geotechnical Surveys

Water depth over the IACs and OSP inter-connector cable installation area range between approximately 34 m and 53 m LAT (Lowest Astronomical Tide). The shallowest water depths typically occur in the Northeast of the development area and the deeper water depths towards the Southeast. Similarly, a gentle regional scale seabed slope can be noted, in conjunction with this trend from shallower to deeper water from Northeast to Southwest.

Seabed conditions within the IAC and OSP inter-connector cable route corridors are generally flat, or shallowly sloping. In addition to the shallow regional seabed slope, noted in the regional bathymetric trend, localised seabed slopes are also associated with sedimentary bedforms and seabed depressions. These slopes are typically less than 4° to 5° and are localised with limited height. A small number of steeper localised slopes are noted, up to 14°.

Seabed sediments are typically reported to be sandy within the survey documentation, but coarser granular soils, such as sandy gravels, can also be noted in some areas. Localised occurrences of cobbles and boulders can also be expected, with some low to medium density boulder fields identified within the development area. In addition to natural seabed obstructions, such as boulders, additional items of debris have been identified in the survey data.

Shallow soil conditions, for example, as relevant to cable trenching, can be informed by the regional geological setting, which is further validated on a route-specific basis from the geotechnical and geophysical survey activities. The anticipated shallow geological conditions are summarised in Table 2

Table 2.2: Anticipated Shallow Geology			
Soil Unit	British Geological Survey Classification	Geological Setting	Anticipated Soil Conditions
I	Holocene	Surficial Sediments	Loose to Very Dense fine to coarse Sand with localised coarser granular soils, e.g. sandy Gravels.
Ila	Pleistocene	Late Glacial Sediments	Typically, Medium Dense to Very Dense Sand.
Ilb	Pleistocene	Late Glacial Sediments	Sandy Clay, variable strength but typically extremely low to low strength.
III	Pleistocene	Glacial Sediments	Sandy Clay, typically higher strength. (Glacial Till)
IV	Pleistocene	Glacial Sediments	Glacial Till

Soil Unit I is generally present over all cable routes, but this unit has some variability in thickness. For an expected trench depth of approximately 1.0 m to 1.5 m, Soil Unit Ila will often be present. Significantly less common localised occurrences of Soil Unit Ilb can also be expected, and potentially soil Unit III. Soil Unit IV would typically be below the depth of interest for trenching operations.

#### 2.1.2.2 Benthic Surveys

Across the Moray West Site, PSA characterised sediment types as gravelly muddy sand, gravelly sand, (slightly gravelly) muddy sand, sand, sandy gravel, muddy sandy gravel and (slightly gravelly) sand. A large proportion of the EIA survey sample stations were classified as (slightly gravelly) sand which tended to have a relatively small amount of gravel (<5%) typically shell fragment/grit or occasional small stones. These (slightly gravelly) sand sediments showed a degree of spatial variation with stations to the west of the site tending to have a modest mud content (up to 10%) whilst (slightly gravelly) sand sediments further east had very low mud contents (<1%). In general, the north and eastern end of the Moray West Site tended to exhibit more variation in sediments with more mixed or coarser sediments present.

The DDV sampling campaign carried out during the EIA corroborate the PSA findings presented above, which revealed that a large area covering much of the western side of the Moray West Site was characterised by extensive areas of rippled (slightly muddy) sand which are broadly classified as SS.SSa (sublittoral sands and muddy sands). Further west of this, the sandy habitats in the eastern side of the Moray West Site appeared to get progressively sandier with a lower mud content and comprised of rippled sand often with shell grit/debris or occasional stones SS.SSa (sublittoral sands and muddy sands). Five DDV

survey stations within the Moray West Site appeared to have somewhat muddier sands with occasional shell debris or stones but could be generally classified as SS.SSa (sublittoral sands and muddy sands). In some areas of the Moray West Site, primarily in the eastern half of the survey area, a habitat comprising of mixed gravelly sediment was recorded at a number of stations. These habitats comprised of coarse shell gravel and sand with some mud and were often present as areas of gravel 'waves' running through otherwise sandy habitats. In such areas, the troughs of the waves often had muddier mixed sediment with stones and these habitats varied from circalittoral coarse sediments (SS.SCS.CCS) to muddier circalittoral mixed sediments (SS.SMx.CMx).

## **2.2 Cable Routing and Constraints**

The general key principles for cable route design considered by Moray West and the cable installation contractor can be identified as follows:

- The shortest or most efficient path between different offshore assets (WTGs and the OSPs);
- Avoidance of all identified exclusion zones;
- Avoidance of infrastructure (where possible). Where avoidance is not possible, minimise number of third-party asset crossings;
- Consideration of all the constraints that bound the cable route such as the UXO clearance corridor, anomalies identified by geophysical and geotechnical surveys, large debris, etc;
- Avoidance of shipping anchorages (if identified);
- Reduction in the number of alter courses (curves in route) to reduce installation time, and cable damage risk;
- Operational consideration of a minimum cable straight distance (150 m) from the structure exit positions before any route alters course;
- Consideration of constraints regarding operational limitations of trenching equipment (e.g. seabed slope, offset distances, turning radius);
- Achieving target depth of lowering and depth of cover (with consideration of natural seabed mobility characteristics of a given site) to minimise the amount of mechanical protection required; and
- Consideration of fishing activities and methods in the wind farm site including a review of historical data (Section 6.1.3).

## **2.3 Routing Constraints**

The eastern boundary of the Moray West Site abuts the Moray East Offshore Wind Farm and the Beatrice Offshore Wind Farm and Repsol Sinopec Beatrice Oil & Gas Field to the North of the Moray West Site.

Constraints regarding the proximity of the IACs and OSP inter-connector cable to the offshore export cable (two) routes from OSPs towards shore are also considered and adequate spacing is incorporated to prevent interaction and elevated risk during construction and operation.

## **2.4 Exclusion Zones**

There are several identified disused (plugged and abandoned) oil and gas wellheads located in the Moray West Site. These have been considered and avoided during IAC and OSP inter-connector cable route design and they are outside of IAC and OSP inter-connector cable corridors.

It should be noted that there are 500 m exclusion zones applicable around the bridge-linked Beatrice Alpha Drilling (Beatrice AD) and Beatrice Alpha Production (Beatrice AP), tied to the Wind Turbines A and B, located within the north of the Moray West Site. Furthermore, there are 500m exclusion zones applicable around the Beatrice Bravo (Beatrice B) and Beatrice Charlie (Beatrice C) platforms located outside to the north of the Moray West Site. Note, it is understood that Wind Turbines A and B shall be decommissioned within the next 5 years.

## **2.5 Route Engineered Locations**

The planned cable route positions are identified in Figure 2.1. The finalised cable routes will be provided to mariners and Marine Scotland as a part of the Notice to Mariners. Upon the outcome of further engineering works and surveys, minor modifications to the Route Position List (RPL) and protection of the IACs and OSP inter-connector cable may be proposed; however, these are not likely to result in significant changes to this Wind Farm CaP. As described within Section 1.4.2 above, this Wind Farm CaP will be reviewed in case of significant changes in the information provided. The final as built cable route details for the IACs and OSP inter-connector cable will be provided to Marine Scotland in line with the Wind Farm Marine Licence condition.

## **2.6 Route Deviations**

During construction, unforeseen circumstances or previously unidentified hazards could result in minor route deviations, these would typically be within the cable survey and UXO clearance corridors. As such, large deviations (greater than +/- >25 m) from the planned routes are not foreseen.

In addition, the cables will be routed in such a way as to minimise the anticipated amount of remedial rock protection required. Analysis of the pre-construction site investigation data will provide the required information to be able to microsite the IACs and OSP inter-connector cable routes. The routes will be further micrositied using data collected during the pre-lay surveys.

### 3 Timing of Construction Works

The program for the offshore construction works of the Wind Farm is described within the CoP and CMS.

Construction works for the IACs and OSP inter-connector cable will be undertaken as detailed in Table 3.1 (based on the program at time writing this document). Full details of the construction programme are provided in the CoP and CMS.

Table 3.1: Summary of key milestone dates of the IAC construction works.		
Operation	Time period	Description
Boulder / Debris Clearance	April 2023	Relocation of boulders and debris from the cable corridors to allow cable lay and trenching activities
Pre-Installation Survey	July 2023	MBES and Side Scan Sonar (SSS) survey of the engineered RPL, and confirmation of depth of burial of existing assets at crossing points etc.
Pre-Lay Grapnel Run (PLGR)	August 2023	Removal of linear debris, ropes, chains wires which may be over the route and not generally detectable by other means.
Cable Lay	February – June 2024	Lay and Trenching of array cables
Mattress Installation (at cable/pipeline crossings)	February 2024	Installation of any pre-lay construction items required to construct the crossings e.g. rock bags, concrete mattresses, etc.
Cable Testing and Terminations	March – June 2024	Testing and Terminations of Array cables
Cable Trenching	June 2024	Trenching of array cables
Rock Placement	July 2024	Post installation rock placement of the crossings

## 4 Technical Specification of the IACs and OSP Inter-connector Cable

### 4.1 Key Cable Data

The Array Cable System connects the WTGs in a series of arrays or ‘strings’ and also provide the connection from the WTGs to the OSPs. The OSP inter-connector cable connects the two OSPs together. The cables are all 66 kV high voltage alternating current (HVAC). The cables will initially be laid on the seabed by the Cable Lay Vessel (CLV) before being buried via Jet trenching to a target Depth of Lowering (DoL) to meet the minimum DoL required by the cable burial risk assessment (CBRA) (see Table 6.2). Where cables cannot be buried due to seabed conditions or other constraints, they will be physically protected. The Design Envelope for IACs and OSP inter-connector cables is presented in Table 4.1.

The IACs and OSP inter-connector cable comprise of three conductor cores assembled together with one fibre optic cable to allow control and communications between the offshore assets. Two different cable types will form part of the IAC strings to improve electrical losses whilst optimising cable cross section and size.

The IACs and OSP inter-connector cable are expected to comprise two cable sizes, a smaller 300 mm<sup>2</sup> cross sectional area cable with an overall outer diameter of 138 mm, and a larger 800 mm<sup>2</sup> cross sectional area cable with an overall outer diameter of 172 mm. The size of the cable between two assets is determined by the amount of power the cable is required to carry, with the smaller of the cables installed towards the end of the strings and the larger of the cables installed towards and connecting to the OSPs. The 300 mm<sup>2</sup> cable is expected to cover a length of 50 km in the site, and the 800 mm<sup>2</sup> cable is expected to cover a length of 81.8 km (including the OSP interconnector cable).

The three conductor cores and the fibre optic cable will be bundled together and protected by an armour wire layer that will include an outer protective coating to complete the IACs and OSP inter-connector cable.

