

Subject	Neart na Gaoithe Offshore Wind Limited (NnGOWL) Transmission Marine Licence Variation Request - MS-00008954	
To	Marine Scotland Operations and Licensing Team (MS-LOT)	
Cc	David Sweenie (NnGOWL); Sarah MacNab (Poseidon); Calum Billings (NnGOWL)	
From	Claire Gilchrist (NnGOWL)	Date 30 JUN 2021

# 1 Introduction

## 1.1 Purpose of Note

Neart na Gaoithe Offshore Wind Limited (NnGOWL) will install two export cables in 2021, from landfall at Thorntonloch, East Lothian, to each of the Offshore Substation Platforms within the Neart na Gaoithe (NnG) offshore wind farm.

Within the NnG Cable Plan (NnGOWL, 2020<sup>1</sup>), it was stated that there may be a requirement for rock protection, where ground conditions may be unsuitable for cable burial to target depth. Analysis of survey data has confirmed that in some areas along the export cable routes, trenching tools are unable to trench due to profile of ground causing instability to trenching tool. In these locations, where the target depth of lowering will not be attained by burial, rock protection will be required to ensure cables are adequately protected.

Contractors supporting NnGOWL have now completed designs for required rock protection. Designs have indicated that a greater volume of rock will be required for use in protection than is currently licensed for deposit in the NnG Transmission Marine Licence (Ref: MS-00008954).

This note has been prepared for issue to the Marine Scotland Licensing Operations Team (MS-LOT) to support a request to vary the total volume of rock deposit stated on the NnG Transmission Marine Licence.

## 1.2 Summary of Offshore Consents Requirements

A number of Marine Licence conditions and Consent Plan commitments relate to deployment of protection along the export cables; these are presented in Table 1 below, which clearly identifies where a variation to these conditions is requested.

*Table 1 - Conditions and commitments relevant to export cable protection*

Source Document	Condition/Commitment	Requirement for Variation/Action
Transmission Marine Licence	Section 2.4: A total of 17,200m <sup>3</sup> stone/rock/gravel is allowed as a permanent deposit.	Variation required to increase volume of stone/rock/gravel to be permanently deposited (see Section 2).
Transmission Marine Licence	Condition 3.2.2.8 and 3.2.3.2: <i>"Any licensed cable protection must ensure existing and future safe navigation"</i>	Action required (see Section 3.1.1).

<sup>1</sup> NnGOWL (2020) Neart na Gaoithe Cable Plan; Revision 8.0 – November 2020.

	<i>is not compromised. The 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 Licensing Authority."</i>	
NnG Cable Plan	Section 6.3: Allows for cable protection of up to 15% of the total consented length of the export cable, equating to 12.8km.	No variation required; the cable protection will not exceed 15% of the total consented length.
NnG Cable Plan	Section 7.2.2.4 <i>"NnGOWL confirm that where it is identified that rock placement is required, NnGOWL will issue a NtM containing the justification of the requirement for cable protection in that location. A clear chart and coordinates illustrating the location of the cable protection would be included within the Notice."</i>	No variation required; NnGOWL will issue a Notice to Mariners (NtM) containing the justification of the requirement for cable protection in that location. A clear chart and coordinates illustrating the location of the cable protection will be included within the Notice.
NnG Cable Plan	Section 7.2.2.4: <i>"Where it is confirmed that cable burial to DoL has been achieved by post-lay survey (see para 146), NnGOWL will not undertake over trawl investigations. Where target DoL is not achieved and additional cable protection is deployed, over trawl investigations will be undertaken by NnGOWL."</i>	No variation required; NnGOWL propose to undertake over trawl investigations in agreement with MS-LOT and following engagement with stakeholders including fisheries organisations, where cable protection overlaps with fishing activity.

## 2 Requirement for Variation

Detailed design of the rock protection is ongoing; however, it is currently planned that rock protection will be installed along each export cable route between approximately Kilometer Point (KP) 0.7 and KP 4.5. There is also a likelihood that a small number of short cable route sections offshore with hard ground conditions and a high number of boulders, may also require cable protection. Section 2.1 and Section 2.2 provide further information about the requirements at each of these.

### 2.1 Nearshore (KP 0.7 – 4.5)

#### 2.1.1 Requirement for Rock Protection between KP 0.7 to KP 1.3

It is anticipated that rock protection will be required over the short section of each export cable which is to be installed within a pre-excavated trench, from the Horizontal Directional Drill (HDD) exit point at KP 0.7 to KP 1.3 (Figure 1).

