# Marine Licence Application for Construction Projects

# Havfrue Cable System

# Attachment C: Environmental Assessment

*CONTENTS*

The Havfrue Cable System (the Project) is a planned subsea cable system in the Atlantic and North Sea linking the countries of the United States, Denmark, Ireland and Norway. This Environmental Assessment (EA) has been produced to support a Marine Licence Application required under Part 4 of the *Marine (Scotland) Act 2010,* for Cable Installation projects for the section of the cable system passing through the Scottish Territorial Sea (TS) and areas affected by rock placement within the United Kingdom (UK) Exclusive Economic Zone (EEZ). The Project does not have a landing in the UK at this time.

Cable installation activities in the TS, including route clearance, cable installation and burial, will be undertaken over the course of six days in spring/summer 2019. Rock placement at nine infrastructure crossing locations in the EEZ will be undertaken in two stages: pre-installation "bottom rock" placement in advance of the cable lay, and post-installation "top rock" placement after the cable is installed. Rock placement is expected to take less than a day per site. No maintenance is required for subsea cables or rock installations once installed. In the event that a cable repair is required, impacts in the immediate vicinity of the repair will be similar in magnitude to those described for installation.

A Scoping Report was developed for the Project and submitted to Marine Scotland on 14 May 2018. Marine Scotland in turn consulted with relevant statutory and advisory agencies and provided a Scoping Opinion for the Project, recommending the following resource areas for inclusion in the EA:

- benthic ecology;
- fish and shellfish ecology;
- designated sites;
- commercial fisheries;
- shipping and navigation;
- unplanned events; and
- cumulative effects.

All of the above topics have been included in this EA, with designated sites addressed in Annex C, since no designated sites would be impacted by licensable activities. Following implementation of mitigation measures, the EA predicts no significant residual impacts on sensitive receptors as a result of the Project. Installation activities are short-term and have been designed to cause minimal disturbance to the marine environment. The permanent structures on the seabed, *ie* the subsea cable and rock installations, were likewise found to have no

significant negative impacts on the identified receptors. In the case of rock installations, there may be some positive effects in terms of habitat creation.

The Havfrue Cable System (the Project) is a planned subsea cable system in the Atlantic and North Sea linking the countries of the United States (US), Denmark, Ireland and Norway. This Environmental Assessment (EA) has been produced to support a Marine Licence Application required under Part 4 of the *Marine (Scotland) Act 2010,* for Cable Installation projects for the sections of the cable system passing through the Scottish Territorial Sea (TS) and areas affected by rock placement within the United Kingdom (UK) Exclusive Economic Zone (EEZ).

The EA aims to identify potential environmental impacts associated with the Project, determine the significance of each impact and recommend appropriate mitigation measures, controls and safeguards to minimise the impacts identified. The EA forms part of a package of Marine Licence Application supporting documents including annotated charts and method statements.

An EA Scoping Report was submitted to Marine Scotland on 14 May 2018. This EA has been informed by the Scoping Report as submitted to Marine Scotland and Marine Scotland's subsequent Scoping Opinion. The Gap Analysis performed following the Scoping Opinion is provided in Attachment J to the Marine License Application. Gaps identified during the scoping process have been addressed in this EA.

This EA supports the Marine Licence Application and should be read in conjunction with the documents listed in *Table 1.1.*

***Table 1.1 Marine Licence Supporting Documentation***

| Supporting document | Description | Formal attachment letter |
|---|---|---|
| Construction Method Statement | Construction Method Statement for the Havfrue Cable System within the Scottish TS and UK EEZ. | Attachment B |
| Navigation Risk Assessment | Risk assessment required as part of the Scoping Opinion to determine the risks to Project and other vessels during cable installation. | Attachment D |

| Supporting document | Description | Formal attachment letter |
|---|---|---|
| Fisheries Liaison and Mitigation Plan | Aims to reduce the potential for negative interactions with fisheries. The fisheries engagement process also serves to identify key stakeholders in the fishing community, confirm notification protocols in advance of operations, identify processes and requirements in the event of gear entanglement and determine mitigation measures and/or "fishing agreements" if these are required. | Attachment F |
| Communication Strategy | Details the liaison procedures that the Havfrue Project Team will follow for dissemination of information in relation to the cable survey, installation and protection activities within the Scottish TS and UK EEZ to the fishing industry and other legitimate users of the sea. | Attachment G |
| Burial Risk Assessment and Protection Plan | Cable route-specific geotechnical report detailing seabed type, likelihood of burial and type of cable armouring required along the route.<br>Details measures taken to protect the cable. | Attachment H |
| Post-Installation Survey and Decommissioning Plan | Describes the requirements for the post-survey installation and decommissioning plan for the Havfrue Cable System in the Scottish TS and UK EEZ. The document presents the following:<br>• Survey types;<br>• Proposed timelines; and<br>• Decommissioning activities. | Attachment I |
| European Protected Species Licence Risk Assessment | Risk assessment covering construction and operational effects on European Protected Species. | *Submitted Separately* |

This EA is structured as follows:

Non-Technical Summary
Section 1: Introduction
Section 2: Project Description
Section 3: Project Alternatives
Section 4: Regulatory Context and Statutory Consent Procedure
Section 5: Environmental Assessment Methodology
Section 6: Environmental Assessment
Section 7: Conclusions
Section 8: References
Annex A: Vessel and Equipment Specifications
Annex B: Substrate Types Crossed by the Cable Route
Annex C: Designated Sites Impact Analysis

# 2 PROJECT DESCRIPTION

## 2.1 PROJECT OVERVIEW

The Project is a planned subsea cable system in the Atlantic and North Sea linking the countries of the US, Denmark, Ireland and Norway. The Havfrue cable will be owned and operated by Optibulk Havfrue As, America Europe Connect 2 Limited (AEC), Edge Network Services Limited and Google Infrastructure Bermuda Limited. Tyco Electronics SubSea Communications LLC (TE SubCom) has been contracted to supply and install the system. AEC is the Applicant for this Marine License.

The Project involves laying a subsea fibre-optic cable (approximately 4 centimetres [cm] in diameter) across the seafloor. The cable will be buried, where conditions allow, out to the 1,500-metre (m) depth contour. This EA addresses the cable segment transiting between Fair Isle and the Shetland Islands (Segment 5: see *Figure 2.1*). Approximately 38 kilometres (km) of cable will cross the Scottish TS, with an additional 939 km crossing the UK EEZ, as shown on *Figure 2.1*. The cable will cross existing pipelines and cables in the UK EEZ but will not cross any in-service cables or pipelines within the Scottish TS. Rock protection will be installed at nine pipeline and cable crossings in the UK EEZ where this has been required by the asset owners.

The Project described in this report incorporates siting and technical considerations undertaken by the Project, as well as industry best practice.

### 2.1.1 Project Objective

The objective of the Project is to install a subsea fibre-optic system providing connectivity across the Atlantic and North Sea. The new system will increase telecommunication reliability and diversity between the regions and increase data transmission capacity and speeds, helping to satisfy the growing demand for transmission capacity in Europe and the US.

## 2.2 PROJECT LOCATION

*Table 2.1* provides the coordinates of the cable entry and exit locations in the Scottish TS. There is no landing site in the UK.