Table 4.1: IAC and OSP inter-connector cable design parameters	
Parameter	Design Basis
System operating voltage	66 kV
Maximum system voltage	72.5 kV
Operational frequency	50 Hz
Lifetime expectancy (minimum)	25 years
Max. conductor temperature at normal operation	90°C



Table 4.1: IAC and OSP inter-connector cable design parameters	
Design load factor	Static and dynamic
Power factor $\cos\phi$ (OSP)	0.95
System fault current – 3-phase to ground / Duration	18.01 kA / 1 s
Cable circuit specification	3-core cable, most likely with integrated fibre optics
Number of Array Cable Circuits	13 (12 strings + 1 Interconnector)
Array Cable length	300mm <sup>2</sup> – 50 km 800mm <sup>2</sup> – 81.8 km (67.4 km + 14.4 km interconnector) Combined total – 131.8 km

A cross section of the 300 mm<sup>2</sup> Array Cable can be seen in Figure 4.1. The cross section of the 800 mm<sup>2</sup> Array Cable can be seen in

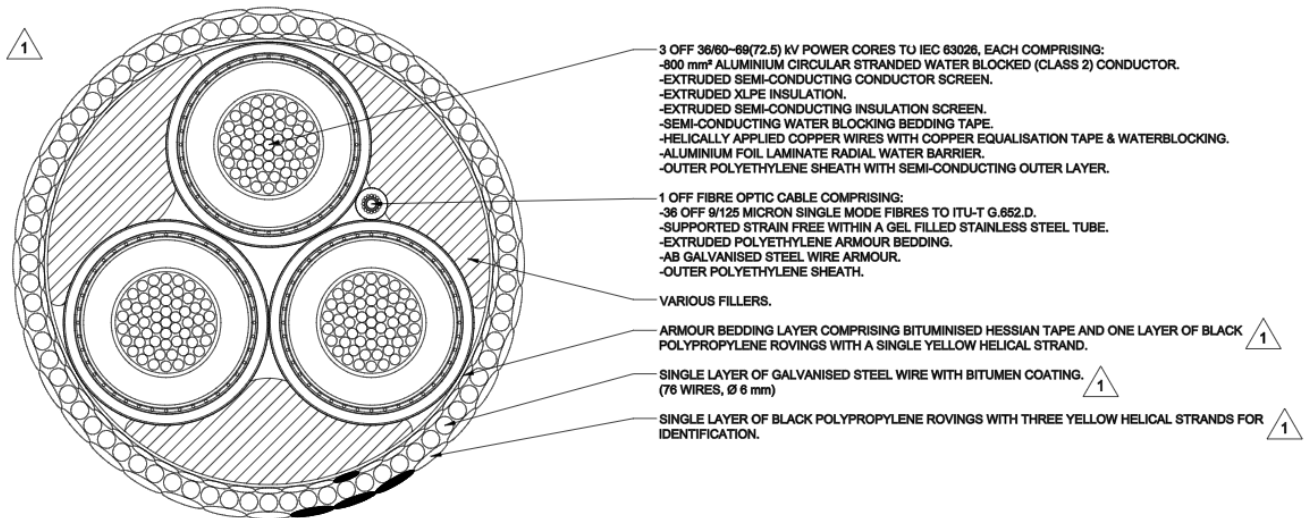


Figure 4.2.



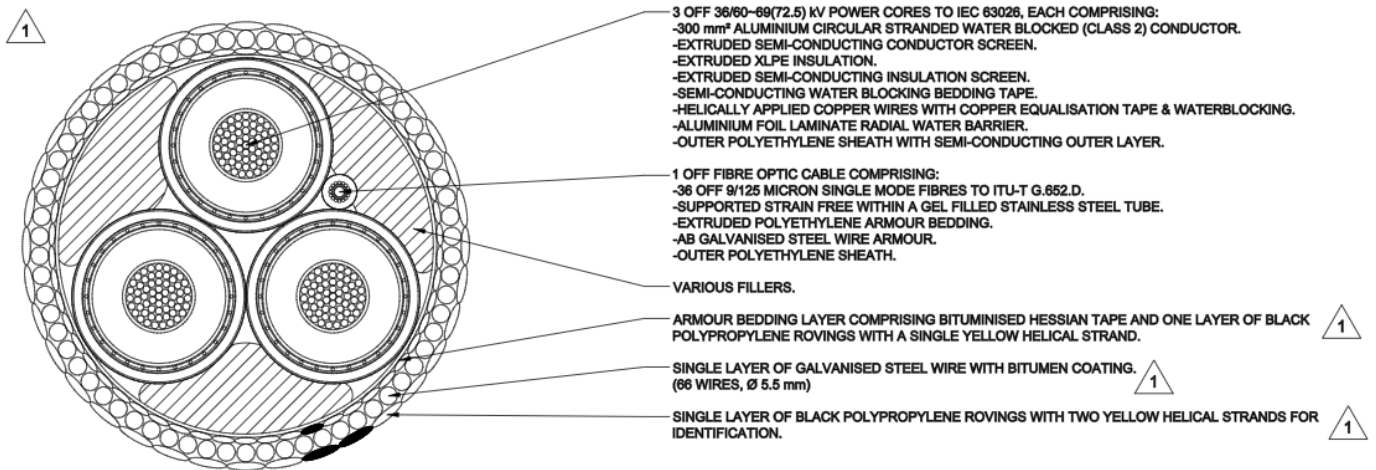


Figure 4.1: SUBMARINE CABLE – Cross section drawing of the 300 mm² Array Cable

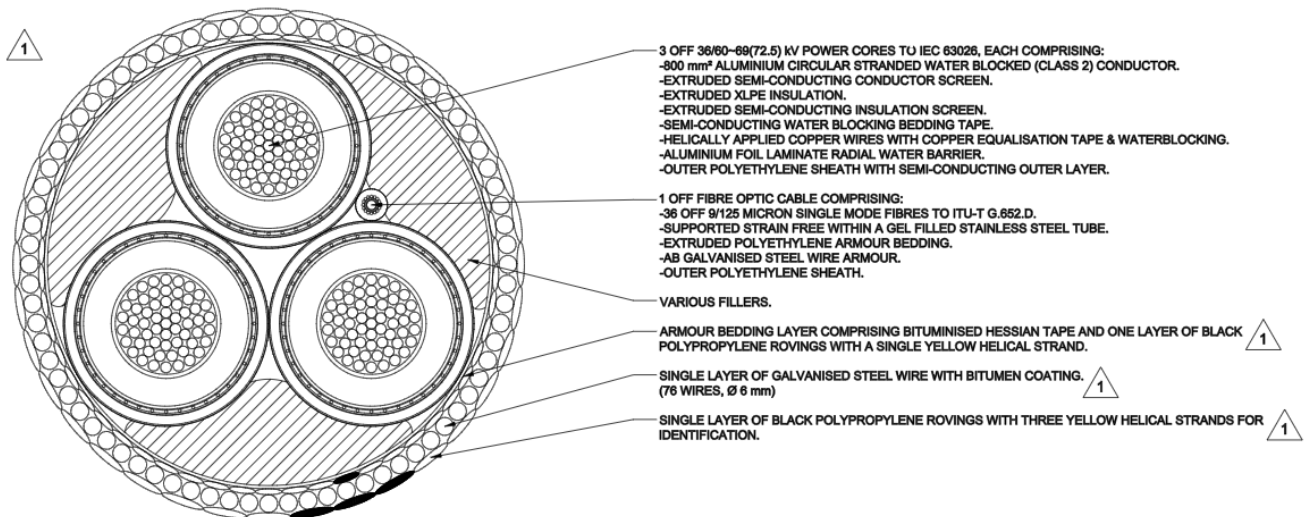


Figure 4.2: SUBMARINE CABLE – Cross section Drawing of the 800 mm² Array Cable

Table 4.2 provides key data for the two different types of cables discussed above.

Table 4.2: Key cable data		
Parameter	300 mm²	800 mm²

Table 4.2: Key cable data		
Current rating in seabed at 1.5m depth (Thermal Resistivity of Seabed: 0.9K.m/W)	472 A	736 A
Conductor material	Aluminium	Aluminium
Approx. weight (in air)	26.27 kg/m	40.99 kg/m
Approx. weight (submerged)	13.44 kg/m	20.42 kg/m
Cable outer diameter	138 mm	172 mm

## 4.2 Cable Components

### 4.2.1 Power Cores

The submarine cable has three conductor cores made of stranded aluminium wires laid up into a compacted circular configuration. The power cores are longitudinally water-blocked to prevent penetration of seawater into the conductor in case of damage to the cable.

The cores will be insulated with cross-linked polyethylene (XLPE), which has high dielectric strength, low dielectric constant, high insulation resistance and low water absorption.

### 4.2.2 Fibre Optic Data Cable

The IACs and OSP inter-connector cable will be bundled with a fibre optic cable which will provide the necessary communications and control capabilities. The fibre optic cable consists of a minimum of 36 single mode fibres.

### 4.2.3 Cable Armouring and Outer Sheathing

The cable armouring consists of layers of bituminised hessian tape and polypropylene rovings, which provide a bedding to a single layer of galvanized steel wire. The armour wires provide external mechanical protection, weight and strength, as well as providing burst resistance due to the magnetic forces generated during short circuits in the cable.

The outer sheathing contains bitumen and polypropylene rovings to provide outer protection to the cable. The sheathing is black with a coloured helical stripe for identification.

### 4.2.4 Armour Wires and Outer Roving

The outer cable layer consists of steel armouring wire with covering rovings. The armouring wires provide mechanical protection and the required structural capacity to handle and install the cables. The rovings provide environmental protection to the steel wire as well as providing identification of the cable type by coloured stripes.

### 4.3 Electromagnetic Fields

This section summarises the results of an electromagnetic field (EMF) desk-based assessment carried out by Cable Consulting International Ltd on behalf of Moray West on the attenuation of electromagnetic fields associated with the IACs and OSP inter-connector cable.

The calculations were based on the cable design provided by one of the prospective cable suppliers under consideration by Moray West: three-core, 66 kV, XLPE insulated, 800 mm<sup>2</sup> aluminium conductor, with steel wire armour. As the 800 mm<sup>2</sup> conductor cable is designed to carry the highest current of all IACs and OSP inter-connector cable, and dimensional details have been supplied by the prospective cable supplier, the study of this cable's EMF is considered to be a representative worst case for this and similar cables manufactured by all prospective cable suppliers under consideration by Moray West.

Calculations have been performed assuming a single cable carrying a balanced, steady state load current of 960 A. No consideration of external influences such as other cables, pipes or nearby metallic structures has been included. The below is subject to refinement during detailed engineering and once the IACs and OSP inter-connector cable supplier has been nominated.