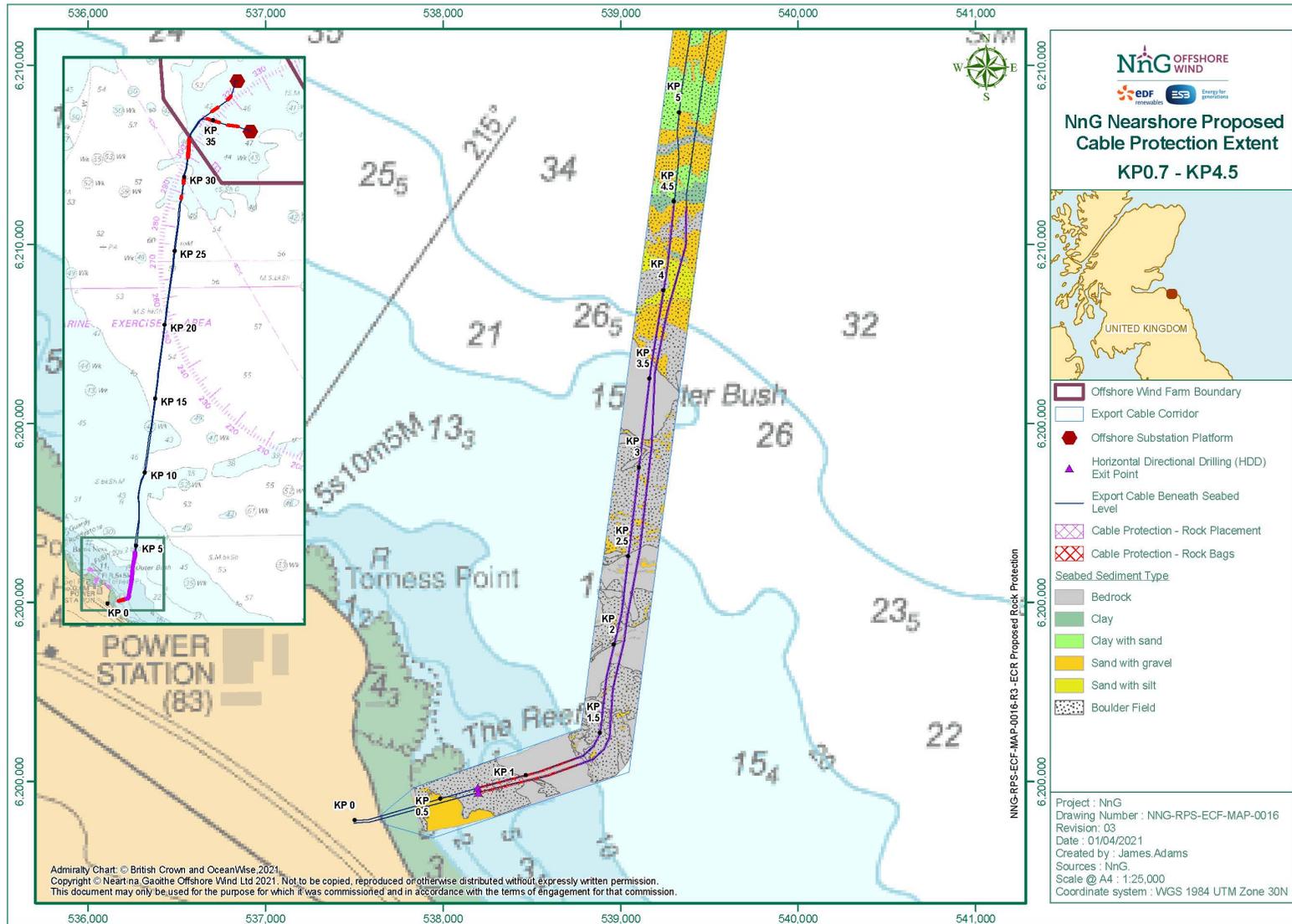


Figure 1 – Proposed rock protection required between KP0.7 – KP 4.5

Following excavation of each trench it was found that the extracted material is too large to be used as backfill material would not form suitable or adequate protection for the installed export cables (Figure 2). As such, mechanical protection is required to protect the cable within the trench. Rock bags have been selected as the method of protection in this location, based on operational parameters as described in Section 2.1.3.