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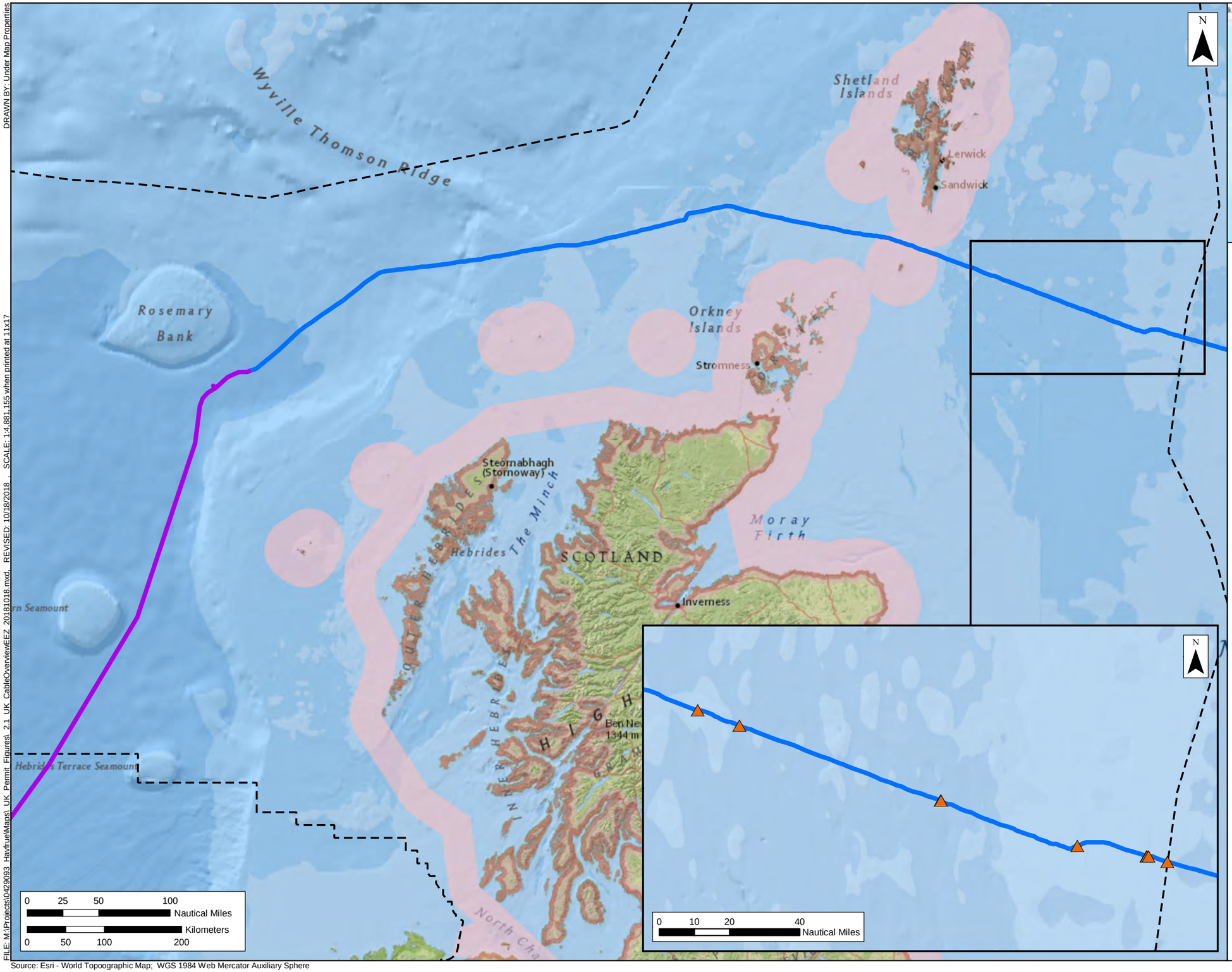




**Legend**

**Havfrue Cable System**

- Segment 3
- Segment 5
- Rock Installation Locations

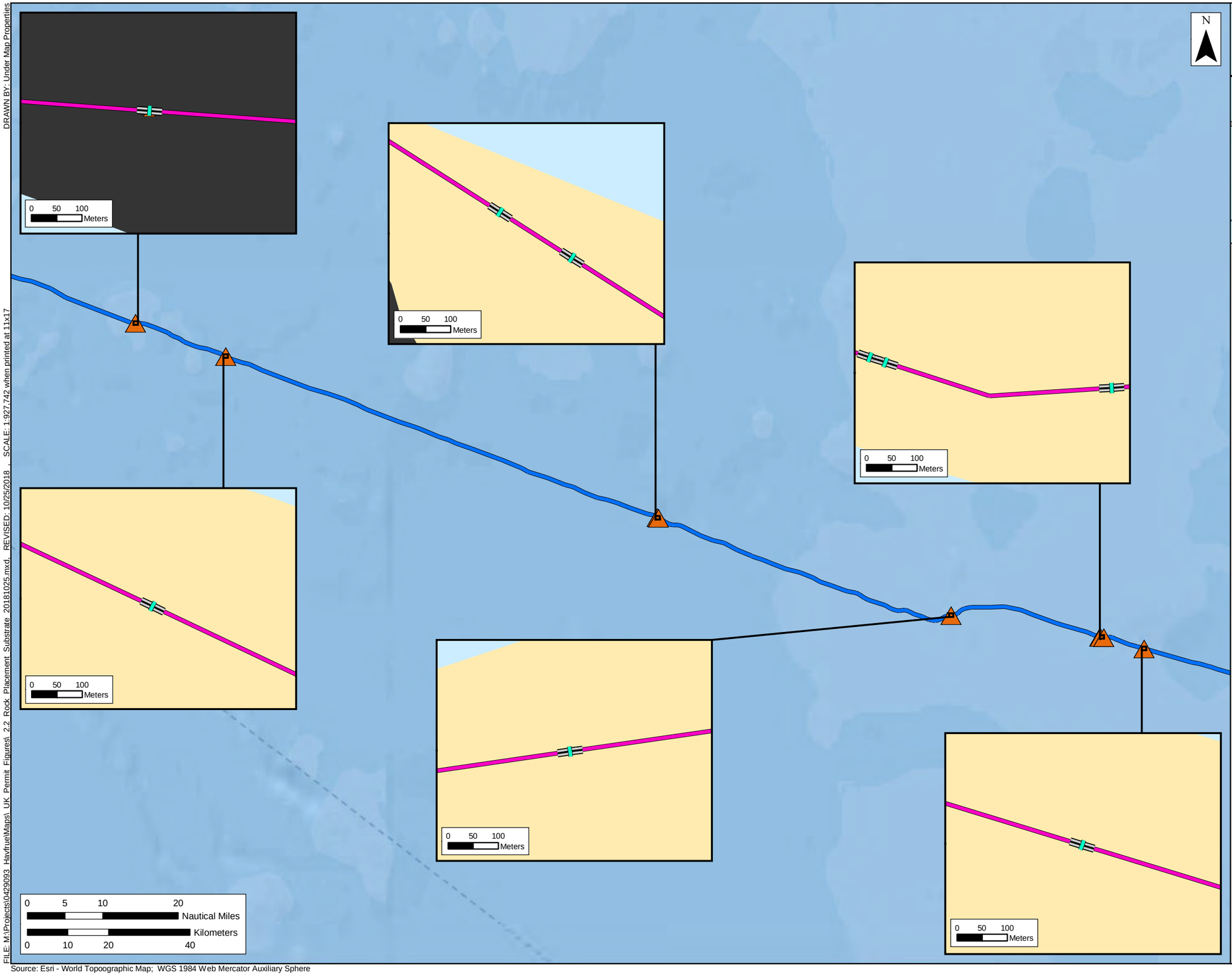
**Jurisdictional Boundaries**

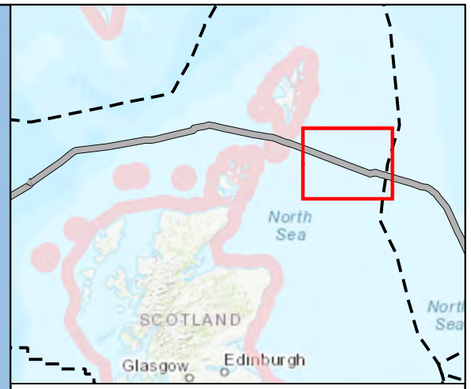
- Exclusive Economic Zone (EEZ) - 200 nmi
- Territorial Seas - 12 nmi