The depth of lowering is equivalent to the distance between the mean seabed level and the top of the cable. For the scenario where rock berms are used to cover surface laid cables, the maximum EMF strength would be equivalent to that calculated for a similar cable depth of lowering, afforded by the thickness of rock cover from the top of the cable.

Table 4.3: Maximum EMF strength for the Hellenic 800 mm <sup>2</sup> IACs and OSP inter-connector cable design				
Measurement height above seabed (m)	Cable Depth of Lowering (m)			
	Surface laid	0.5	1.0	2.0
	EMF (μT)	EMF (μT)	EMF (μT)	EMF (μT)
0	872	39.45	12.38	3.51
5	0.63	0.62	0.61	0.53
10	0.15	0.15	0.15	0.15

For context, a reference magnitude of the earth's magnetic field at the Moray West Offshore Wind Farm location and from sea level to maximum water depth the geomagnetic total field is estimated as 50.67±0.145 μT.

The minimum DoL of the as-built cables will be greater than 0.5 m following taking over of the cables by Moray West, therefore the EMF values in the 0.5 m column can be considered the maximum likely EMF from installed cable, which is less than the reference of the earth's magnetic field.

#### 4.4 Cable Protection System Specification

A cable protection system (CPS) will be designed, procured and installed on each cable end. Its purpose is to protect the cable where it is in a free span zone, from the structure cable entry point and into full burial. In this zone, the cable is affected by dynamic environmental loads (waves and current). The CPS protects the cable from these loads and also provides impact protection. The design consists of polyurethane, cast iron, and polymer elements (Figure 4 below).

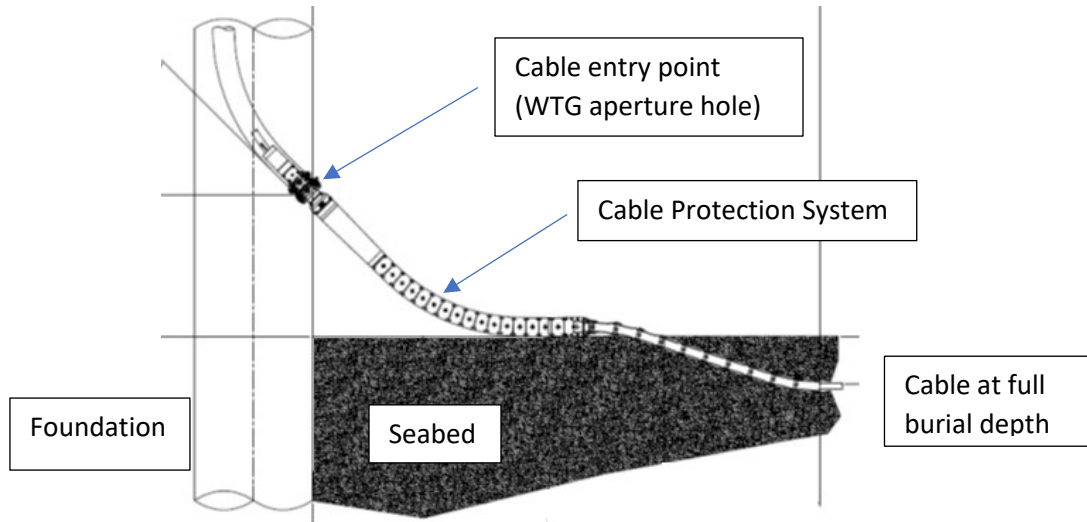


Figure 4.3: Cable Protection System

## 5 Cable Installation Method

### 5.1 Vessel-Related Requirements

Table 5.1 presents the main construction vessel types and their role in the IACs and OSP inter-connector cable installation campaign. All vessels to be used during all IACs and OSP inter-connector cable installation activities will adhere to the VMNSP and, at least five days prior to vessel engagement, the details of the vessel are provided within the Vessel Report. Further details on this procedure can be found within the VMNSP.

Table 5.1 Main IAC and OSP inter-connector cable installation vessels	
Vessel Type	Role
Cable Lay Vessel (CLV)	Cable delivery from cable factory to site. Pre-lay surveys of cable route Cable laying and touch-down point monitoring
Trenching Support Vessel (TSV)	Jet Trenching, Mattress Installation and Boulder Clearance (OPTION)
Rock Placement Vessel	Crossing installation and remedial cable protection.
Installation Support Vessel (ISV)	Transfer of personnel to the OSPs and WTGs for site preparations, pull-in operations as well as termination and testing.
Offshore survey vessel (OSV)	Pre- and post-lay surveys.
Pre-lay Grapnel Run Vessel (PLGR)	Pre Lay Grapnel Run

Figure 5.1 provides an example CLV (Seaway Aimery) that is proposed to be used for the IAC and OSP inter-connector cable installation.

Figure 5.2 provides an example ISV (Seaway Moxie) that is proposed to be used for the IAC and OSP inter-connector cable installation CLV support work.

Figure 5.3 provides an example TSV (Siem Barracuda) that is proposed to be used for the IAC and OSP inter-connector cable trenching operations.



# Moray Offshore Windfarm (West) Limited Wind Farm Cable Plan



Figure 5.1: Seaway Aimery



Figure 5.2: Seaway Moxie



Figure 5.3: Siem Barracuda

## 5.2 Pre-Installation Preparatory Works

Prior to the installation of the IACs and OSP inter-connector cable, a series of works will be carried out in preparation to facilitate successful cables installation, these are described in the sections below.

### 5.2.1 OSP and WTG Preparation

Prior to cable installation, the OSPs and WTGs are prepared for cable pull-in in such a manner so as not to delay the cable lay vessel upon its arrival. Messenger lines will be passed through the installed J-tubes on OSPs and the aperture holes on WTGs, pull-in equipment fitted, tested and set up offshore. On the OSPs, the J-tube ends will be covered and will remain capped until shortly before cable pull-in operation commence.

### 5.2.2 Pre-Lay Grapnel Run

A PLGR will be conducted to remove linear seabed surface debris along the IAC and OSP inter-connector cable routes. Seabed surface debris can include items such as fishing gear, chains, wires and ropes, etc located along the routes. A PLGR will be carried out along the centreline of each route prior to cable installation procedures. PLGR will be performed approximately along the proposed IAC and OSP inter-connector cable routes from the WTGs to the OSPs; practical limitations apply with respect to approach to existing infrastructure (e.g., crossings) and planned structures.

The PLGR will be carried out by towing a grapnel train similar to that shown in Figure 5. using a suitable vessel such as an anchor handling tug or offshore installation vessel. During the tow, the tension in the wire holding the grapnels will be monitored at all times. A steady rise in tension is normally an indication



that the grapnel has engaged with debris. The grapnels will then be recovered, and debris removed. Recovered debris will be stored onboard and disposed in a suitable manner at the next port of call. The penetration of the grapnel into the seabed will be approx. 0.5 m deep. If debris is located deeper than this, the debris will not be recovered.

As the grapnel interacts with the top approximately 0.5 m of the seabed, it is proposed to perform the PLGR before the pre-lay route inspection to ensure the pre-lay route inspection captures the position of any boulders or debris dislodged from the seabed.



Figure 5.4: Example of a typical PLGR train

### 5.2.3 Cable Route Pre-Lay Inspection

Pre-lay inspection surveys of the IAC, OSP inter-connector and cable crossings will be carried out to ensure that the cable lay areas are free from any debris or hazards that can damage the cables. The surveys will be carried out using an MBES, and, where required, side scan sonar and a visual inspection using an ROV. The MBES survey will be carried out approximately six months in advance of cable installation; this will allow time to acquire high resolution data and to give the engineering time required to review the survey data and evaluate the need for any route adjustment. The ROV visual inspection surveys of the OSPs J-tubes and WTGs apertures will be carried out just prior to cable installation by the CLV or another suitable vessel.

The pre-lay surveys will also identify if there are any boulders or debris present along the IAC and OSPs inter-connector cable routes, that require relocation ahead of cable lay operations.



#### 5.2.4 Boulder and Debris Clearance

Where boulders and debris are present, they may need to be relocated by a grab or plough methodology where they will subsequently be relocated outside the IAC and OSP inter-connector cable routes.

Moray West shall complete a boulder clearance campaign in spring/summer 2023 for the wind farm site including the cable corridors.

Following completion of the IAC and OSP inter connector cable routes pre-lay inspection described above, a final listing of residual boulder and debris to be relocated from the route will be developed. Either the IAC Contractor or Moray West directly will undertake further boulder and debris clearance works. Depending on the setting and the density of boulders this may take place via the following methods (Figure 5.):

- The primary method considered is boulder / debris grab for isolated / individual boulders and/or boulder fields; or
- A secondary boulder ploughing for boulder fields (with consideration not to create additional seabed obstacles with new berms).



Figure 5.5: Example of a boulder grab system (left) and typical boulder clearance plough (right).

#### 5.2.5 Third-Party Crossing Preparation

A total of seven third-party crossings have been identified;

- Three crossings of a disused Repsol Oil pipeline
  - 2x between B06-C05 WTGs
  - 1x between D08-E06 WTGs
- Four crossings of the Beatrice Offshore Wind Farm Export Cables
  - 2x along OSP interconnector
  - 2x between G05-J05 WTGs

A sketch of an indicative crossing design that will ensure separation from the existing asset is shown below:

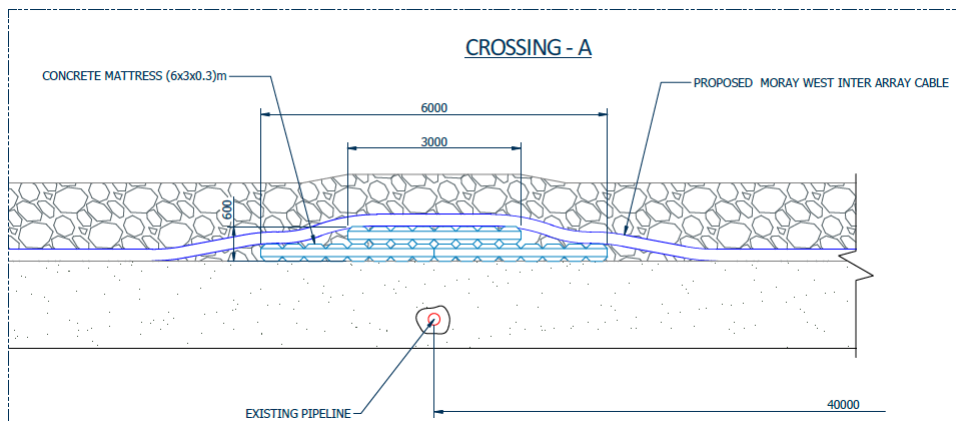


Figure 2.6: Indicative cable crossing design of third party asset

The position of the third-party cables will be confirmed during the pre-lay survey; this survey will also establish the status of the as-installed protection in terms of DoL and Depth of Cover (DoC) at the proposed crossing locations.

