

The logo for Moray East Offshore Windfarm features the word "MORAY EAST" in a bold, dark teal font, with the letter "O" in "MORAY" containing a white circle. Below it, the words "OFFSHORE WINDFARM" are written in a lighter blue, all-caps font. The text is set against a background of a large, light blue circular graphic composed of several segments, resembling a stylized sun or a gear.

MORAY EAST

OFFSHORE WINDFARM

CPS Grouted Support: Method Statement

Moray East Offshore Wind Farm

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Moray Offshore Windfarm (East) Limited

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List of Abbreviations

CPS	Cable Protection System
DP	Dynamic Positioning
MS-LOT	Marine Scotland – Licensing Operations Team
OftI	Offshore Transmission Infrastructure
OEC	Offshore Export Cable
OSP	Offshore Substation Platform
ROV	Remotely Operated Vehicle
WTG	Wind Turbine Generator

1 Introduction

This document presents the proposed method statement for the installation of three grouted supports under the Cable Protection Systems (CPS) of the export cables entering the three Offshore Substation Platforms (OSPs) in the Moray East Offshore Wind Farm. The installation of these grouted supports aims to mitigate the risks caused by the existing damage on the CPS of OSP 2, and to prevent the potential for similar damage to the CPS of OSP 1 and 3.

In order to enable the activity, a Marine Licence is required from Marine Scotland Licensing Operations Team (MS-LOT), under the Marine and Coastal Access Act 2009.

This method statement is provided in support of the Marine Licence application submitted by Moray East to MS-LOT. A description of the construction activities is provided in Section 2.

1.1 Project Background

In March 2014, Moray Offshore Windfarm (East) Limited (Moray East) received consents from the Scottish Ministers under Section 36 of the Electricity Act 1989, and the associated Marine Licences under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 for the construction and operation of the Moray East Offshore Wind Farm. At that time, the Moray East site was made up of three sites known as “Telford”, “Stevenson” and “MacColl” offshore wind farm sites. Moray East developed the three consented wind farms (Telford, Stevenson and MacColl) as a single wind farm (Moray East Offshore Wind Farm) (Figure 1-1 below).

A Marine Licence for the Offshore Transmission Infrastructure (OfTI) was granted in September 2014 and a further Marine Licence for two additional distributed offshore substation platforms (OSPs) was granted in September 2017 (together these are referred to as the OfTI Marine Licences).