Figure 2 – Excavated material between KP 0.7 and KP 1.3

### 2.1.2 Requirement for Rock Protection between KP 1.3 to KP 4.5

It is planned that rock protection will also be required to be installed over surface laid export cables between KP 1.3 – KP 4.5 (shown in Figure 1). The seabed in this area is predominantly exposed, fractured bedrock with overlying boulders and rock protrusions, with areas of softer sediment in between. This layer is estimated to be approximately 30cm thick, and the slabs are sat on a solid layer of bedrock.

The nature of the seabed prevents use of the trenching tool in this area due to an uneven surface, which is outwith the limits of the trenching tools. Examples of the harder seabed in this area are shown in ROV images in Figure 3 and Figure 4 below. Mechanical protection of the cable is required to both protect the cable assets and limit risks to other marine users associated with exposed cables. Rock berms have been selected as the method of protection in this location, as described in Section 2.1.3.

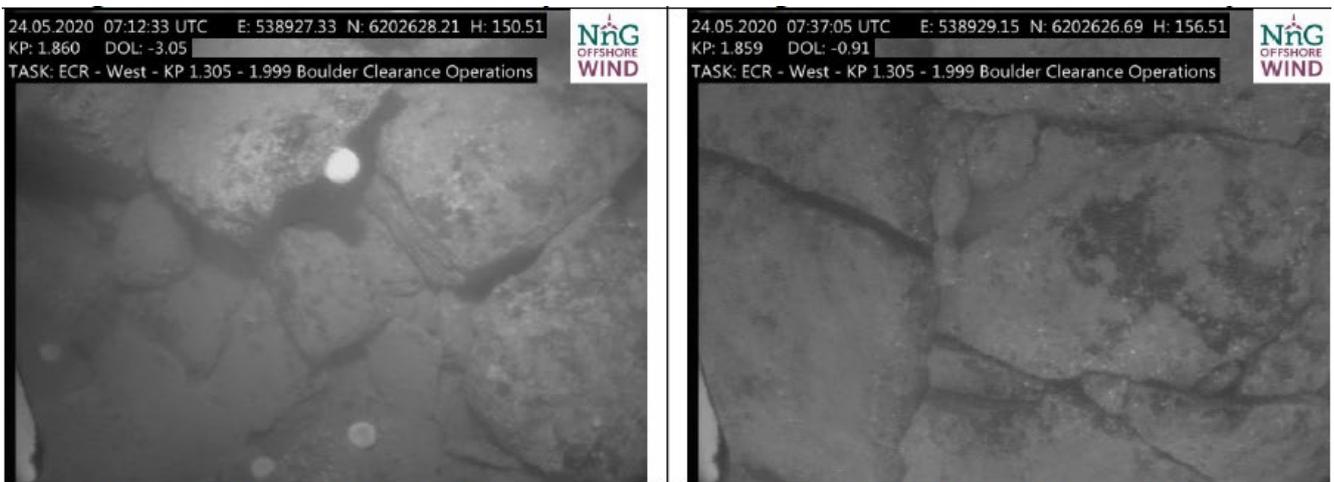


Figure 3 - Loose slabs of bedrock at KP 1.8



Figure 4 - Cracked bedrock at KP 2.6

### 2.1.3 Planned Rock Protection

Up to approximately 3.8km of known rock protection is currently required on each export cable between KP 0.7 and KP 4.5, as shown in Figure 1. It is proposed that rock bags will be installed between KP 0.7 and KP 1.3 and that rock berms will be installed between KP 1.3 and KP 4.5. Water depths range between -2m LAT at KP 0.75, -12m LAT at KP 1.3 and -39m LAT at KP 4.5.

Rock bags have been selected as the method of protection between KP 0.75 and KP 1.3 due to the very shallow water limiting the type of vessel used and prohibiting the safe installation of rock berms. The rock bags will be placed directly over the cable within the trench and will not protrude above the level of the seabed. Further details on the design and installation methodology are described in Section 2.3.2.

The rock berms to be installed between KP 1.3 and KP 4.5 will be composed of crushed rock. The nature of the rock protection material, berm design and installation method are described in Section 2.3.1.

In total, up to 7.7km of export cable lengths in the nearshore will require rock protection, which equates to 9% of the total consented export cable length.