Depending on the as-found condition of the seabed at the proposed crossing locations, it may be required to install measures to guarantee the physical separation between the third-party asset and the Moray West IACs and OSP inter-connector cable. Typically, these pre-lay works comprise installation of rock bags, sandbags or concrete mattresses (Figure 5.7). If the seabed is specifically challenging, then it may be required to install pre-lay rock placement.

Following completion of the installation and post-installation of mechanical protection, a suitable survey e.g., visual inspection, MBES and/or cable tracking survey will be performed to confirm the specifics of the crossing construction requirements in compliance with the third-party crossing agreements.



Figure 5.7: Example of a concrete mattress

### 5.2.6 Unexploded Ordnance

A UXO geophysical survey will take place between July and November 2022. Prior to start of construction activities, a UXO clearance programme will be undertaken between November 2022 and March 2023 following a UXO inspection and identification campaign in October and November 2022. Therefore, the risk of discovering previously unidentified UXO will be reduced to as low as reasonably practicable (ALARP). However, in the event of a UXO discovery, the Contractors shall inform the Marine Coordinator immediately, who will in turn contact the Quality, Health, Safety and Environment (QHSE) Manager and Moray West Development Team.

Moray West will consult with, and engage, a recognised, competent UXO disposal company for the safe handling and disposal of any UXO.

## 5.3 Cable Installation

During the IAC and OSP inter-connector cable installation operations, notifications to other mariners will be provided by way of Notice to Mariners (NtM), information to Sea Users Bulletins (Kingfisher Bulletin), publication on the Moray West webpage and communications with the local port authorities. Guard vessels will also be present from the start of cable lay to the satisfactory completion of cable protection works to warn other mariners about the installation operations in progress and to protect the installed cables and other users for the sea. Further details on this can be found within the VMNSP.

### 5.3.1 IACs and OSP Inter-connector Cable Loadout and Transportation

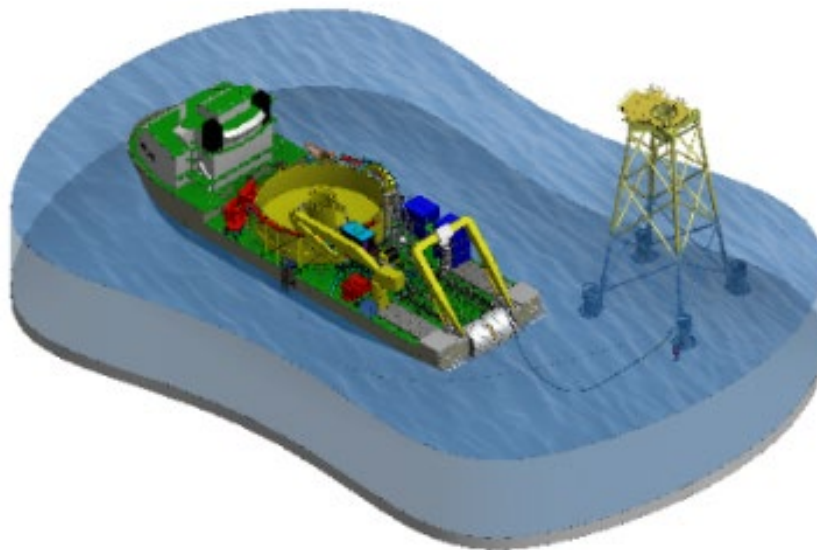
Load-out of the cables onto the CLV will be performed at the agreed cable manufacturers' load out site. The cables load out will follow project specific procedures to carefully monitor the cable and to ensure that the mechanical limits of the cable is not exceeded.

### 5.3.2 Cable Installation

The installation sequence of IACs and OSP inter-connector cable will be completed on a circuit by circuit. The installation support vessel will work ahead of the cable lay vessel and the pull-in teams, who will set-up the pull-in equipment and prepare each WTG foundation structure or OSP for cable installation.

### 5.3.3 First End Pull In

The cable lay vessel will set-up stern to the foundation. The pull-in wire is transferred from the foundation to the cable lay vessel deck and the pull-in winch is brought to deck and connected to the cable first end, including the CPS. The cable end is overboarded and pulled into the foundation entry point. The CPS will dock into the foundation entry point, the cable is then pulled up into the foundation cable deck. A clamp is fitted to secure the cable end. The vessel will move off from the structure and lay cable on the seabed. (Figure 5.8 below).



*Figure 5.8: First end cable pull-in and vessel laying away (illustrative image only; note that Moray West utilises monopile foundations, not jacket foundations)*

### 5.3.4 Cable Lay

The cable will be laid along the defined cable design route with the cable shape and tension monitored throughout by ROV and the deck tensioner read out (Figure 5.9 below).

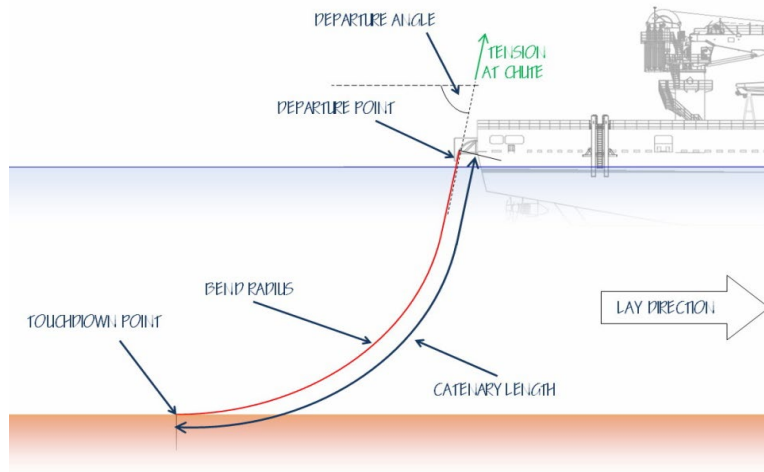


Figure 5.9: Cable Lay parameters

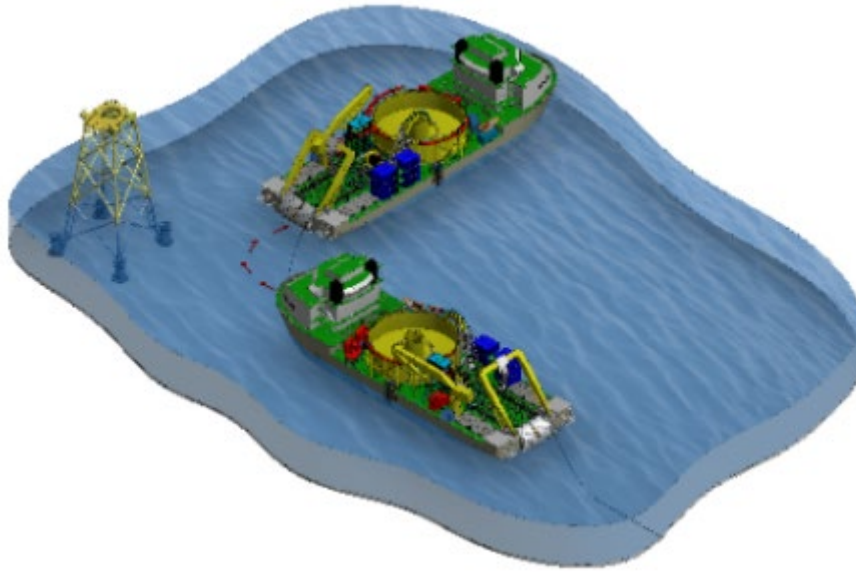
### 5.3.5 Second End Pull In

On approach to the second foundation, the CPS will be assembled on the cable lay vessel deck. The pull-in teams will be transferred onto the WTG or OSP foundation and pull-in winch set-up and preparations shall be completed. The key operations are:

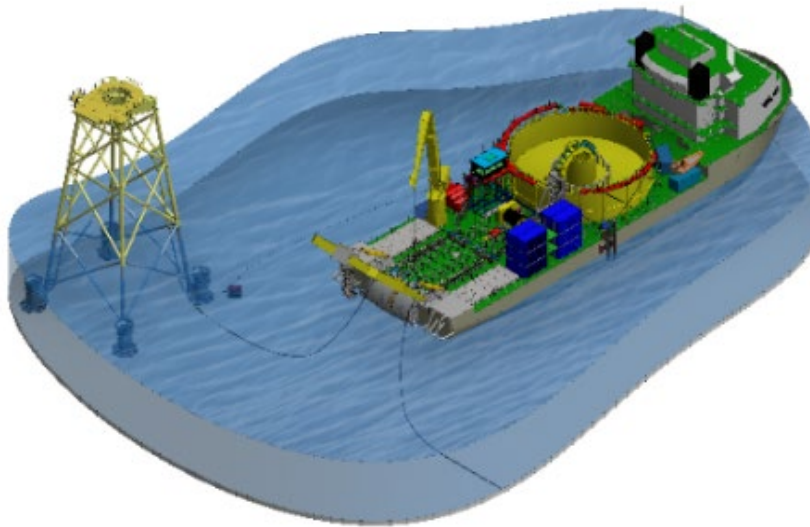
- Calculate the required remaining cable length;
- Position the vessel at  $\sim 90^\circ$  to the cable approach into the foundation (Figure 5.10 below);
- Cut and seal the cable end;
- Transfer the pull-in winch wire to the vessel deck;
- Move the cable down the deck and overboard using the vessel crane (Figure 5.11 below);
- Pull in the cable into the foundation whilst lowering the cable to the seabed (Figure 5.12 below);
- Complete the docking of the CPS into the foundation entry point and pull the cable up to the foundation deck;
- Secure the cable in the hang off clamp; and
- Prepare the cable for termination and testing.



# Moray Offshore Windfarm (West) Limited Wind Farm Cable Plan



*Figure 5-10: Lay vessel second end approach to structure (illustrative image only; note that Moray West utilises monopile foundations, not jacket foundations)*



*Figure 5-11: 2<sup>nd</sup> End pull-in and cable quadrant overboarding (illustrative image only; note that Moray West utilises monopile foundations, not jacket foundations)*





*Figure 5-12: Cable and Cable Handling quadrant lowered to seabed prior to release (illustrative image only; note that Moray West utilises monopile foundations, not jacket foundations)*

### 5.3.6 Post-Installation Survey

The position of the cable is determined by touchdown monitoring during cable lay from CLV. The final position of the cable (after trenching) will be determined by means of a post-installation survey, carried out by using an ROV, moving along the cable route and recording the horizontal and vertical position of the cable relative to the seabed. This shall be performed from the cable burial vessel using an ROV fitted cable tracker system and MBES, and where remedial rock placement works are required, this will be performed from the Fall Pipe Vessel (FPV) using MBES coupled with the as-trenched data.