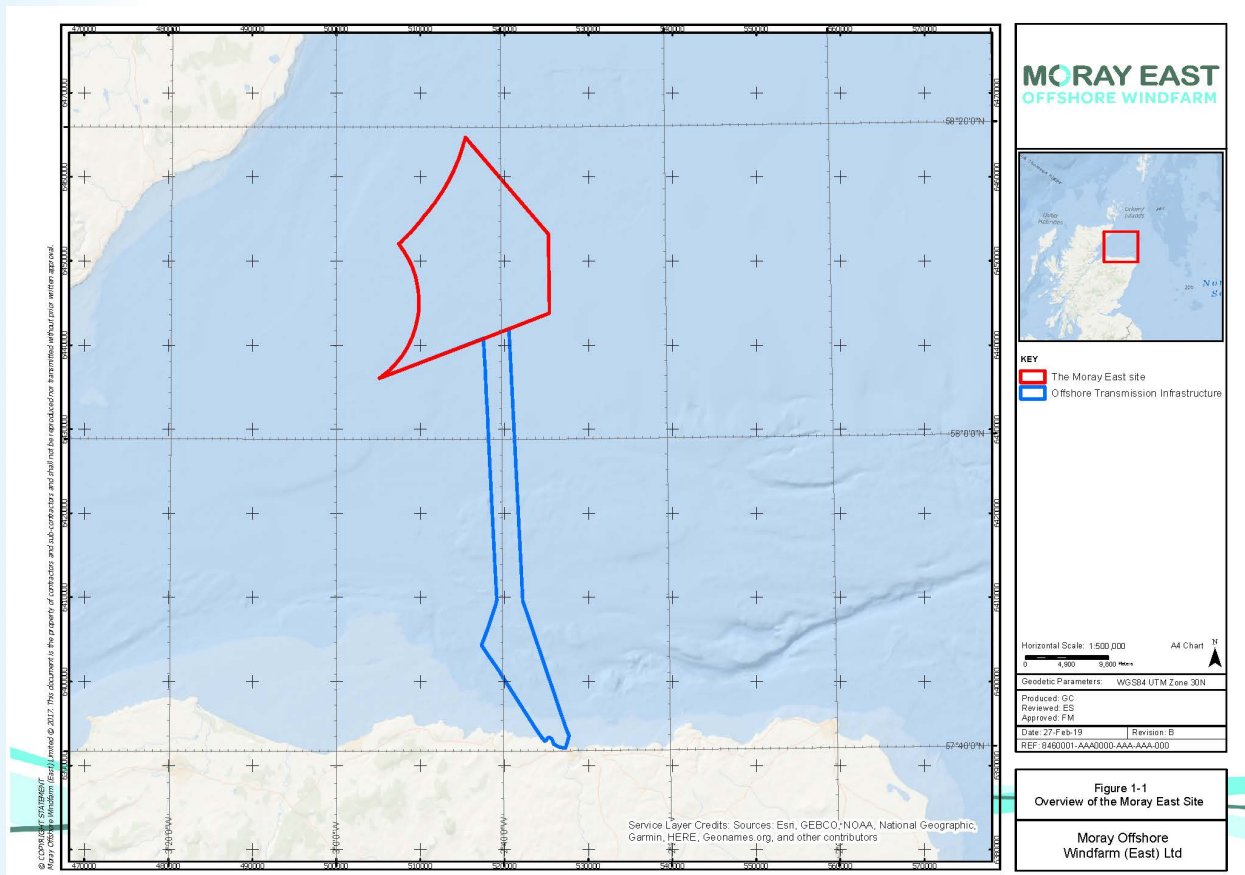


Figure 1-1. Moray East Site and OfTI Corridor

During an inspection survey carried out in April 2022, damage on the CPS associated with the export cable was identified at Moray East OSP 2 platform. The external stiffener component of the CPS was found to be cracked and open. The rupture is located in the polyurethane tube of the external stiffener, immediately adjacent to the clamp section at the entry to the bellmouth close to the CPS joint (see Figure 1-2).