## 2.2 Offshore (KP 9.7 – KP 10 and KP 28.5 – KP 37)

### 2.2.1 Requirement for Rock Protection

Further offshore, there are small areas of exposed bedrock and areas where the density of boulders and gravel is very high. In these locations, the nature of the seabed may limit the efficacy of the trenching tool and may prevent target burial depth being achieved. Trenching of these locations will be attempted, and jetting may be attempted if this is not successful. However, should target depth of lowering of the cable not be achieved using the trenching or jetting tool, additional mechanical protection of the cable would be required to both protect the cable assets and limit risks to other marine users associated with exposed cables.

### 2.2.2 Potential Rock Protection

Areas where rock protection may be required are shown in Figure 5, Figure 6 and Figure 7, however, note that it is not likely that the full length of these routes will require cable protection.

If required in any areas within the extents shown, rock berms would be composed of crushed rock as per that which will be installed between KP 1.3 and KP 4.5, as described in Section 2.3.1.

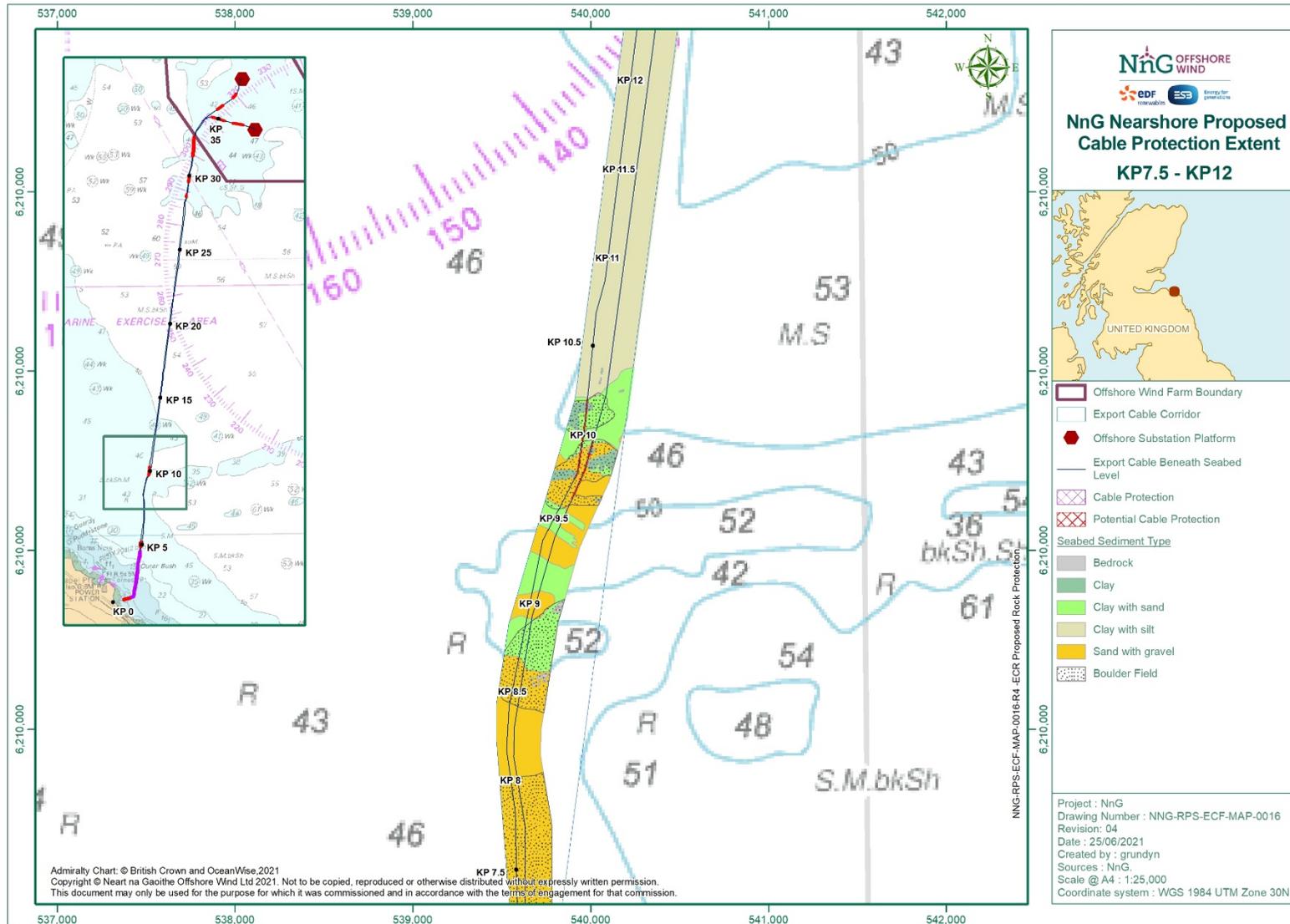


Figure 5 – Proposed rock protection required between KP9.7 – KP10.2

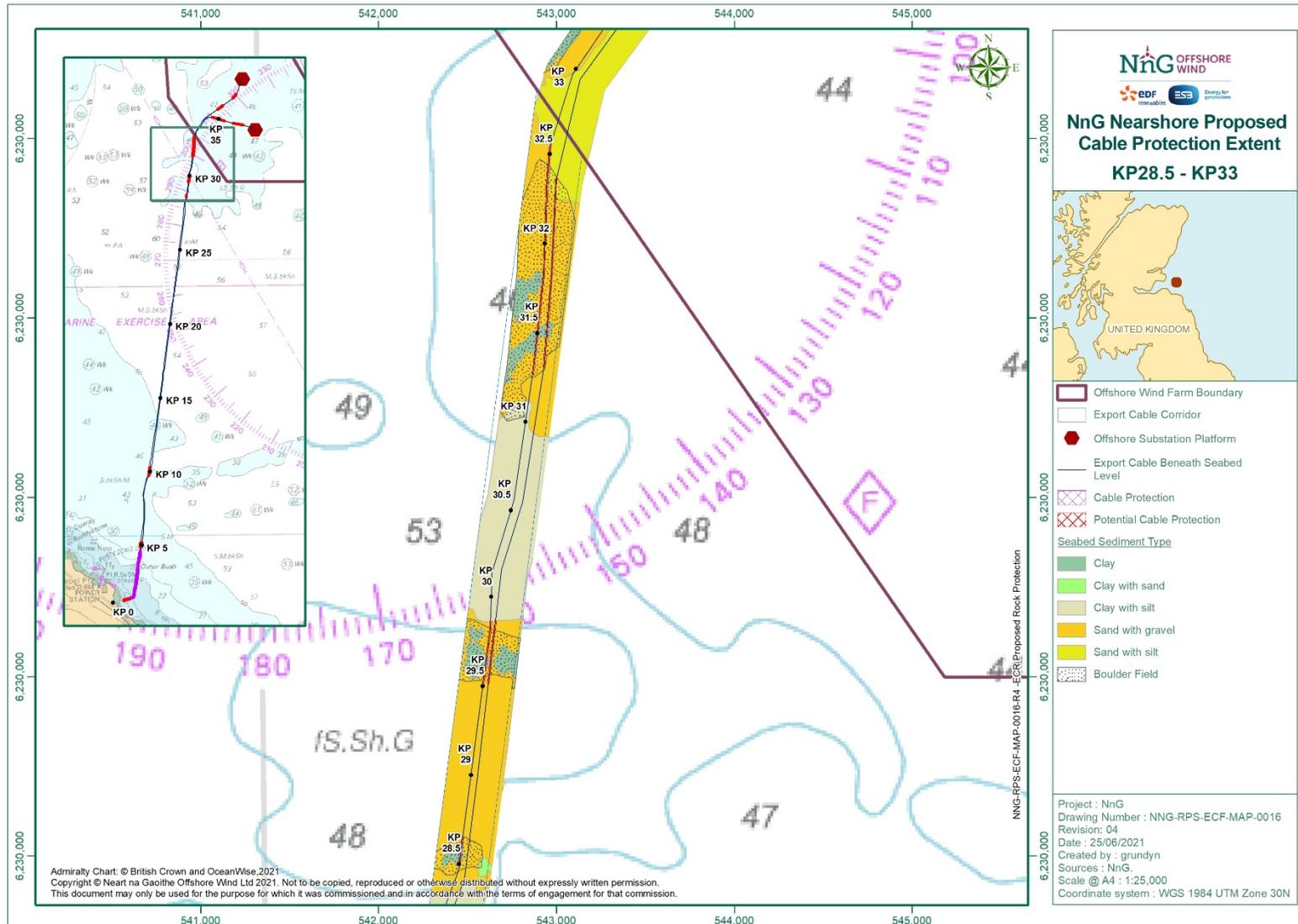


Figure 6 – Proposed rock protection required between KP 28.5 – KP 33