### 5.3.7 Termination and Testing

Post installation, the cable pulled into the structure will be stripped back. The three-phase individual cable power cores and the fibre optic bundle are split out. The permanent hang off assembly is fitted to the OSPs, and WTGs topside platform flange and cable armour wires are secured to the structure to support the cable weight.

The individual cable cores are then routed through the foundation and terminated with a connector into the electrical switch gear. All accessories and cable elements are earthed to the foundation where required.

After termination, post installation electrical and optical testing is completed to verify there are no defects or damage in the cable system.

The complete inter-array and OSP inter-connector cable system is then handed over for energisation of the cable network.

## 6 Cable Burial and Protection

This section provides an overview and summary of the cable burial risk assessment undertaken to identify potential threats to the IACs and OSP inter-connector cable and inform burial depths (DoL and DoC) to mitigate, or reduce to an acceptable level, the risk from these threats. This section then sets out the proposed cable burial techniques and protection, informed by Cable Burial Risk Assessment (CBRA) and the anticipated soil conditions.

The overall strategy for the protection of the cables is comprised of two elements as detailed in Figure 6- below.

Protection of the cable from the exit point of the structure is provided by the CPS. The CPS is partially buried to the required depth by the post lay burial method using jetting and / cutting or burial tools. The cable is then buried to the required depth of lowering for the remainder of the cable route.

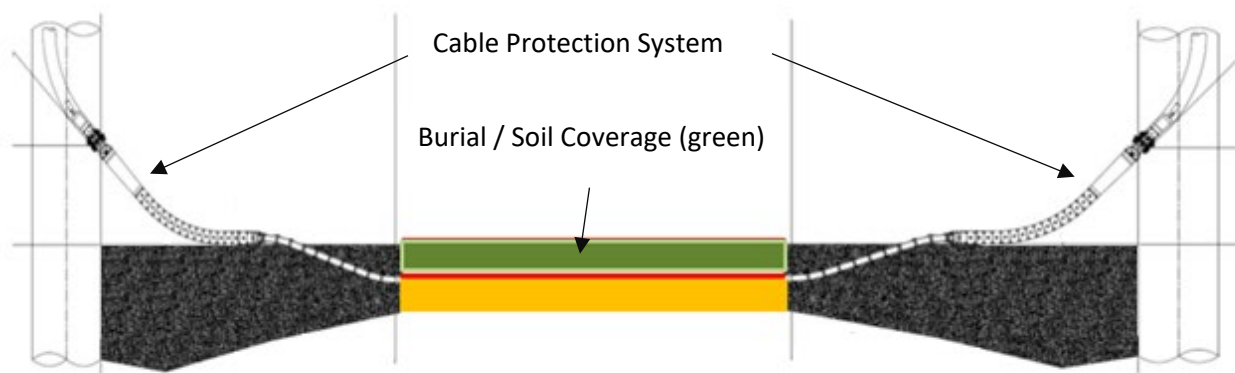


Figure 6-1: Typical cable protection strategy

### 6.1 Cable Burial Risk Assessment

The CBRA is a risk assessment undertaken to consider all credible hazards to the IACs and OSP inter-connector cable and the level of protection afforded by cable burial. Cable burial is considered as a combination of DoL below mean seabed level (MSBL) and the DoC over a cable (see Figure 6.2).

This CBRA was performed on the basis of the latest site investigation survey results, reported in early 2022. However, it can be noted further survey data is currently being collected to account for IACs and OSP inter-connector cable layout changes. Within this context, the CBRA will be updated, and potentially refined, when this additional data becomes available.

Depending on the outcome of the trenching operations, the CBRA may also be updated once the cable has been trenched and as-installed DoL and DoC data is available. This would be undertaken with the objective to minimise, and optimise, the requirement of any remedial rock protection, in areas where difficulties in trenching may have impacted the achieved DoL, or DoC.

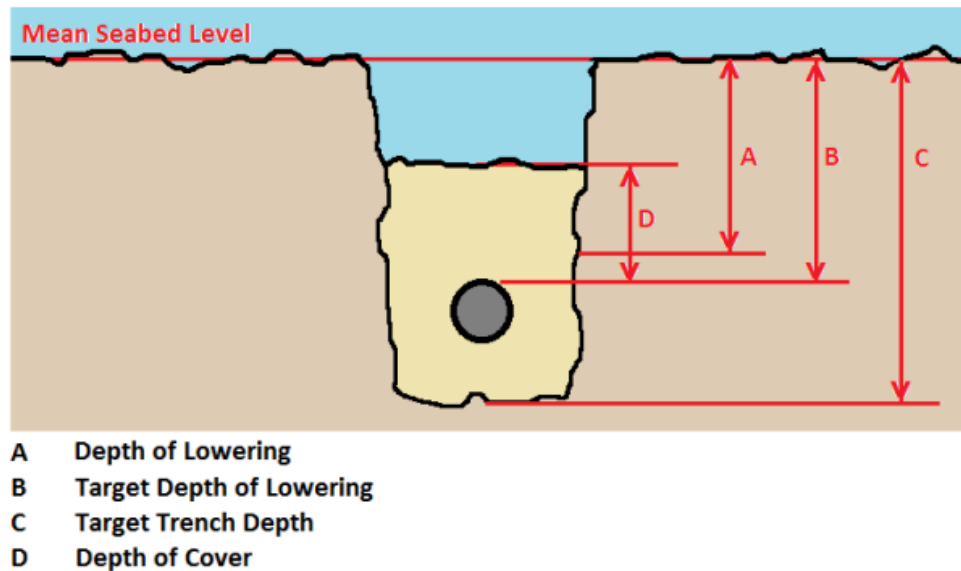


Figure 6.2: Trenching specification terminology including DoL (taken from Carbon Trust (2015))

### 6.1.1 Method

The basis for the risk assessment addressing IACs and OSP inter-connector cable is the identification of the credible potential hazards, and associated risks, and evaluating the level of protection that may be afforded to the cable by burial beneath the seabed. Where trenching is not practical, such as at crossing locations or the final approach to WTG or OSP locations, other means of protection such as rock placement, or concrete mattresses, can be adopted.

The CBRA assesses the soil conditions along the IAC and OSPs inter connector cable routes, identifying hazards to the cables. The CBRA method adopts the general principals within the following guidance:

- Carbon Trust (Feb 2015). Cable Burial Risk Assessment Methodology, Guidance for the Preparation of Cable Burial Depth of Lowering Specification. ([www.carbontrust.com/resources/cable-burial-risk-assessment-cbra-guidance-and-application-guide](http://www.carbontrust.com/resources/cable-burial-risk-assessment-cbra-guidance-and-application-guide); accessed September 2022)
- Carbon Trust (Dec 2015). Application Guide for the Specification of the Depth of Lowering using the Cable Burial Risk Assessment (CBRA) Methodology. ([www.carbontrust.com/resources/cable-burial-risk-assessment-cbra-guidance-and-application-guide](http://www.carbontrust.com/resources/cable-burial-risk-assessment-cbra-guidance-and-application-guide); accessed September 2022)

# Moray Offshore Windfarm (West) Limited

## Wind Farm Cable Plan



8460005-DBHA10-MWW-PLN-000001

- DNV (2021). Subsea Power Cables in Shallow Water, Recommended Practice, DNVGL-RP-0360 ([www.dnv.com/energy/standards-guidelines/dnv-rp-0360-subsea-power-cables-in-shallow-water.html](http://www.dnv.com/energy/standards-guidelines/dnv-rp-0360-subsea-power-cables-in-shallow-water.html); accessed September 2022).

The following steps are taken within a CBRA:

1. Seabed and subsurface conditions are assessed, with consideration given to seabed soils and shallow geology, along with the associated geotechnical properties for these soil conditions. Seabed gradients, water depth for trenching operations, seabed features that may impact trenching operations, and cable crossings are also reviewed.
2. An integrated ground model is prepared within GIS, including detailed analysis and soil categorisation in support of the CBRA.
3. Threats and hazards are identified and assessed. This review addresses natural hazards to the cable, such as seabed sediment mobility, and anthropogenic hazards, such as fishing and commercial shipping. The approach uses the available shipping/fishing data to identify vessel details and frequency of movements across the proposed IACs and OSP inter-connector cable area.
4. Identification of risks to the cable are assessed in more detailed framework, either through a probabilistic approach, where applicable and/or data quality permits, or through a deterministic or qualitative approach.
5. Development of a cable threat assessment.
6. Minimum DoL and DoC levels are recommended to mitigate the risks identified within the CBRA to an appropriate level. As an example, the DoL requirements are assessed by determining the anchor penetration for the range of expected vessel sizes and a cumulative probability of strike that is within an acceptable probability (or acceptable return period). For fishing a deterministic DoL and DoC framework is typically adopted.
7. Recommendations for additional cable protection, where applicable.

Hazards are categorised into primary and secondary hazards, to be considered in undertaking a CBRA. A primary hazard is defined as a hazard (i.e., an activity or seabed condition which has the potential to cause harm) that presents a direct risk to the cable. A secondary hazard is one which, although not able to directly damage a cable, results in an increased risk of damage from primary hazards. For example, seabed scour that exposes a cable to subsequent damage from fishing activity.

Table 6.1 summarises the principal primary and secondary hazards expected for the IACs and OSP inter-connector cable routes, as considered in a CBRA.

Table 6.1: CBRA summary, principal primary and secondary hazards		
Hazard type	Hazard description	Risk
Primary Hazards		

Table 6.1: CBRA summary, principal primary and secondary hazards		
Hazard type	Hazard description	Risk
Fishing	Damage from impact snagging or hooking of the cable.	Fishing activity over proposed cable.
Shipping / vessel anchoring	Damage from dragged or dropped anchors.	Vessel anchoring in an emergency scenario.
<b>Secondary Hazards</b>		
Sediment mobility	Leading to cable exposure, freespan, and exposure to primary hazards.	Suitable granular sediment, energetic wave / current regime.

Fishing activity is expected to be the principal primary hazard to the proposed IACs and OSP inter-connector cable routes. While some controls, such as charting of cables, will act as a mitigation, burial or protection of the cables by other means such as rock placement, CPS, etc, is expected to be required over the full length of all cables.

The shipping density, and arising emergency anchoring hazard to the cables, is expected to be relatively low within the IACs and OSP inter-connector cable routes. However, some consideration of burial, or other protection measures, is expected to have a beneficial risk reduction effect.

The principal secondary hazard is sediment transport, based on the IACs and OSP inter-connector cable routes setting, survey data, water depth range, etc.

On the approaches to the OSP, the DoL specification for general hazard protection is likely to be suitable. However, DoC requirements may need to be increased to provide additional dropped object protection due to the slight increased likelihood of dropped objects in and around the OSP.