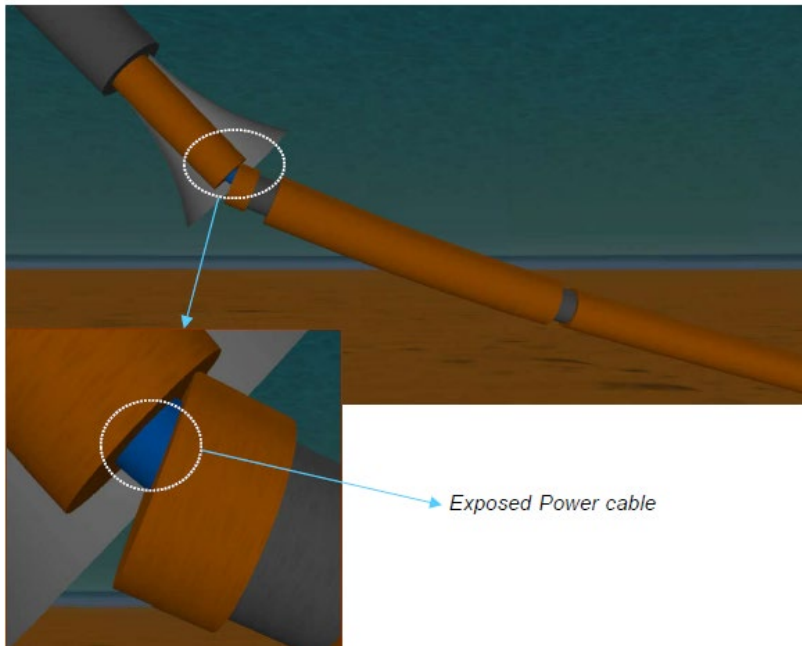


Figure 1-2: Illustration of CPS damage identified at OSP 2

As a result, the section of the CPS below the rupture is currently resting over the cable, increasing the load and stress to which the cable is exposed to. Under these conditions, there is a threat to the structural integrity of the cable with risk of cable failure, which would compromise energy export from the OSP 2.

Following an analysis undertaken by NKT, cable installation contractor, it is concluded that a free span support is required to mitigate the threat to the structural integrity of the cable. A custom-made grout bag is proposed to be installed beneath the CPS/cable free span. This is to provide a continuous vertical and lateral support for the cable system. As a preventative measure, a similar approach is proposed to be undertaken at OSP 1 and 3 to prevent the risk of future damage of a similar nature.

2 Method Statement

2.1 Overview

The proposed works consist of deploying on the seabed three grouted supports underneath and along the existing export power cable systems connecting the three Moray East OSPs to the onshore infrastructure, i.e. one grouted support for each OSP (see grouted support illustration in Figure 2-1). Specifically, the structures will support the CPS associated with the export power cables. The section of the CPS to be supported is suspended above an already installed rock-based scour protection. Figures 2-2 shows an indicative layout of the CPS and proposed grouted support, this will be refined following final engineering design. It is anticipated that all works will be undertaken above existing rock protection.

Each one of the grouted supports consists of a custom-made polypropylene fabric formwork to be inflated with grout mixed in-situ on the installation vessel and then pumped subsea. The formwork is designed to provide continuous vertical and lateral support along the length of the catenary and cup the cable. Additionally, the shoulders on the top of the formwork will provide shielding to the cable to further prevent lateral loading (see Figure 2-1). The dimension of each grouted support is expected to be up to 2.5 m (height) x 7.2 m (length) x 3.3 m (width), with a footprint of no more than 21 m² each, and 63 m² in total for the three OSPs.