Source: Esri - World Topographic Map; WGS 1984 Web Mercator Auxiliary Sphere

**Figure 2.1**
**Cable Overview in the UK EEZ**
Havfrue Cable System
United Kingdom Transit
TE SubCom

Environmental Resources Management
www.erm.com




**Legend**

**Havfrue Cable System**

Segment 5

Burial Category

Post-Lay Burial (PLB)

**Jurisdictional Boundaries**

Exclusive Economic Zone (EEZ) - 200 nmi

Territorial Seas - 12 nmi

**Rock Installation Features**

Crossing Point

Top Rock Installation Footprint (50 m X 2 m X 1 m) *(Not to Scale)*

Bottom Rock Installation Footprint (20 m X 10 m X 3 m) *(Not to Scale)*

**Substrate**

Sand

Subcropping Rock or Till

**Figure 2.2**
**Substrate and Burial Categories for Rock Installation Locations**
Havfrue Cable System
United Kingdom Transit
TE SubCom

Environmental Resources Management
www.erm.com

Source: Esri - World Topoographic Map; WGS 1984 Web Mercator Auxiliary Sphere

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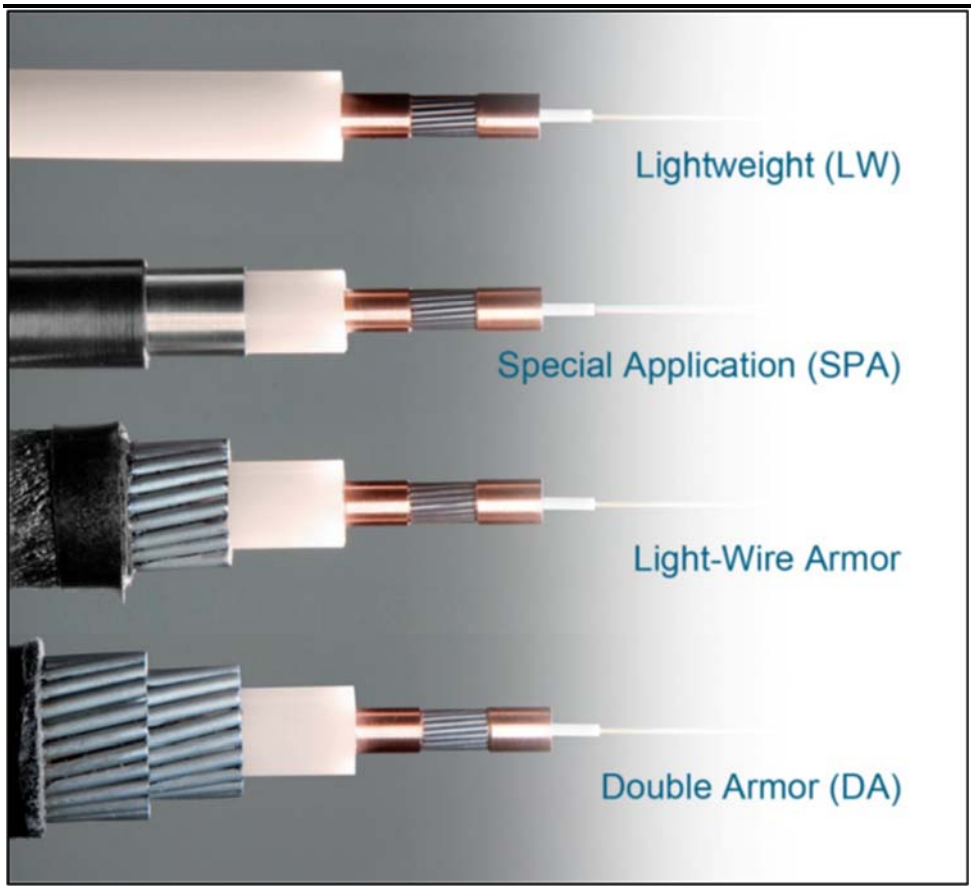
## 2.3 PROJECT COMPONENTS

### 2.3.1 Subsea Cable

The basic design of subsea cables includes steel wire and copper sheathing, and polyethylene insulation surrounding a core of optical fibres (see *Figure 2.3* Subsea Cable Design) Additional layers of protection may be added to the basic lightweight cable. The degree of protection, *ie* double-armoured (DA) versus light-wire-armoured (LWA), will depend on the seabed substrate and the potential for damage (*eg* fishing interaction). The Havfrue Cable System will use DA cable (diameter of approximately 3.59 cm) through the Scottish TS.

*Figure 2.3* **Subsea Cable Design**




(Source: TE SubCom)

### 2.3.2 Rock Installations

As noted earlier, the owner/operators of nine cables and pipelines crossed by the cable route in the UK EEZ are requiring rock protection at the location where the cable crosses their asset. The details of the rock installations are negotiated and documented in crossing agreements, some of which were not yet finalized at the time of writing. Available information on the planned installations for the Havfrue cable has been used for the analysis in the EA.

Each crossing will include a bottom rock installation (pre-cable installation) and a top rock installation to protect the cable once installed. The bottom rock installations will extend 20 m along the pipeline centred at the crossing location, and have a width of 10 m and a berm depth of 0.2 to 0.6 m, depending on the crossing (*Figure 2.4* Bottom Rock Installation Diagram).

The final dimensions of the top rock installation will be determined following post-lay inspection (see *Section 2.4.7*). The top rock installations will be approximately 2 m wide by 30 to 60 m long and 1 m high (*Figure 2.5*).

The operation will use freshly crushed rock (granite/gneiss) between 12 and 20 cm, as recommended by the Scottish Fisherman's Federation (SFF). The slope ratio was also designed in consultation with SFF. *Table 2.3* Dimensions and Volumes for Rock Installations presents the proposed rock installation dimensions and volumes.

***Table 2.3 Dimensions and Volumes for Rock Installations***

| Rock Installation | Length (m) | Width (m) | Height (m) |
|---|---|---|---|
| Bottom Rock | 20 | 10 | 0.2 to 0.6 |
| Top Rock | 30 - 60 | 2 | 1 |

There are eight crossings where top and bottom rock installation will be necessary within the EEZ, with a footprint of 260 $m^2$ to 300 $m^2$ at each site. At least one location will require a top rock installation only (60 $m^2$ footprint). The total footprint on the seabed is estimated at approximately 2,300 $m^2$. The total volume of the rock installations in the UK EEZ is estimated by the Project as 6,765 cubic metres.