### 6.1.2 Sediment Mobility

There is some evidence of minor sediment mobility, such as small bedforms noted in the multi-beam bathymetric data. The water depth range and the presence of granular soils also suggests sediment mobility as potential secondary hazard to the cables. However, in general, nearby engineering studies, such as for the export cables and knowledge of the seabed from the neighbouring Moray East project, suggests a relatively benign sediment transport regime within the Moray Firth .

While not expected to be significant, a nominal allowance for scour within DoL specification is expected to be a useful risk reduction measure. As the IACs and OSP inter-connector cable routes scope progresses into detailed engineering, a route specific scour study may be used to refine this scour allowance.

### 6.1.3 Fishing Gear Interaction

Due to the presence of fishing activity within the Moray Firth, fishing gear interaction is expected to present the greatest risk of damage to the cables. Within the CBRA this has been considered within a deterministic assessment framework, accounting for the anticipated seabed and shallow soil conditions and the expected behaviour of the fishing equipment e.g. penetration of fishing equipment into the seabed.

The granular soils expected within the IACs and OSP inter-connector cable routes are generally favourable to providing protection from fishing equipment interaction, with a maximum penetration expected to be < 0.3 m below MSBL. Within a deterministic framework, a slightly conservative safety factor of 2 can be assigned to account for repeated fishing at the same location, suggesting a requirement for a minimum DoL of 0.6 m. For a slot shaped trench, which provides additional protection to the cables, a nominal DoC is expected to be suitable, in conjunction with DoL requirements. This combination of a narrow trench geometry and nominal cover, draws on the protective benefit of the DoL requirement, while providing a small amount of dropped object protection from fishing equipment.

### 6.1.4 Shipping Anchor Interaction

It is typically not practical to provide absolute protection from emergency anchoring activities, in particular protection from the large anchors deployed from larger commercial shipping. A probabilistic approach is often adopted, to reach an acceptable risk level for a proposed IACs and OSP inter-connector cable routes.

Shipping density within the IACs and OSP inter-connector cable routes is general low. The early engineering CBRA indicated that even when no DoL is provided the risk to the IACs and OSP inter-connector cable are not especially high. Within this context, DoL requirements for anchoring can be pragmatically considered against the protection provided by the DoL levels required for other hazards, for example the primary hazard represented by fishing. Within this context it has been noted that a DoL of 0.6 m represents a significant risk reduction from anchoring, reducing the risk from the smallest anchors associated with recreational and commercial shipping.

### 6.1.5 CBRA Findings

To protect against fishing the CBRA recommends a minimum DoL requirement of 0.6m and a nominal DoC of 0.2 m to 0.3 m, where protection is also provided by the trench geometry. Anchoring risk is generally low, and a high degree of protection is provided from anchor risk by adopting the minimum requirements of DoL of 0.6 m to mitigate against fishing related risks. Thus, the CBRA concludes the composite risk for all the hazards identified is significantly reduced when a **DoL of 0.6 m** is applied.

A nominal additional allowance for scour may be required, subject to refinement during detailed engineering. Within the expected granular soils the DoC arising from the trenching process is expected to exceed the nominal requirements of 0.2m DoC, with additional potential for further deposition of cover, post-installation.



On the approaches to the OSPs dropped object risk should be accounted for. Further to the DoL of 0.6m to protect against other factors, a DoC requirement should be considered. Typically, this is expected to be in the region of a DoC of 0.5 m, subject to refinement as detailed engineering is progressed.

The CBRA findings are summarised in Table 6.2 below:

Table 6.2: CBRA Findings for Wind Farm Site and OSP Approaches		
	Depth of Lowering (DoL) (m)	Depth of Covering (DoC) (m)
Wind Farm Site	0.6	0.2
OSP Approaches	0.6	0.5

## 6.2 Cable Burial Techniques

The IACs and OSP inter-connector cable layout feature a variety of soils, but conditions are expected to be dominated by granular soils at shallow depth, typically sands. Less commonly, localised presence of lower strength clays may occur, and potentially some higher strength clays. The presence of coarse granular soils, including boulders can also be expected, albeit a boulder removal scope is planned to mitigate the presence of surface boulders.

The proposed cable burial technique needs to account for the anticipated soil conditions and the DoL and DoC requirements discussed in the previous sections, as determined in a CBRA.

### 6.2.1 Jet Trenching

Jet trenching is a commonly used post-lay trenching technique. Jetting based trenching equipment uses low pressure, high volume, water jets directed into the seabed from a series of nozzles contained within jet legs. Following cable lay, post-lay trenching, the jet trencher engages the jet legs either side of the cable, lowering the cable with a combine of soil transportation and soil fluidisation. Soil cover is also established during trenching, due to the cable sinking through fluidised soil, or deposition and trench wall collapse.

Jet trenching is expected to be the primary method of trenching for the IACs and OSP inter-connector cable. This trenching technique performs well in sandy soils and lower strength clays. Trenching performance may be degraded in areas of gravel and potentially impacted by the localised presence of boulders and, or, higher strength clays. Figure 6.3 below shows an example of a jetting tool which may be used to bury the IAC and OSP inter-connector cables at Moray West.



Figure 6.3: LDT ROVJET 1200

### 6.3 Cable Protection

The CBRA has identified the DoL and DoC at which threats to the cable are mitigated to an acceptable risk level. The results of the CBRA will also be used to inform likely locations that will require additional protection, and type of protection at these locations

If the cable protection being used, e.g. rock placement, reduces the navigable depth to more than 5% (referenced to chart datum), then agreement will be sought, in writing, by the Licensing Authority in consultation with the Maritime and Coastguard Agency (MCA) and Northern Lighthouse Board (NLB).

#### 6.3.1 Remedial Protection

Where DoL and DoC cannot be achieved during installation, additional means of protection such as the use of rock berms and, or, concrete mattresses will be employed. The final achieved (i.e., as-built) burial profile for the IACs and OSP inter-connector cable will be provided by the cable installation contractor once cable installation and post-lay survey have been completed.

The final route and trenching engineering for the IACs and OSP inter-connector cable routes is currently ongoing. The primary method of cable protection will be trenching with supplementary rock placement on the sections of cable route where trenching is not possible, including the third party asset crossings, the final approaches to the OSPs and WTGs, and trench transition areas. The latest route survey data indicates that for some sections of the proposed IACs and OSP inter-connector cable routes where

trenching is proposed, there is a potential requirement for remedial cable protection, such as rock placement to supplement partial protection by trenching.

At the identified DoL, the use of a jet trencher is considered to be suitable for the majority of soil conditions encountered and remedial rock protection would typically not be required. The use of mechanical cutting is not yet confirmed, however, there may be the possibility of the use of mechanical cutting in areas where jet trenching is not suitable, or where jet trenching performance could be detrimentally impacted. This will be confirmed during engineering design.

Geophysical and geotechnical data available to date suggest that some remedial rock protection will be required within areas proposed for trenching. This rock placement is not expected to be very extensive, or comprise a significant proportion of the cable route length, however, this will be clarified upon review of survey results (e.g., 2021 and 2022 data) and when the CBRA is updated following completion of cable trenching to account for the actual cable burial depth and risk levels. The installation contractor shall determine any requirements for rock placement for transitions in and out of burial as part of their cable trenching engineering plan.

Whilst detailed engineering is to be completed, it is anticipated that, where required, the rock placement will comprise a typical North Sea rock berm design with nominally 1 to 3 in slopes, 1 m crest width and a height which varies depending on the DoL up to 1.0 m excluding tolerances. Where the cable is partially buried, the berm height can be reduced to provide the equivalent mechanical protection over the cable design life. Figure 6 provides an example schematic of a typical offshore rock berm.

**"Offshore Rock Berms"**

Typically 1-5"  
rock grade >40m

2-8" and 3-9" in  
shallower water  
<40m

Crest width = 1m

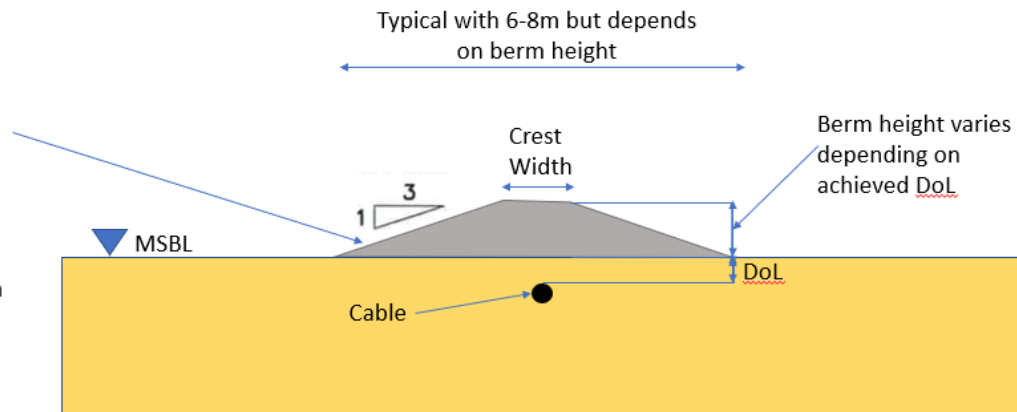


Figure 6.4: Example schematic of a typical offshore rock berm

In order to optimise the amount of rock placement, Moray West may perform a post-installation CBRA on the as-installed IACs and OSP inter-connector cable routes. Where the cable is installed deeper than the target depth, it is possible to use this benefit to recompute the probability of 3<sup>rd</sup> party interaction using

the CBRA method as long as an absolute minimum DoL and DoC is achieved and overall reliability levels for the cable system are maintained.

### **6.3.2 Planned Protection (Non-Trenched Sections)**

There are a number of planned locations requiring rock, concrete mattress and/or other alternative protection methods. These are as follows:

- At the third-party crossings it may be required to install measures to guarantee separation between the two assets. Measures may include the use of rock bags, sandbags or concrete mattresses and would be installed as pre-lay items, placed over the third-party asset with the Moray West IAC and OSPs inter connector cables laid on top. The Moray West IACs and OSP inter-connector cable will then need to be further protected using rock protection and, or concrete mattresses. The extent of each cable crossing is subject to detailed engineering and the third party crossing agreements.
- It is expected that each IACs and OSP inter-connector cable from the OSPs and WTGs will require a cable protection system (CPS) where the cable approaches the OSP bellmouths and WTG apertures. CPSs, which may be used alone or in combination with other protection methods, are effectively protective polymer or steel sleeves (cast-iron half shells) which are installed around the cable to provide equivalent mechanical protection. CPS will interact with the trenching across the OSPs/WTGs foundations and will be inside the J-tube on OSPs or aperture holes on WTGs.