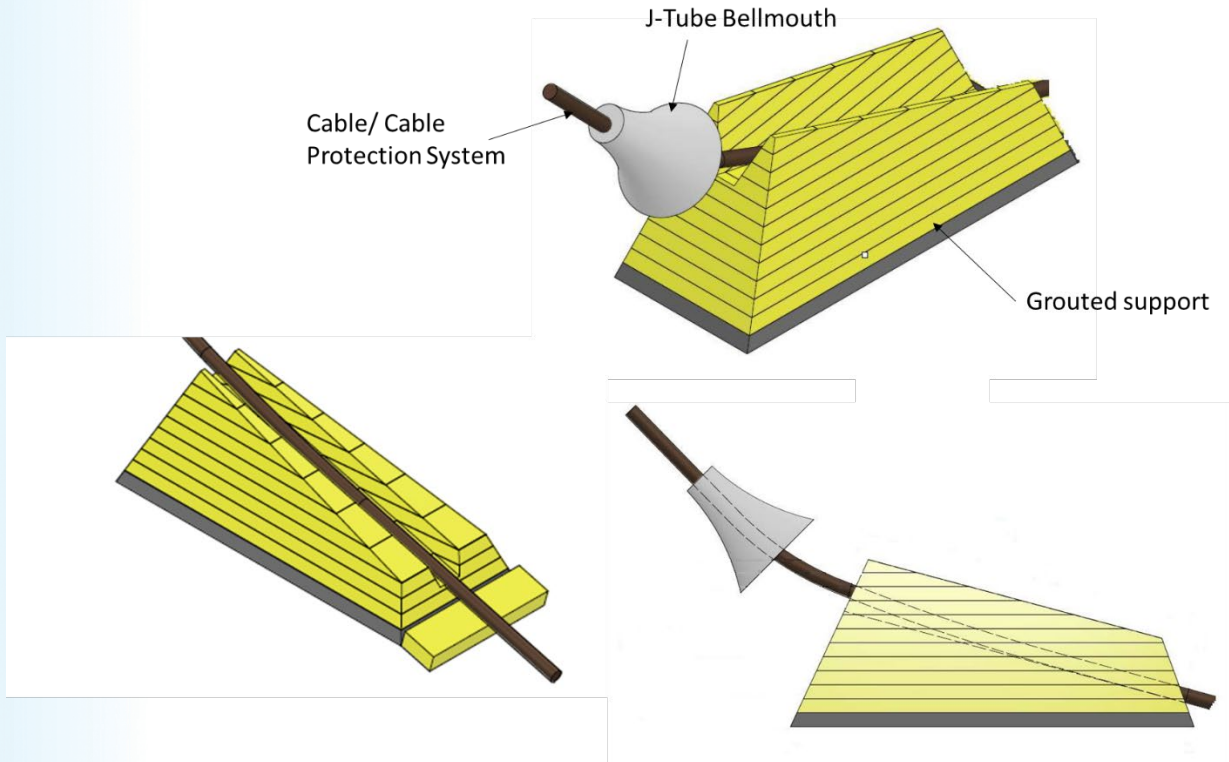


Figure 2-1: Overview of grout bag solution

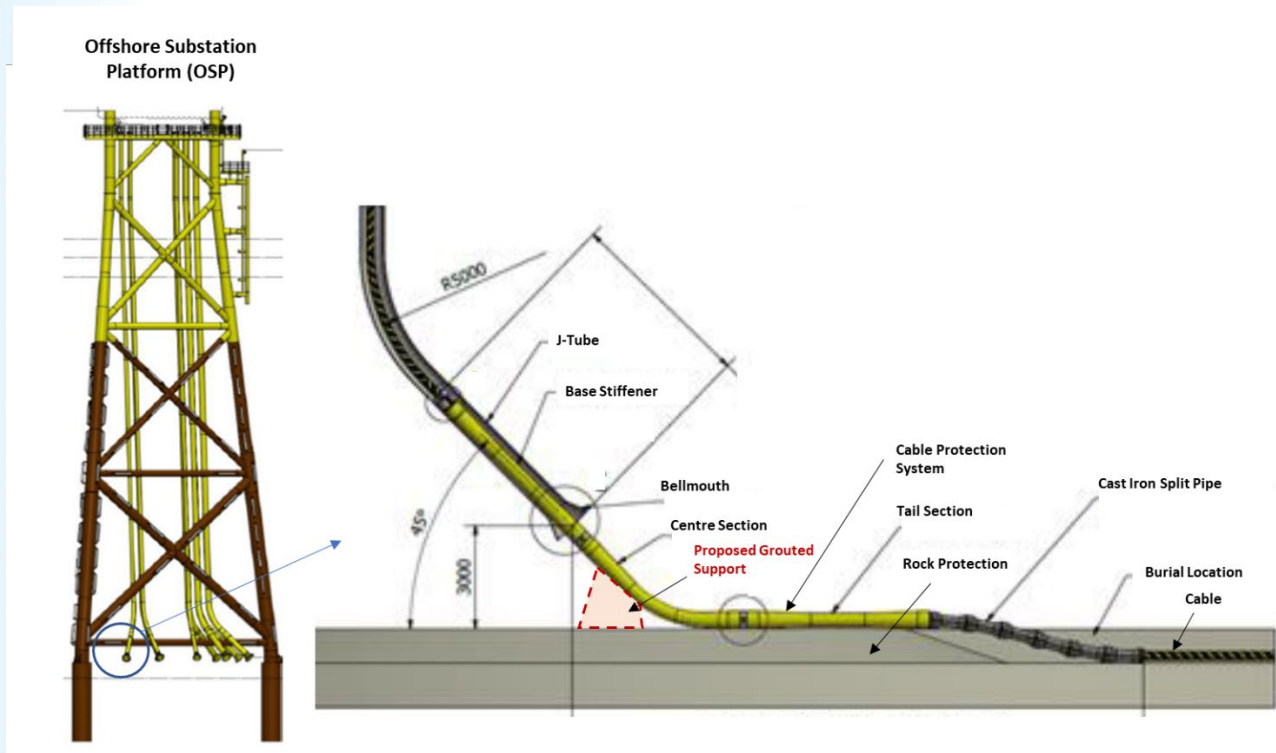


Figure 2-2: Indicative overall layout - Cable Protection System and Proposed Grout Support

The grouted support consists of 2 main components, the polypropylene fabric bag that is used to construct the formwork, and the grout that is placed inside it.

2.2 Construction Materials

The materials to be deposited on the seabed and approximate quantities and dimensions are described in Table 2-1.

Table 2-1: Grouted support construction materials

Type of Deposit	Description	Quantity and Dimensions (for each grouted support)	Total Quantity and Dimensions (for three grouted supports)
Concrete	Grout (CEM I Portland cement, water and sand) Approximate dimensions (H x L x W) : 2.5 m x 7.2 m x 3.3 m	40 tonnes	120 tonnes
Plastic/ Synthetic	woven polypropylene (outer material)	105 m ²	315 m ²
Plastic/ Synthetic	Oxford nylon 200 denier (internal layers)	105 m ²	315 m ²
Plastic/ Synthetic	Polymer webbing of 50mm wide (installation aids)	1,5 m of 50 mm wide	4.5 m of 50 mm wide

2.3 Location of installation

The grouted supports will be installed in the close proximity of the Moray East OSPs, as indicated in Figure 2-3 above. The coordinates for the OSPs are provided below in Table 2-2.

Table 2-2: OSPs coordinates

OSP	X_UTM30N	Y_UTM30N	Depth [mLAT]
SV-E06-OSP2	513910.33	6442735.80	-43.54
SV-F15-OSP1	515457.79	6452876.32	-48.88
SV-I10-OSP3	520100.16	6447182.68	-49.79