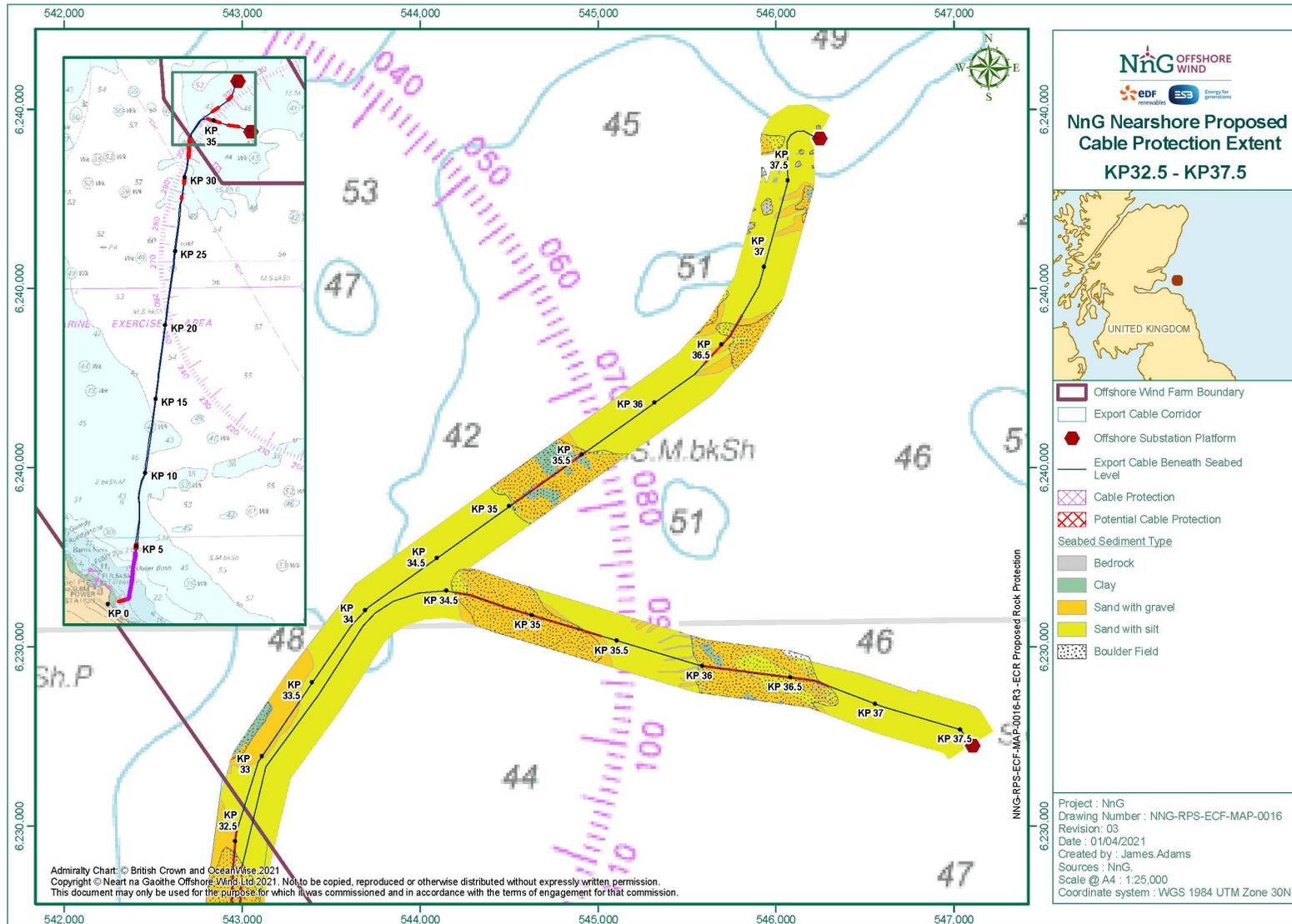


Figure 7 – Proposed rock protection required between KP 32.5 – KP 37.5

## 2.3 Materials and Installation Methodology

### 2.3.1 Rock Berm Protection

#### 2.3.1.1 Design and Materials

The design of any rock protection is required to take account of local hydrodynamic conditions to ensure robust cable protection across the design life of the Neart na Gaoithe Offshore Wind Farm.

The rock protection will be deployed in the form of a berm across those areas of export cable that remain surface laid due to hard ground conditions. The rock protection will consist of quarry-sourced clean, freshly crushed rock at varying rock grades and densities.