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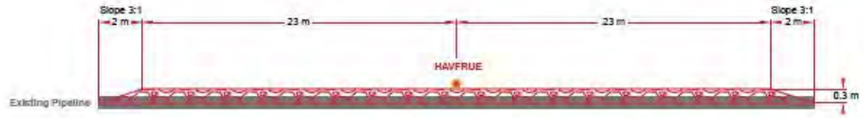
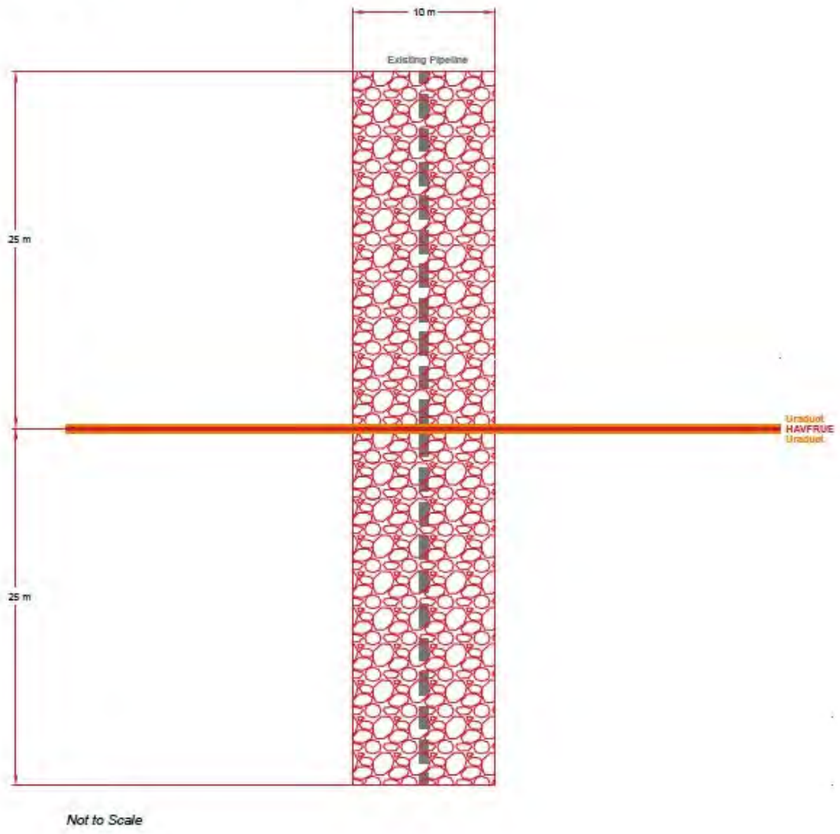
## Elevation


## Cross-Section




## Plan




*Not to Scale*

**PROVISIONAL**

Notes:
Represents the standard dimensions for rock installations along the cable in UK waters. Some variation expected per specific asset owner requests.

**Figure 2.4**
**Typical Bottom Rock Installation Diagram**
Havfrue Cable System
United Kingdom Transit
TE SubCom

Environmental Resources Management
www.erm.com

Source: Esri - World Topoographic Map; WGS 1984 Web Mercator Auxiliary Sphere

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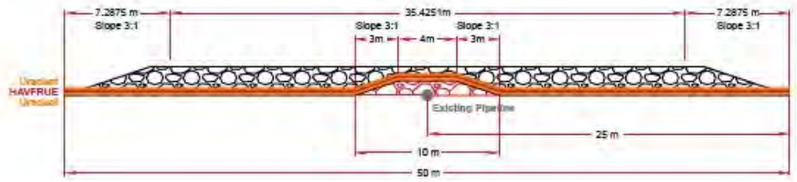
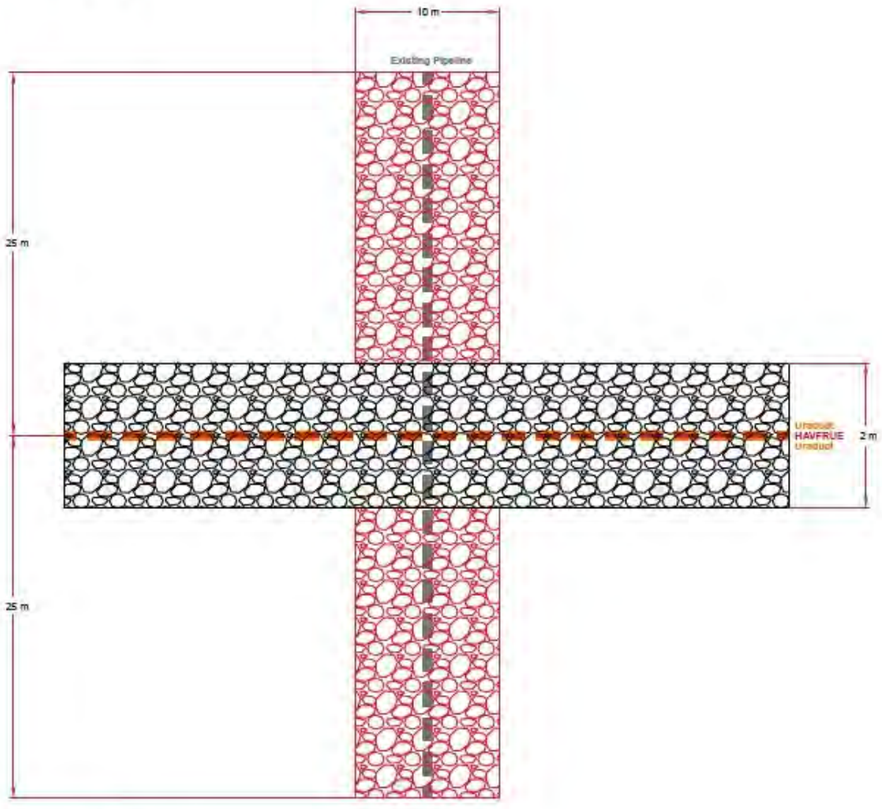
## Elevation




## Cross-Section


## Plan




*Not to Scale*

**PROVISIONAL**

Notes:
Represents the standard dimensions for rock installations along the cable in UK waters. Some variation expected per specific asset owner requests

**Figure 2.5**
**Typical Top Rock Installation Diagram**
Havfrue Cable System
United Kingdom Transit
TE SubCom

Environmental Resources Management
www.erm.com
ERM

Source: Esri - World Topoographic Map; WGS 1984 Web Mercator Auxiliary Sphere

## 2.4 PROJECT ACTIVITIES

The subsea cable installation, operation and decommissioning include the following activities:

1. Cable Route Survey and Design
2. Pre-Lay Inspection and Owner Review
3. Pre-Installation ("Bottom") Rock Placement
4. Cable Installation
    a. Route Clearance of Out-of-Service (OOS) Cables
    b. Pre-Lay Grapnel Run (PLGR)
    c. Main Lay
5. Post-Lay Inspection and Burial (PLIB)
6. Post-Installation ("Top") Rock Placement
7. Operation, Maintenance and Repair
8. Retirement, Abandonment or Decommissioning

These activities are discussed in more detail below.

### 2.4.1 *Cable Route Survey and Design*

*Figure 2.1* shows the proposed cable alignment for the Havfrue Cable System within the Scottish TS. The cable route is designed to avoid hard seabed and other marine hazards and features (*eg* shipwrecks, anchorage areas, fishing and protected areas, and other restricted areas) to the extent possible. The route was engineered in two stages: first through a desktop review and stakeholder consultation, and then refined through a marine survey using geotechnical and geophysical survey techniques, including side scan sonar, backscatter data and core samples to characterise seabed and potential hazards along the route.