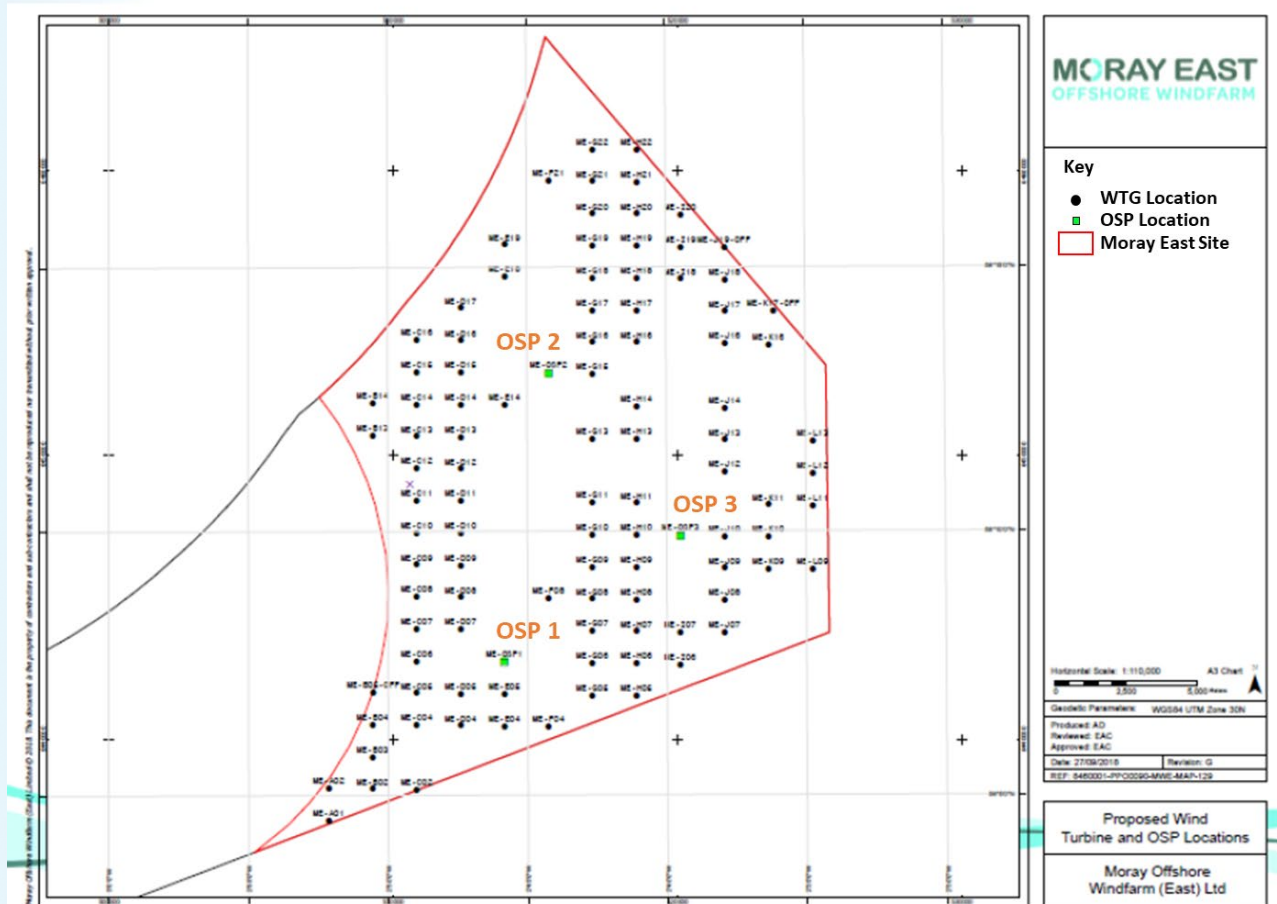


Figure 2-3: Moray East OSP locations

2.4 Construction activities

The grouted support will be positioned in place using a support vessel equipped with Remotely Operated Vehicle (ROV), crane and grout spread. The vessel will have Dynamic Positioning (DP) and no anchoring will be used.

The polypropylene fabric bag, which consist of the formwork for the grouted support, will be deployed using a subsea turntable. The turntable with the fabric bag will be overboarded from the vessel and placed adjacent to the grouted support location on existing scour protection. An ROV will then release the bag from the turntable and pull it under the cable using a rope bridle. Each layer of the formwork/ fabric bag has a layflat hose with a hotstab connection that can then be connected back to a quick-connect box located on the turntable. The quick-connect box is connected to the grouting pipe (downline) that runs back to the grouting spread on the vessel where the grout is mixed and pumped to inflate the formwork section by section (see Figure 2-4). The turntable and any other support equipment will be recovered to the vessel once the grouted support installation is completed.