As shown in Figure 8, the export cable (a) will be covered by an initial filter layer of finer grade rock (b) and then a protective rock armour layer (c). The resulting berm will have slopes of 1 in 3 or 1 in 4.5 depending on water depth, with a base width at seabed of a maximum of 4m either side of the export cable. The design height of the berm will be 1m above the level of the seabed, with approximately 0.5m height associated with each of the filter and armour layers. However, to account for variability during installation, a tolerance of  $\pm 0.5m$  is applied and therefore the maximum height of the berm may be up to 1.5m.

The rock material for both the filter layer and armour layer will consist of freshly crushed rock at varying rock grades and densities (Table 2). A smaller quantity of rock material will be required for the filter layer in comparison to the armour layer due to the rock composition of each layer in protecting the export cable (Table 2).

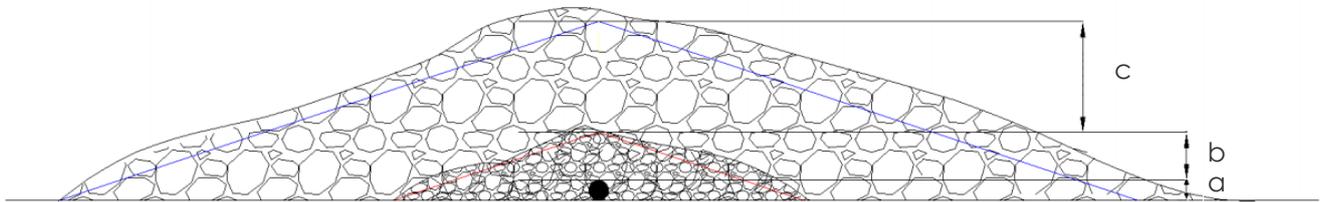


Figure 8 - Indicative nearshore berm design consisting of (a) armour layer, (b) filter layer and (c) cable

Table 2 - Rock Material Parameters

Rock Parameters	Filter	Armour
Type	Clean, crushed, graded rock	Clean, crushed, graded rock
Grading (diameter)	Up to 23mm	Between 50 – 200mm
Designed berm height	0.5m	0.5m
Vertical installation tolerance	$\pm 0.5m$	
Maximum berm height	1.5m	
Total Expected volume of rock	55,000 m <sup>3</sup>	

#### 2.3.1.2 Installation Method

The rock protection is expected to be permanently in place from September/October 2021.

A fall pipe vessel (FPV) will deploy the rock protection (Figure 9). The FPV will mobilise to a Norwegian quarry where it will be loaded with the rock material and will then transit to the rock installation

location. It is anticipated that up to four return trips to the quarry for material may be made. The total duration of the installation works will be around one month.

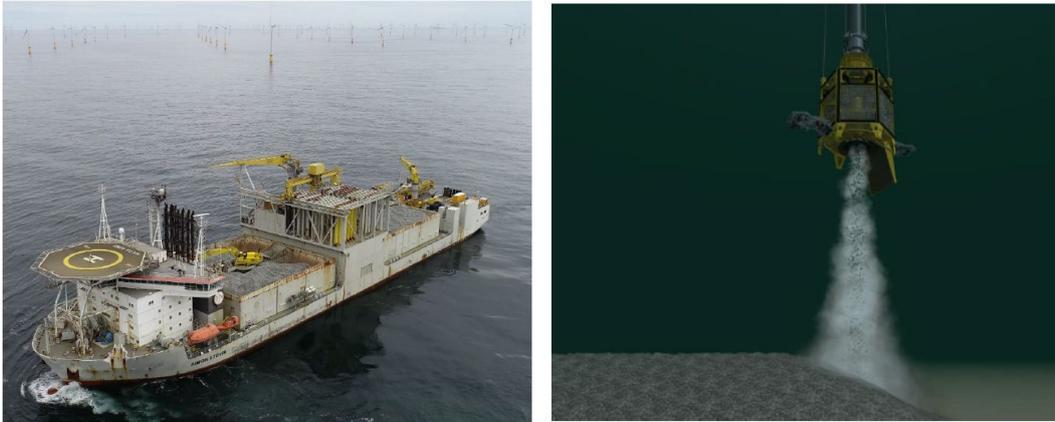


Figure 9 - Fall pipe vessel (left) and subsea rock installation through the fall pipe equipped with ROV (right)

The FPV will install the rock protection material via a fall-pipe, positioned accurately using a remotely operated vehicle (ROV). Rock protection will be placed in layers, with the vessel making a number of runs to build the final berm to the design height of 1m. During installation works, intermediate surveys of the installed rock will be undertaken.