### 2.4.2 *UXO Strategy*

Certain sections of the route with a high density of sonar or magnetic contacts will be designated for an Unexploded Ordnance (UXO) survey, which occurs after the main marine geophysical/geotechnical survey. It is anticipated that the survey will be undertaken by towed gradiometer array or remotely operated vehicle (ROV)-mounted gradiometer, at line spacing sufficient to identify the minimum estimated ferrous signature. All operations will adhere to the Construction Industry Research and Information Association (CIRIA) 2015 guidelines, *Assessment and management of unexploded ordnance (UXO) risk in the marine environment*.

The outcome of the UXO survey is not yet complete. As such, no mitigation measures have been determined. However, options of avoidance and removal are the two preferred methods. The UXO survey results may result in further refinements to the route.

### 2.4.3 *Pre-Lay Crossing Inspection and Owner Review*

The Project will perform a pre-lay inspection at the proposed location of each pipeline and cable crossing. The principal inspection tools will be a video system and a cable/pipe-tracking system. Upon completion of the inspection, the recorded video and data will be forwarded to the asset owners for review. The timeline for the review period is typically 2 to 3 weeks, after which the results will be used to finalize the bottom rock installation requirements.

### 2.4.4 *Pre-Installation ("Bottom") Rock Placement*

Bottom rock placement will be undertaken at designated pipeline and cable crossings in advance of cable installation. A pre-rock placement video is typically undertaken to document the condition of the pipeline or cable and record the horizontal and vertical positioning of the asset. A Dynamically Positioned Fall Pipe Vessel (DPFPV) is then moved into position. Rocks are fed into a flexible fall pipe from the deck and placed on the sea floor. The ROV at the end of the fall pipe is used to manoeuvre the pipe and carries all the survey and positioning equipment necessary to allow the crew to accurately place the rock at the pre-determined location.

Upon completion, the ROV will perform a video inspection to document the installation. The rock placement operation will require two to three vessels: a rock placement vessel and an ROV support vessel, where required (see *Annex A* for vessel specifications).

### 2.4.5 *Cable Installation*

*Route Clearance of Out-of-Service Cables*

To allow the cable ship to maximize burial depth along the cable route, a clear cable corridor centred on the cable route should be established at any OOS cable crossings. Before any OOS cable can be cut, the Project will receive permission from the various cable owners to cut and clear the existing cables.

Route clearance operations will involve the following steps:

- Cutting the existing OOS cable at the cable route intersection;
- Recovering the OOS cable that was cut out to the ship for disposal;
- Weighting the OOS cable ends outside the pre-determined corridor with clump weights (small, disk-shaped weight; 0.5 m by 0.2 m thick);
- Lowering the weighted end to the seabed;
- Laying each end back on the original OOS cable route.

This procedure for clearing the OOS cable is intended to ensure a clear passage for the burial operation and to minimize the chances of the OOS cable being fouled or hooked by other seabed users. At this time, three OOS cables

have been identified for removal in the EEZ and one in the Scottish TS (*Table 2.4*). Therefore, a maximum of eight clump weights (two per crossing) will be used across the UK cable installation, at the following crossing points:

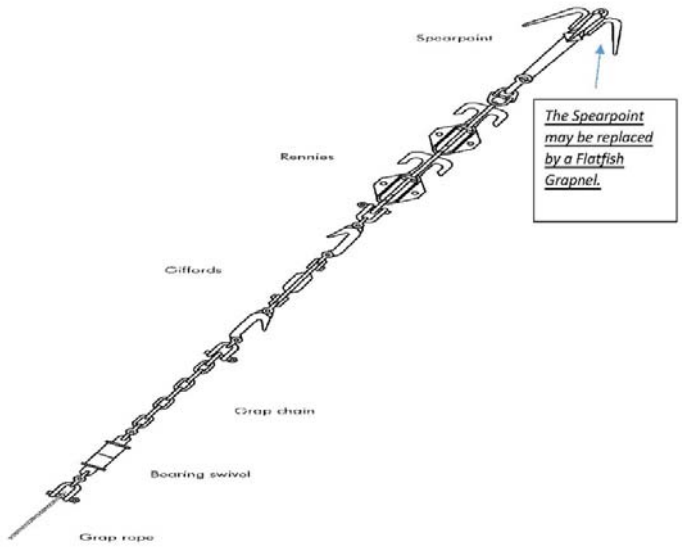
***Table 2.4 Location of OOS Cables in the UK EEZ***

| Latitude | Longitude | OOS Cable |
|---|---|---|
| 59 33.7364N | 006 49.1855W | OOS SCOTICE South |
| 59 53.0940N | 003 45.4829W | OOS TAT-10 Seg B, As-Fnd: MAG |
| 59 36.9020N | 001 14.5238W | OOS Telegraph, Sandwick Bay-Sinclair Bay |
| 59 20.0756N | 000 14.0729E | OOS Telegraph, Peterhead-Alexandrovsk |

*Pre-Lay Grapnel Run*

Immediately prior to installation of the subsea cable, a PLGR will be carried out along the proposed cable route at each location where burial is planned. The intention of the PLGR is to clear seabed surface debris (*eg* wires or hawsers, discarded fishing gear) that may have been deposited on the seabed along the route. The grapnel array will resemble the configuration provided in *Figure 2.6*, using a flatfish or spearpoint grapnel, depending on seabed conditions.

***Figure 2.6 Proposed Grapnel Configuration***




(Source: TE SubCom)

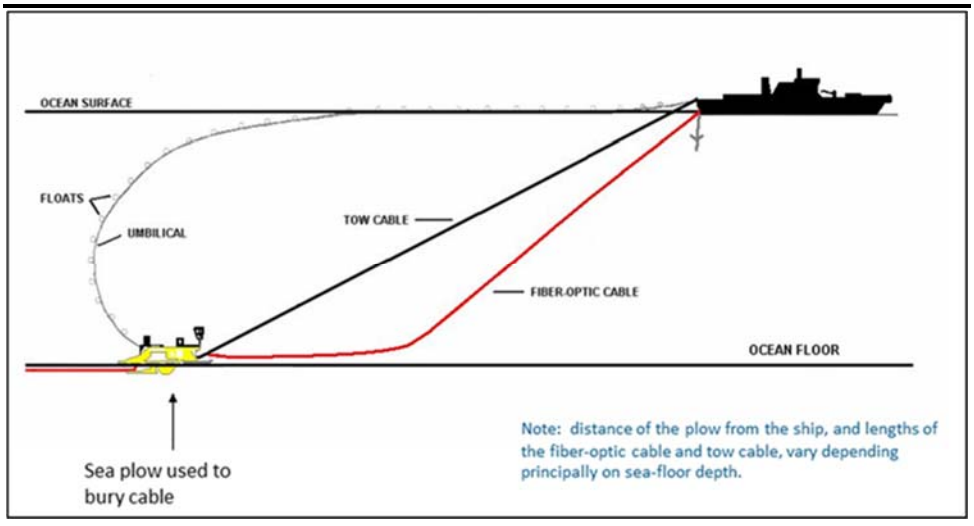
The cable ship will lower a suitable grapnel to the seabed and proceed to tow the grapnel across the seabed along the cable route. Should the first pass encounter any type of debris, two additional parallel passes, on either side of the centre line, will be made. The impact area of each pass will be

approximately 0.75 m, with spacing up to 150 m apart. As the grapnel is pulled across the seabed, typical blade seabed penetration of up to 40 cm is achieved, depending on seabed composition. The grapnel activity will not be conducted in hard bottom areas and will avoid existing buried cables. Debris recovered to the cable ship during these operations will be disposed of appropriately onshore upon completion of the operation.