Where an alternative cable protection solution is used that is not covered by the licensed deposits on the OfTI Marine Licence, these will be subject to approval of an additional Marine Licence or variation to the existing Marine Licence.

## **7 Operation and Maintenance**

Once the Development is fully operational, a programme of cable or seabed surveys will be undertaken to confirm that cables remain buried and fully protected.

### **7.1 Ongoing Cable Inspections**

Prior to completion of installation, a full set of as built documentation will have been obtained as the baseline for the as-built condition of the IACs and OSP inter-connector cable. Post-construction surveys will be undertaken shortly after installation, to determine the as-built conditions. These as-builts will consist of survey data for all aspects of the lay and burial and include updated charts and acceptance tests. In addition, ROV footage of the seabed will be collected during the laying and specific other aspects of the installation of the cables.

The IACs and OSP inter-connector cable will also be subject to periodic inspections. An initial MBES survey for specific sections identified through a risk-based assessment will be undertaken approximately 1-year post-installation to confirm the cables remain buried. The frequency and scope of further monitoring will be proportionate to the risk of future cable exposure and determined based on comparisons with the initial post-installation survey results and subsequent surveys.

### **7.2 Overtrawl Surveys**

For areas where the minimum DoL and DoC is not achieved during cable installation with jet trenching (and therefore remedial protection has been installed), and where high level of fishing activity occurs and where substantial lengths of IACs and OSP inter-connector cable require mechanical protection, Moray West will be required to provide methodologies to undertake targeted overtrawl surveys. The appropriate methodologies will be discussed with the local fishing industry and agreed with the Licencing Authority. Moray West will liaise with the Scottish Fishermen's Federation (SFF) and are committed to discuss the methodologies for overtrawl surveys with fishing stakeholders. Once as-built information is available, this can be provided for review. Following the review of the as-built information, Moray West will discuss the scope and timings of overtrawl trials, should they be required.

### **7.3 Risk of Scour Locations**

Where scour development is anticipated to occur, rock placement shall be installed at the base of WTGs or OSPs foundations, which will be required at all 62 locations (60 WTG and 2 OSP). This shall prevent the development of scour pits at these locations and hence the chance of cable exposure over time. Scour allowances may also be incorporated into DoL requirements for areas of trenching.

### **7.4 Further Remedial Actions**

Should the post-installation MBES surveys identify that the IACs and OSPs inter-connector cable have become locally exposed, experience a significant reduction in burial depth, or in the event of cable failure, cable sections will be inspected to determine the full extent of the exposure or failure.

An assessment will be undertaken to determine the risk posed by the exposed cables to other sea users and to the Development. Where the risk is unacceptable, remedial action will be undertaken to ensure the cable is adequately protected. The following measures may be considered:

- cable reburial, placement of rock bags, rock armour or suitable alternatives, at the relevant locations to mitigate cable movement / migration; and
- placement of rock along the length of exposed cable and merging into areas of adjacent burial or pre-existing rock placement.

If a fault occurs on the subsea portion of the route, the following actions will be taken:

1. First notification of cable damage – the cable repair contractor and relevant third parties and authorities will be notified by way of Notice to Mariners (NtM) and information to Sea Users Bulletins (Kingfisher Bulletin).
2. Initial fault location – if any damage is identified, it is essential to be able to locate the relevant area (rough position) early, to be able to determine what kind of repair spread will be required. Fault location equipment is assumed to be readily available.

All remedial work will be undertaken immediately after mobilisation and on a continuous 24/7 basis until operations are fully completed. Following the repair, the cable will be tested prior to demobilisation. Following reinstatement of the IAC, it may be required to install remedial protection as described above upon issue of a Marine Licence from Marine Scotland Licensing Operations Team (MS-LOT) for the deposits required.

#### **7.4.1.1 Replacement of a Section of Cable**

Typically, a quantity of cable equal to three to four times the water depth will be used for limited cable damage. This estimate is dependent on several factors and the specifics of the repair including potential water ingress of the cable.

An overview of the procedure to cut out a section of cable and insert a new piece using two cable joints is presented below:

1. The repair vessel will uncover the damaged section. The cable may be exposed using a jetting tool and/or mass flow excavation.
2. The cable will be cut either side of the damaged location.
3. The cable repair vessel will then recover the first end of the cable to be repaired.
4. A cable joint will be used to connect the replacement section of cable to the cut end of the recovered cable.
5. The second end of the cable to be repaired will then be recovered. This end of the cable will be connected to the other side of the cable repair section using a second cable joint.



## Moray Offshore Windfarm (West) Limited Wind Farm Cable Plan



8460005-DBHA10-MWW-PLN-000001

6. The repaired cable will then be lowered to the seabed. The cable repair section will result in a bight (loop) at the repair location.
7. The cable will then be re-buried using the most appropriate burial tool or protected using rock protection.

# Moray Offshore Windfarm (West) Limited

## Wind Farm Cable Plan



8460005-DBHA10-MWW-PLN-000001

## 8 Reporting Measures

Table 8.1 below provides the opportunities for sharing and communicating information to MS-LOT on matters relating the IACs and OSP inter-connector cable, including reporting any exposure of cables or risk to other users of the sea from the cables.

Table 8.1: Reporting opportunities	
Reporting Pathway	Summary of Content
As-built report	Moray West will provide by way of Notice to Mariners (NtM) and information to Sea Users Bulletins (Kingfisher Bulletin) the proposed, and as-built locations of the areas where remedial rock placement is required to the fisheries stakeholders, MS-LOT, and NatureScot in the form of maps and coordinates, as soon as these become available.
Environmental Clerk of Works (ECoW) monthly and quarterly reports	The ECoW will be reporting on a monthly and quarterly basis, the progression of construction to MS-LOT. This will include construction activities relating to the installation of the IAC and OSP inter-connector cable, including any issues that may arise.
Survey results	Moray West will submit the results of any geophysical, geotechnical and benthic surveys to MS-LOT.
Overtrawl survey reporting	On completion of the overtrawl survey, a report summarising the results of the survey will be provided to MS-LOT.

# Moray Offshore Windfarm (West) Limited

## Wind Farm Cable Plan



8460005-DBHA10-MWW-PLN-000001

### Appendix A – Defined Terms

Term	Description
Design Envelope	The range of design parameters used to inform the assessment of impacts.
Marine Licence for the Generating Station	Marine Licence for the Moray West Offshore Wind Farm - Licence Number: MS- MS-00009774 - granted under the Marine and Coastal Access Act 2009, Part 4 Marine Licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area granted to Moray West on 14 June 2019, varied on 7 March 2022 and on 11 April 2022.
Marine Licence for the Transmission Works	Marine Licence for the Offshore Transmission Infrastructure – Licence Number MS-MS-00009813 – granted under the Marine and Coastal Access Act 2009, & Marine (Scotland) Act 2010, Part 4 Marine Licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the UK Marine Licensing Area (referred to as the “OfTI Marine Licence”) granted to Moray West on 14 June 2019 and varied on 11 April 2022.
Moray Offshore Windfarm (West) Limited	The legal entity submitting this Wind Farm Cable Plan (CaP).
Moray West EIA Report	The Environmental Impact Assessment Report for the Moray West Offshore Wind Farm and Associated Transmission Infrastructure submitted July 2018. Additional information was provided in the Moray West Report to Inform an Appropriate Assessment (RIAA) July 2018 and Moray West Application Addendum Document November 2018.
Moray West Offshore Wind Farm	The wind farm to be developed in the Moray West Site (also referred as the Wind Farm).
Offshore Consents	Collective term for the two Marine Licences and the Section 36 consent.
Offshore Transmission Infrastructure (OfTI)	The offshore elements of the transmission infrastructure.
OfTI Corridor	The export cable route corridor, i.e., the OfTI area excluding the Moray West Site.
Section 36 Consent	Section 36 consent under Section 36 of the Electricity Act 1989 for the construction and operation of the Moray West Offshore Wind Farm assigned to Moray West on 14 June 2019 and varied on 7 March 2022.
The Development	The Moray West Offshore Wind Farm and OfTI.
The Development Site	The area outlined in Figure 1 attached to the Section 36 Consent Annex 1, Figure 1 attached to the two Marine Licences, and Figure B.1 of this CaP.

## Moray Offshore Windfarm (West) Limited Wind Farm Cable Plan



8460005-DBHA10-MWW-PLN-000001

Term	Description
The Moray West Site	The area in which the Moray West Offshore Wind Farm will be located. Section 36 Consents and associated Marine Licence to construct and operate generating stations on the Moray West site were granted in June 2019 and as varied.
The Works	The construction activities undertaken for the Development.
Transmission Infrastructure (TI)	Includes both offshore and onshore electricity transmission infrastructure for the consented wind farm. Includes connection to the national electricity transmission system near Broad Craig in Aberdeenshire encompassing Alternating Current (AC) Offshore Substation Platforms (OSPs), AC export cables offshore to landfall point at Broad Craig, near Sandend in Aberdeenshire continuing onshore to the AC collector station (onshore substation) at Whitehillock and the additional regional Transmission Operator substation at Blackhillock near Keith. A Marine Licence for the OfTI was granted in June 2019 and varied on 11 April 2022.

## Appendix B – Development Background Information

### B.1 Development Description

Moray West Offshore Wind Farm is being developed by Moray Offshore Windfarm (West) Limited (Moray West; Company Number 10515140) which is registered at Octagon Point, 5 Cheapside, London, England, EC2V 6AA. Moray Offshore Windfarm (West) Limited is a wholly owned subsidiary of Moray West Holdings Limited which in turn is owned by Moray Offshore Renewable Power Limited, Delphis Holdings Limited, EDP Renewables Europe, S.L.U and UAB Ignitis Renewables.

The Moray West Site covers an area of approximately 225 km<sup>2</sup> on the Smith Bank in the Outer Moray Firth approximately 22 km from the Caithness coastline.

The Moray West Offshore Wind Farm will comprise 60 wind turbine generators (WTGs), associated substructures and seabed foundations, inter array cables, one OSP inter-connector cable and any scour protection around substructures or cable protection. The OfTI comprises two offshore substation platforms (OSPs) which will be located within the Moray West Site, and two offshore export cable circuits which will be located within the OfTI Corridor and will be used to transmit the electricity generated by the offshore wind farm to shore.

The offshore export cable circuits will come ashore at Sandend Bay, which is located on the Aberdeenshire Coast at Broad Craig, approximately 65 km south of the Moray West Site. There will be two underground circuits from landfall at Sandend Bay to Whitehillock where the onshore substation will be located. There will also be further underground cabling between Whitehillock substation and Blackhillock substation. Moray West will transfer ownership of the transmission asset to an Offshore Transmission Owner (OFTO) who will manage the transmission infrastructure.