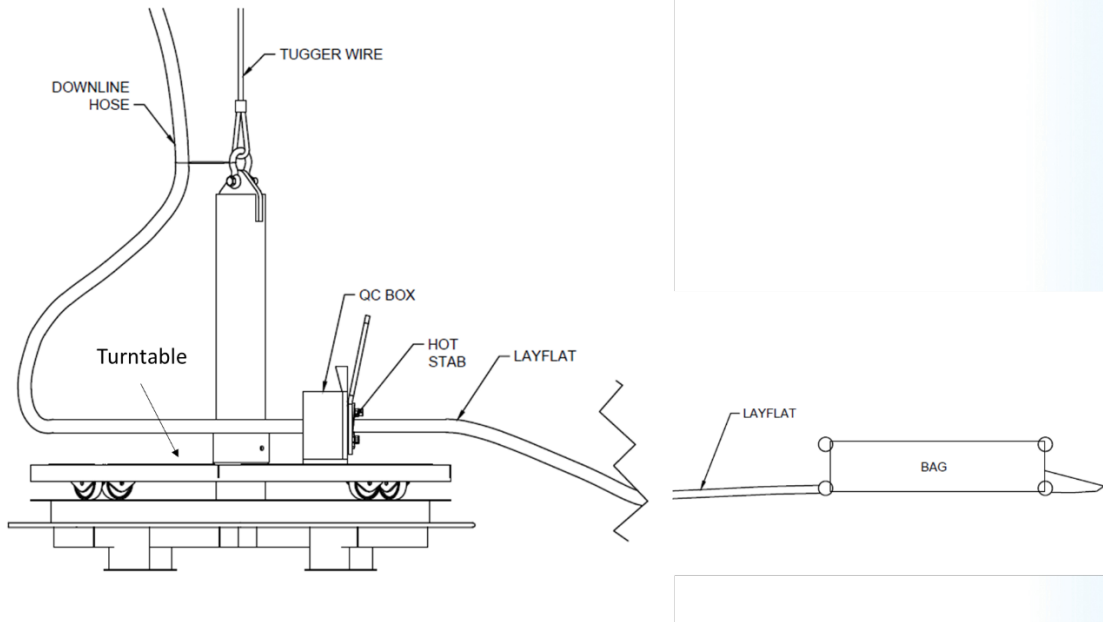


Figure 2-4: Illustration of subsea equipment used to inflate the formwork

Total inflation is expected to take around 24 hours. Once the bag is inflated with grout to the desired level, it will take approximately 24 hours for the grout to be storm-proof, with a total of 24 to 30 days for the grout to be fully solidified. The 24 to 30 day solidification period is assessed on expected local sea temperatures at the time of installation.

The installation activity will be completed using one support vessel, with a single trip to the site for each campaign (up to two campaigns expected). The operating port is not yet confirmed, although is expected to be Kristiansand, in Norway for the first campaign.

The exact programme for the construction activities is yet to be confirmed. The OSP 2 grouted support is expected to be deployed by mid-October, given the urgency for the repair and requirement to be completed before higher sea states. This considers the estimated timeline for the engineering and manufacturing of the OSP 2 formwork (6 to 8 weeks). As discussed in Section 1.1 above, the grouted support is required to mitigate the threat to the structural integrity of the cable due to freespan fatigue and load excess from the damaged CPS section resting over the cable. The repair is therefore required to ensure the defect does not progress to a cable failure which would require a significantly more intrusive repair.

Deployment at the OSP 1 and 3, which is a preventive measure, could be undertaken in a separate campaign subject to the timeline for manufacturing the two additional formworks and better weather conditions. This could be either during the favourable weather window during the winter or in spring / summer 2023 but not later than 01 August 2023.

A summary of the timeline and durations anticipated for the works is provided in Table 2-3 below. It is noted that these dates and duration are indicative and subject to final engineering and manufacturing of the grout bag, as well as weather conditions. Other sea users will be informed of the effective starting dates through Notice to Mariners (NTM), to be issued prior to any activity taking place.

Table 2-3: Indicative timeline for activities

Activity	Starting date*	Duration*
Vessel mobilization	15/10/2022 (mid-October)	2 days

Activity	Starting date*	Duration*
Deployment of grout bag and inflation with grout	18/10/2022	2-3 days
Demobilization of equipment and vessel	19/10/2022	1 day
Solidification period	18/11/2022	24- 30 days

*Indicative starting dates and duration, subject to final engineering, manufacturing of the grout bag, and to weather conditions.

2.5 Decommissioning activities

Decommissioning will be undertaken at the end of the lifespan of the Development, as part of the decommissioning for the OfTI assets. The grouted supports will be lifted to a vessel deck using a grab or similar method, and transported for disposal onshore. The effective method for removal will be considered in the future reviews of the Moray East OfTI Decommissioning Programme.



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