*Main Lay*

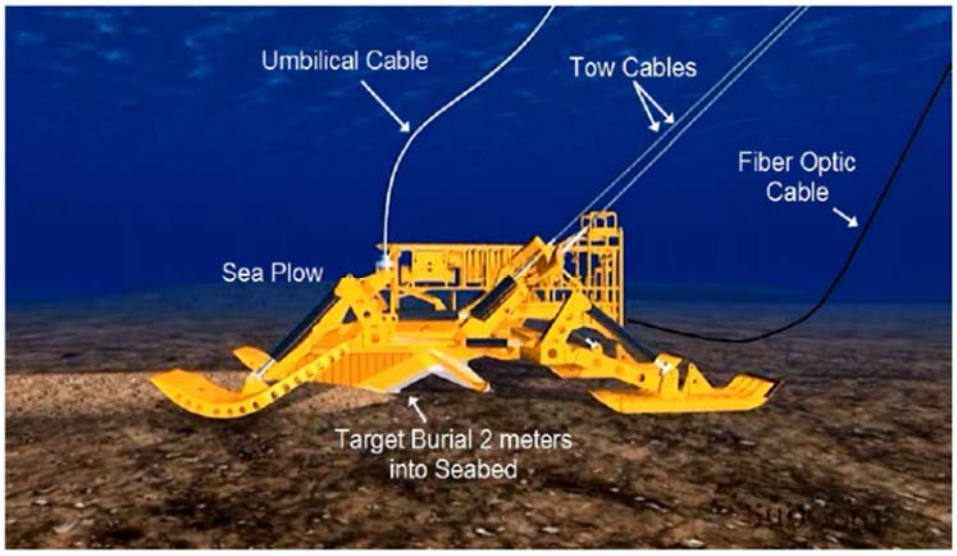
Through soft-bottom areas, including the sections of the cable route through the Scottish TS, the cable ship will install and bury the cable simultaneously using a sea plough (*Figure 2.7*). The sea plough is a burial tool resembling a large sled, approximately 5 m wide, attached to the cable ship with a tow wire (*Figure 2.8,* full specification in *Annex A*). It allows for mechanical burial of the cable to a desired depth by creating a furrow approximately 0.75 m wide and feeding the cable to the bottom of the furrow. As the plough moves forward, the cable lies in the bottom of the furrow and is backfilled via the movement of sediment on the seafloor as the plough is towed across the bed. Typical operational plough speeds are less than 1 knot, depending on the stiffness of the seabed and other factors such as sea state, weather, current speed *etc.* In hard bottom areas and areas below 1,500 m depth, the cable will be surface-laid on the ocean floor.

***Figure 2.7*** ***Towed Sea Plough***




(Source: TE SubCom)

*Figure 2.8 Sea Plough*




(Source: TE SubCom)

Computerised modelling and tracking from the cable ship are used to control position and tension of the cable during laying activities, as well as correct for external factors such as wind and ocean currents. Information such as the planned cable route, bathymetry, the ship heading, position and speed, cable characteristics and layout speed are integrated into the software to optimise real-time monitoring of the cable installation. Use of the cable lay software during installation reduces the likelihood of unwanted cable suspensions and assists in accurately placing the cable along the planned route. Once the cable is laid and buried, it maintains position on the seabed due to burial methods (avoiding cable slack), the weight of the cable and the burial depth.

### *2.4.6 Cable and Pipeline Crossings*

Where the cable route crosses existing infrastructure, the approach for each crossing will be negotiated with the owners of the existing infrastructure. During installation, the plough will be secured to the deck and the cable will be surface laid across infrastructure crossings, typically 500 m either side. The cable is subsequently buried in this area during the PLIB. Instead of or in addition to rock protection, the cable may be fitted with a URADUCT® sleeve to provide separation between the subsea cable and the pipeline or cable, minimising the risk of abrasion damage. URADUCT protection is not planned for crossings in the UK at this time.

### *2.4.7 Post-Lay Inspection and Burial*

Following the completion of the main lay, an ROV will be piloted along the route to inspect the buried cable as part of the main lay cable installation. Where plough burial is not possible as part of the main lay cable installation

(*eg* crossings of other in-service cables) or where the cable plough could not achieve the target depth due to bottom conditions or technical issues, the subsea cable may be surface-laid by the cable ship and subsequently buried during the PLIB.

If required, the PLIB will be undertaken by an ROV, deployed and operated from the cable ship or support vessel via a control umbilical. The ROV uses a seawater jetting tool directed into the seabed to agitate the seabed. The weight of the cable allows it to be buried to the required depth. The ROV jetting system slowly moves along the seabed on the required cable track forming a trench into which the cable is buried. No seabed materials will be introduced or removed from the area.

The PLIB can take place any time after the initial marine installation is completed.

### *2.4.8 Post-Installation ("Top") Rock Placement*

The purpose of the top layer rock installation is to protect the cable from external damage due to activities such as fishing. Top rock placement will take place after PLIB. The basic installation method will be the same as that described for bottom rock installation (*Section 2.3.2*). The top rock placement is designed to protect the cable passing over a feature, such as a pipeline, and as such is thinner and longer than the bottom rock placement (discussed in *Section 2.4.4*).

As detailed in *Section 2.4.4*, two to three separate vessels will be used during the rock placement operations.

### *2.4.9 Operation, Maintenance and Repair*

No routine maintenance is required or planned for the marine elements of the Project due to the stability of the seabed environment. Should the cable be damaged by anchors or fishing gear, the location of the interruption can be pinpointed electronically by the onshore cable terminal station and on site by the repair vessel through the use of low-frequency electroding. Methods for repairing any damage would be determined based on the depth of water and depth of burial at that location.

### *2.4.10 Retirement, Abandonment or Decommissioning*

The Project's life expectancy is approximately 25 years. In accordance with the Initial Decommissioning Plan (to be submitted to Crown Estate Scotland [CES]), the Applicant will advise Marine Scotland and the CES of the status and disposal of the inactive cable.

The method of abandonment and/or removal and final disposal option will be evaluated by Marine Scotland and the CES at the end of the Project's life expectancy.

## 2.5 *PROPOSED INSTALLATION SCHEDULE*

The anticipated construction schedule for the proposed work is shown in **Table 2.5 Proposed Installation Schedule, Scottish TS***Table 2.5* and *Table 2.6.* Combined activities associated with the cable installation operation within the Scottish TS are expected to require approximately 6 days, operating 24 hours per day, 7 days per week.