To ensure the rock protection has been successfully installed, a post rock installation survey will be completed by the ROV and multibeam. The data received from this survey will be analysed against the pre-installation survey to confirm the final dimensions of the installed rock protection.

### 2.3.2 Rock Bag Protection

#### 2.3.2.1 Design and Materials

The rock bags to be used will take consideration of local hydrodynamic conditions in the nearshore area of Thorntonloch. Each rock bag will contain either 2, 4 or 8 tonnes of gravel and cobbles (similar to as shown in Figure 10). Approximately 45,000m<sup>3</sup> in total would be required to protect the export cable within each of the nearshore shallow trenches.

The rock bags have a lifetime of at least thirty years, however, for contingency it is assumed that some bags will need to be replaced during the course of the project. It is therefore required that a further volume of 10,000m<sup>3</sup> is added to the Marine Licence for this reason.



Figure 10 – Example of rock bags to be installed

### 2.3.2.2 Installation Method

The rock bags will be lifted into place using a shallow hulled work vessel, to ensure that it can reach the shallow depths at the start of the trench at KP 0.7. A multi-beam echosounder survey will be completed along the length of the protection, to ensure full coverage of the export cable. The rock bag protection is expected to be permanently in place from August 2021.

## 3 Summary of Variation Request

As outlined in Table 1, there are two aspects requiring approval or variation regarding the installation of rock protection under the NnG Transmission Marine Licence (MS-00008954).

It is required to increase in the current rock volumes to be deposited, as the initial volumes were identified at the point of application prior to detailed design. Approval has also been sought from the Northern Lighthouse Board (NLB) and Maritime and Coastguard Agency (MCA) to reduce the navigable water depth in the nearshore area above the limit of 5%, as per Marine Licence conditions 3.2.2.8 and 3.2.3.2.

### 3.1.1 Reduction in Navigable Depth

The NnGOWL Transmission Marine Licence states "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".

Due to the very shallow water depths in the nearshore area of Thorntonloch, where the export cables make landfall, a section of the proposed rock berm will result in a reduction of navigable water depth by greater than 5%. The rock berm will be designed to a maximum of 1m height, however, a vertical tolerance of  $\pm 0.5\text{m}$  is applied as a contingency to account for variation during installation. The maximum height of the rock berm will exceed 5% of the navigable water depth between KP 1.3 to KP 3.7 (2.4km length in total), where the water depth is between 12 and 30m LAT.

NnG have undertaken additional analysis of vessel types and sizes in the area where water depths could be reduced by greater than 5%. This analysis is based on four weeks of survey data NnG collected in June and July 2019, before the project survey work commenced. The data comprises AIS transmissions collected by both the on-site survey vessel and coastal receivers.

All larger vessels such as commercial vessels (i.e., cargo, tanker, passenger) were recorded at least 2nm from shore, in water depths in excess of 30m. A total of six vessels intersected the cable corridor within the 20-30m contours over the four week period. These comprised three fishing vessels, one recreational craft, and two dive boats. Of these six vessels, only one transmitted a draught via AIS (1.2m). The other vessels were all of length 16m or less, and therefore are very unlikely to have draughts large enough to be of concern relative to water depths of 20-30m.

It is considered that the small reduction in navigable water depth, up to 1.5m, based on the existing shallowest depth of 12m, will not provide a significant hazard to third party vessel traffic due to the sufficient remaining navigable depth and the small vessels which normally operate within this area.

NnGOWL have consulted with the MCA and NLB in relation to a permanent reduction in navigable depth of more than 5%. NnGOWL have confirmed that the following measures will be put in place to notify other marine users of the rock protection works:

- NnGOWL will ensure fisheries stakeholders are directly informed of the planned works, via the NnGOWL Company Fisheries Liaison Officer and the Commercial Fisheries Working Group;
- A Notice to Mariners will be issued prior to and after the rock protection has been installed;
- A guard vessel will be in attendance whilst the rock protection installation works are ongoing; and,

- Post-installation, NnGOWL will provide the as-built information to the appropriate statutory bodies, to enable Admiralty Chart updates where required. As-built data will also be shared with local fisheries and other marine users as required.

### 3.1.2 Variation Request

The NnGOWL Transmission Marine Licence allows for the permanent deposit of 17,200m<sup>3</sup> stone/rock/gravel. It is required that this amount is increased to 110,000m<sup>3</sup> to enable the installation of the rock berms and rock bags, including contingency for potential locations requiring protection.