Figure B.1 displays a map of the Moray West Site and OfTI Corridor.

The development is aiming to be fully operational in 2024/25 with an operational life of 25 years from the date of final commissioning of the Development.

# Moray Offshore Windfarm (West) Limited Wind Farm Cable Plan



8460005-DBHA10-MWW-PLN-000001

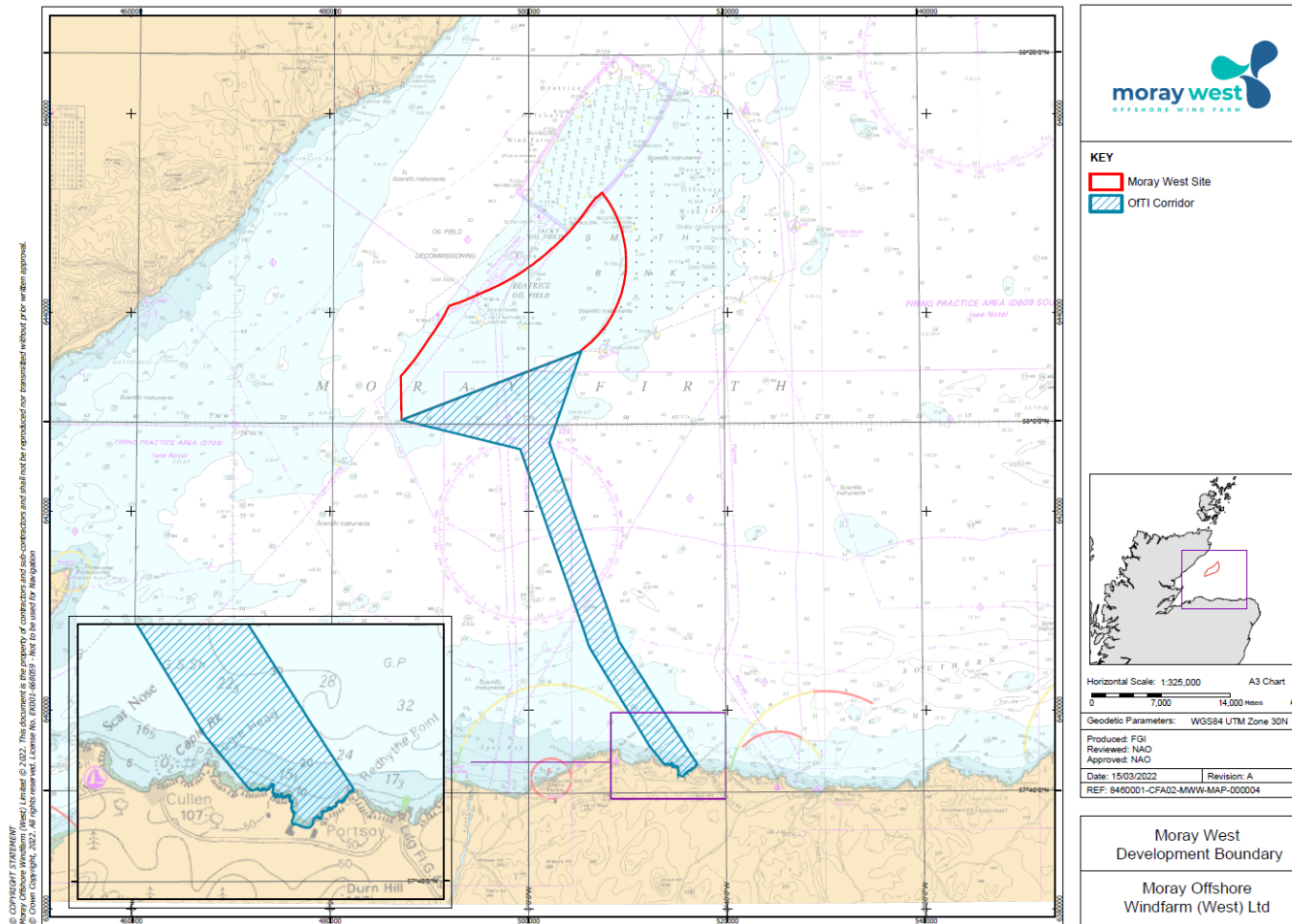


Figure B.1 Geographical location of the Moray West Site and OfTI Corridor.



# Moray Offshore Windfarm (West) Limited

## Wind Farm Cable Plan



8460005-DBHA10-MWW-PLN-000001

### B.2 Legal Context

Table B.1 and Table B.2 provide a list of the marine licence consent conditions relevant to this Wind Farm CaP and how they are addressed within it.

Table B.1. Consent conditions to be discharged by this Wind Farm CaP		
Consent Condition Reference	Condition	Addressed
Section 36 Condition 19 & Wind Farm Marine Licence Condition 3.2.2.16	The Licensee must, no later than six months prior to the Commencement of the Works, submit a CaP, in writing, to the Licensing Authority for its written approval. Such approval may only be granted following consultation by the Licensing Authority with SNH, MCA, SFF and any such other advisors or organisations as may be required at the discretion of the Licensing Authority. Commencement of the Works cannot take place until such approval is granted.	This document sets out the Inter Array Cable Plan for approval by the Scottish Ministers. Consultation to be undertaken by the Scottish Ministers.
	The CaP must be in accordance with the Application.	
	The CaP must include, but not be limited to, the following:	
	a) The vessel types, location, duration and cable laying techniques for the inter array and OSP inter-connector cables;	Section 5.1; Section 3; Section 5
	b) The results of monitoring or data collection work (including geophysical, geotechnical and benthic surveys) which will help inform cable routing;	Section 2
	c) Technical specification of IAC and OSP inter-connector cables including a desk based assessment of attenuation of electromagnetic field strengths and shielding;	Section 4
	d) A Cable Burial Risk Assessment ("CBRA") to ascertain burial depths and where necessary alternative protection measures;	Sections 6
	e) Methodologies for surveys (e.g. over trawl) of IAC and OSP inter-connector cables through the operational life of the wind farm where mechanical protection of cables laid on the seabed is deployed; and	Sections 7.2
	f) Methodologies for IAC and OSP inter-connector cables inspection with measures to address and report to the Licensing Authority any exposure of IAC and OSP inter-connector cables.	Section 2.1

# Moray Offshore Windfarm (West) Limited

## Wind Farm Cable Plan



8460005-DBHA10-MWW-PLN-000001

Table B.1. Consent conditions to be discharged by this Wind Farm CaP		
Consent Condition Reference	Condition	Addressed
	Any licensed cable protection must ensure existing and future safe navigation is not compromised. The Scottish Ministers / Licensing Authority will accept a maximum of 5% reduction in surrounding depth referenced to Chart Datum. Any greater reduction in depth must be agreed in writing by the Scottish Ministers Licensing Authority.	Section 6.3

Table B.2 Other consent conditions relevant to this Wind Farm CaP		
Consent Condition Reference	Condition	Addressed
Wind Farm Marine Licence Condition 3.1.3	<p>The Licensee must ensure that at least five days prior to its engagement in the Licensed Activities, the name and function of any vessel, agent, contractor or subcontractor appointed to engage in the Works and, where applicable, the master's name, vessel type, vessel IMO number and vessel owner or operating company are fully detailed in the Vessel Report. The Licensee must make the Vessel Reports and the Contractor Reports available on the Moray Offshore Windfarm (West) webpage: <a href="http://www.morayoffshore.com/moray-west/the-project/">http://www.morayoffshore.com/moray-west/the-project/</a></p> <p>Any changes to the supplied details must be uploaded to the Vessel Report and the Contractor Report and the Licensing Authority must be notified, in writing, prior to any vessel, agent, contractor or sub-contractor which has not yet been notified to the Licensing Authority engaging in the Licensed Activities.</p> <p>Only those vessels, agents, contractors or sub-contractors detailed in the Vessel Report are permitted to carry out any part of the Works.</p> <p>The Licensee must satisfy itself that any masters of vessels or vehicle operators, agents, contractors or sub-contractors are aware of the extent of the Licensed Activities and the conditions of this licence.</p> <p>All masters of vessels or vehicle operators, agents, contractors and sub-contractors permitted to engage in the Works must abide by the conditions of this licence.</p> <p>The Licensee must give a copy of this licence, and any subsequent variations made to this licence in accordance with section 30 of the 2010 Act and section 72 of the 2009 Act, to the</p>	All vessel-related matters will be discharged by the VMNSP.

# Moray Offshore Windfarm (West) Limited

## Wind Farm Cable Plan



8460005-DBHA10-MWW-PLN-000001

Table B.2 Other consent conditions relevant to this Wind Farm CaP		
Consent Condition Reference	Condition	Addressed
	masters of any vessels, vehicle operators, agents, contractors or sub-contractors permitted to engage in the Works and must ensure that the licence and any such variations are read and understood by those persons.	
Wind Farm Marine Licence Condition 3.2.3.2	The Licensee must ensure that navigable depth is not altered by more than 5% referenced to Chart Datum unless otherwise agreed, in writing, with the Licensing Authority in consultation with the MCA and NLB.	

### B.3 Sustainable Construction

The Institute of Environmental Management and Assessment (IEMA) state “Sustainable Construction” as *“application of sustainable development to the construction industry, whereby the construction and management of a development is based on principles of resource efficiency and the protection/enhancement of natural and built heritage. Sustainable construction comprises such matters as site planning and design, material selection, resource and energy use, recycling and waste minimisation”.* (Institute of Environmental Management and Assessment, Environmental Management Plans Practitioner, Volume 12, December 2008).

Moray West is fully committed to ensuring that the Development staff and stakeholder needs and expectations are met and exceeded, achieving the ultimate goal of delivering the Development to the highest standard of quality, with a Zero Harm approach to the health and safety of individuals and to the environment as a whole. Moray West have developed an overarching QHSE Policy, which includes the following objectives:

- To reduce our carbon footprint by conserving natural resources and reducing energy use and waste generated by our operations; and
- To support and maintain our commitment to the protection of the environment, including prevention of pollution and other specific commitment(s) relevant to the context of the organisation’s undertakings.

The Moray West EMP provides a framework, supported by Moray West’s QSHE Policy, the organisational context, the EIA and associated documents, the Consent Plans (including the WMP and MPCP) and the output of hazard identification processes, to aid Moray West in achieving its own environmental objectives:

- Zero spills to sea.
- Zero high potential incidents.
- All personnel working on the Development shall have a risk assessment for every task, which also addresses environmental impact.
- Responsible construction and compliance with all applicable legislation, licences and conditions and best practice guidance.
- Consideration of local supply chain and use of sustainable materials where possible.
- Use of the waste hierarchy of reduce, reuse and recycle wherever possible.
- Incorporation of ‘lessons learnt’ into ongoing works for continued HSE improvement.