***Table 2.5 Proposed Installation Schedule, Scottish TS***

| Segment | Activity | Target Start Date | Duration (Scottish TS) |
|---|---|---|---|
| **Segment 5** | OOS cable route clearance | April 2019 | 2 days |
| | Pre-lay grapnel run | May 2019 | 2-3 days |
| | Marine cable lay | May 2019 | 2 days |
| | PLIB | July 2019 | Not planned |

***Table 2.6 Proposed Schedule, Rock Placement in UK EEZ***

| Segment | Activity | Target Start Date | Duration |
|---|---|---|---|
| **Segment 5** | Pre-lay crossing inspections | March 2019 | 2-3 days |
| | Bottom rock installation | May 2019 | 3-5 days |
| | Marine cable lay across section of EEZ w/rock installations (169 km) | May 2019 | 12 - 18 days |
| | PLIB | August 2019 | 4-6 days |
| | Top rock installation | August 2019 | 3-5 days |

## 2.6 *CONSULTATIONS*

Consultation with other marine users, including fishermen and ferries, was undertaken during the pre-planning and design stage of the Project. The SFF provided extensive comments, charts and recommendations for avoiding fishing areas along the cable route through the Scottish TS. These zones have been avoided to the extent possible. Cables will be buried, where feasible, in water depths shallower than 1,500 m to avoid conflicts with fishing gear and disturbance to marine species. SFF also provided feedback on the rock installation specifications, including rock size and berm dimensions.

The National Federation of Fishermen's Organisations (NFFO) had no comments and stated that SFF had the best knowledge of the route in this area. The Kingfisher Information Service was made aware of the route and had no comments, but will provide notifications at the appropriate time to its members. The final installed route will be included in the cable awareness notices distributed by Kingfisher. Additional information on past and planned engagement with fishermen and other sea users – e.g. UK MOD, Northlink

Ferry - is provided in the Marine Liaison and Management Plan and Correspondence Record, provided as separate attachments to the Marine License Application.

## 2.7 *SIGNIFICANT NEARBY PROJECTS*

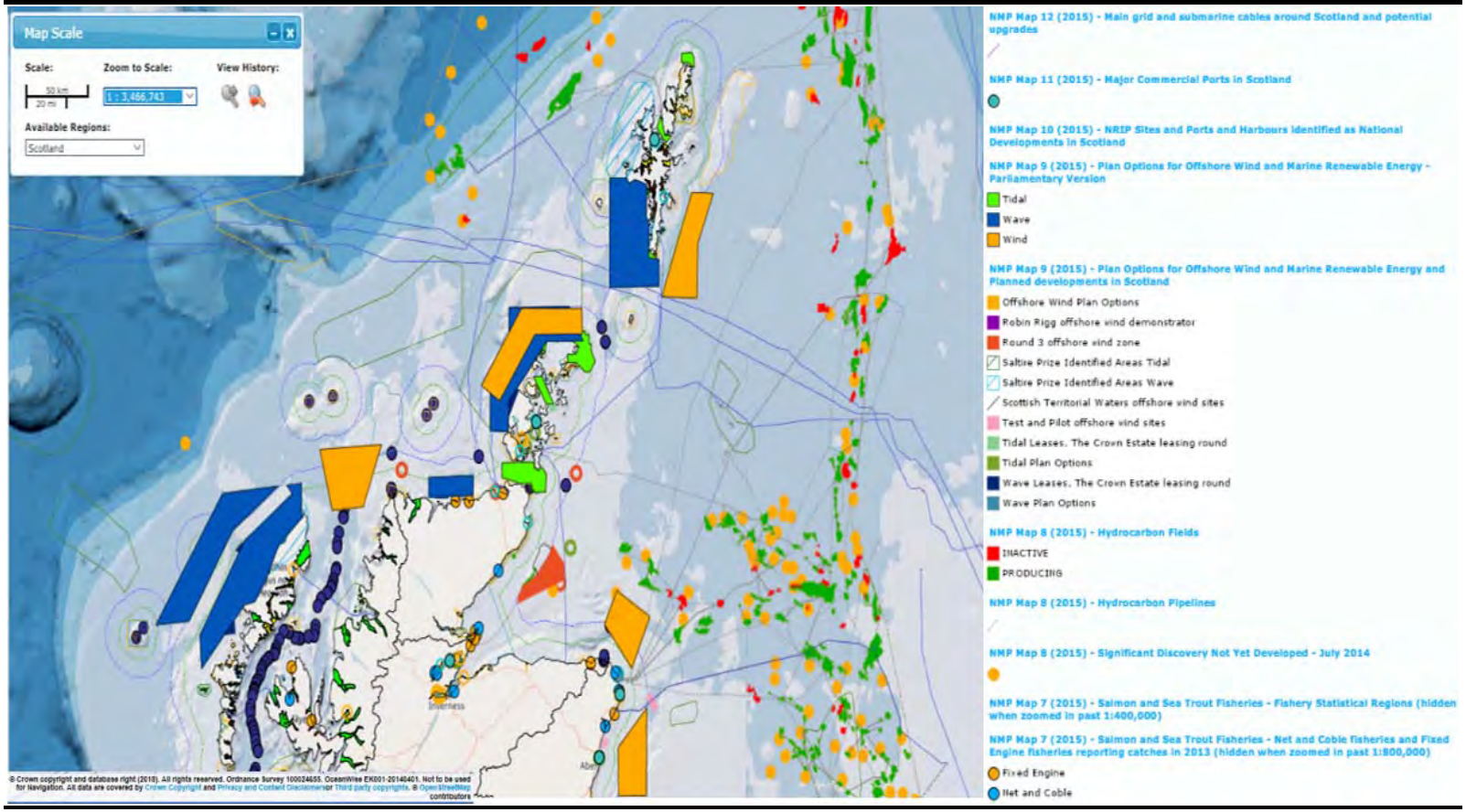
A number of current and proposed developments are near the proposed cable route. *Table 2.7* outlines the key developments that have been identified close to the proposed cable route. The locations of the projects are presented on *Figure 2.9*, along with existing pipelines, cables, and oil and gas fields. *Figure 2.10* presents the Ministry of Defence Danger Area through which the cable crosses in the EEZ.

### *Table 2.7 Current and Proposed Developments*

| Development / Project | Description | Distance and Direction from Cable Route | Consenting Status |
|---|---|---|---|
| Marine Renewable Energy - Tidal | There are several zones planned for marine renewable energy operations in the form of tidal energy to the north and south of the proposed cable route located at two sites near Orkney (10 km) and the Shetland. Within these zones there are several proposed schemes. South of the Shetland Islands, the proposed cable route travels through an area that has the potential to be developed. No further information on the stage of development is available. | NE approx. 19 km | Proposed |
| Marine Renewable Energy - Wind | There are several zones planned for offshore wind operations north and south of the proposed cable route near Orkney (8 km) and the Shetland Islands (20 km). South of the Shetland Islands, the proposed cable route travels through an area that has the potential to be developed as a wind farm. No further information on the stage of development is available. | NE approx. 11 km | Proposed |
| Ferry route from Aberdeen via Orkney (Kirkwall) to Shetland (Lerwick) | Operated by Northlink Ferries (two ferries a day, Northbound and Southbound). Departs Aberdeen at 17.00 or 19.00. Arrives Lerwick 07.30. | Crossing within TS | n/a |
| Ferry route from Fair Isle to Shetland (Grutness) | Operated by Shetland Island Council. Runs Tuesday, Thursday and Saturday, once per day. | Crossing within TS | n/a |

| Development / Project | Description | Distance and Direction from Cable Route | Consenting Status |
|---|---|---|---|
| Crown Estate Licence – TAT 14 Seg K | Telecommunications Cable – British Telecom plc | Crossing outside TS | Confirmed and in place |
| Crown Estate Licence – SHEFA-2 | Telecommunications Cable - P/F SHEFA | Crossing outside TS | Confirmed and in place |
| Crown Estate Licence – Atlantic I Segment A | Telecommunications Cable - Level 3 Communications Europe | Crossing outside TS | Confirmed and in place |
| Ministry of Defence Danger Area | Live firing range off the west coast of Scotland, within the EEZ. | Crossing within EEZ | Confirmed and active |

**FIGURE 2.4 CURRENT AND PLANNED DEVELOPMENTS**




(Source: https://marinescotland.atkinsgeospatial.com/nmpi/)

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Thomson Ridge

Rosemary Bank

Dohrn Seamount

Hebrides Terrace Seamount

Orkney Islands

Stromness

Steornabhagh (Stornoway)

Outer Hebrides

The Minch

Inner Hebrides

Hebrides

SCOTLAND

Moray Firth

Inverness

Aberdeen

HIGHLANDS

GRAMPIAN MOUNTAINS

THE MOUNTH

Ben Nevis 1344 m

Dundee

Firth of Forth

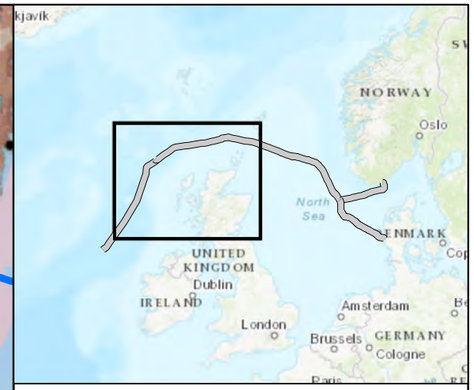
Edinburgh

Glasgow

N

0 20 40 80 Nautical Miles

0 40 80 160 Kilometers




**Legend**

**Havfrue Cable System**

- Segment 3
- Segment 5

**Jurisdictional Boundaries**

- Exclusive Economic Zone (EEZ) - 200 nmi
- Territorial Seas - 12 nmi

**Danger Areas**

- MOD Danger Area

**Figure 2.9**
**Danger Areas in the UK EEZ**
Havfrue Cable System
United Kingdom Transit
TE SubCom

Environmental Resources Management
www.erm.com
ERM

Source: Esri - World Topographic Map; WGS 1984 Web Mercator Auxiliary Sphere

# 3 PROJECT ALTERNATIVES

## 3.1 SUBSEA CABLE ROUTE DESIGN

Marine cable routes are developed through an iterative review of desktop and survey information, and incremental changes are made during this process. The proposed cable route through Scottish TS and the UK EEZ incorporates avoidance of key features in the Project area, including Marine Protected Areas (MPAs) and important commercial fishing areas identified in consultation with the SFF. Route survey data enabled minor route adjustments to reduce hard bottom and increase burial feasibility along the planned route.

## 3.2 DO-NOTHING ALTERNATIVE

The "do-nothing" alternative is a hypothetical scenario sometimes considered as a basis for comparing the development alternatives under consideration. Within the context of the Project, the 'do-nothing' scenario would mean that the Project would not be implemented and the Havfrue Subsea Cable System would not be installed across the Scottish TS and UK EEZ.

Given the demand for high-speed telecommunications links, capacity, reliability and diversity in the North Sea region, it is likely that another cable system would be proposed in the near future to address this demand. The details of such a proposed project are not known at this time but can be assumed to be similar in scope, and therefore involve similar impacts as those addressed in this document.

## 3.3 ORIGINAL HAVFRUE ROUTE

The proposed cable route passes through two nationally designated MPAs in the EEZ, namely, West Shetland Shelf NCMPA and North-West Orkney NCMPA. As discussed in more detail in Appendix A of the Scoping Report, the original Havfrue cable route had more cable length crossing the UK MPAs. Following consultation with fishermen and other interested parties, a re-route was undertaken to avoid a fishing area located between the two MPAs and reduce the route length crossing the MPAs by 53 percent. The re-route was reviewed with interested parties, including fishermen and lease block owners, agreed to be satisfactory and replaced the original MPA crossing alternative.

# 4 REGULATORY CONTEXT AND STATUTORY CONSENT PROCEDURE

## 4.1 INTRODUCTION

A Marine Licence is required for the installation and operation of submarine cables on and under the seabed in the Scottish TS and for the placement of rocks over the cable in the EEZ. Neither of these activities is considered to constitute "EIA Development" as defined under the *Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017*. Therefore, a statutory environmental impact assessment (EIA) is not required to support the Marine Licence applications. However, the Project will require a number of consents and licences and a review of the marine licensing process has been undertaken to ensure that the correct marine licence(s) are applied for. This section summarizes the permissions that apply to the licensable activities of the proposed Project.

Permit conditions may be attached to take account of conservation designations and other marine users.

## 4.2 MARINE LICENCE

The *Marine (Scotland) Act 2010* provides the framework for the marine licensing system in Scotland. Under Part 4 of the 2010 Act, Marine Scotland is the responsible authority for licensing of activities in relation to construction or removal of any objects or substances in Scottish territorial waters (up to 12 nautical miles [nm]).

The *Marine and Coastal Access Act (MCAA) 2009* gives authority to Marine Scotland in the offshore region (12 to 200 nm) to consider applications for a marine licence within the EEZ.

## 4.3 EUROPEAN PROTECTED SPECIES LICENCE

The *Conservation of Habitats and Species Regulations 2017* provides the designation and protection of European Sites, the protection of European Protected Species (EPS) and the adaptation of planning and other controls for protection of European Sites. Under the regulations, Marine Scotland has to consider the European Commission (EC) Habitats Directive and Wild Birds Directive when issuing marine licences.

All cetacean species are EPS. If any activity is likely to cause disturbance or injury to an EPS, a licence is required to undertake the activity legally. This applies to both coastal waters (<12 nm from shore) and offshore waters (>12 nm from shore).

By undertaking a risk assessment it can be determined if the Project activities can be mitigated to avoid causing a negative effect on maintaining the species at a favourable conservation status. A risk assessment has been conducted for the planned activities associated with the Project.

If risks to the species cannot be mitigated, an EPS licence must be applied for. This requires a form to be completed detailing the species which may be affected, their location in relation to the Project, the likely effects and the duration of the effect.

## *4.4 SEABED LEASE*

The CES owns and manages the seabed out to 12 nm (overlapping with the TS). A seabed licence is needed for the right to lay, maintain and operate a cable. The CES has produced a set of guidelines on submarine cable installation (Red Penguin Associates Ltd. 2012) which should be consulted when providing information regarding cables crossing the UK EEZ to the CES to ensure there is no conflict with existing infrastructure and activities. Under the *Crown Estate Act 1961* a CES seabed licence will be required for the Havfrue cable system.

Applicants are required to obtain all necessary consents from applicable government agencies, as well as crossing and proximity agreements from existing tenants before the seabed licence can be granted. Occupation of the site and performance of work cannot commence until the legal agreement between CES and the Applicant has been completed. Negotiations with the CES for this Project were initiated in early 2018 and are at an advanced stage.

## *4.5 WORK LICENCE*

### *4.5.1 Works Licence Policy*

The Shetland Islands Council is responsible for implementing the sustainable economic development of the coastal area of Shetland, and the Council's Works Licence Policy aims to guide development applications out to 12 nm. Any proposal for development in the coastal area has to consider a wide range of marine activity and resource use, many of which have an economic, environmental and social impact both in the sea and on the neighbouring land. The Works Licence Policy provides the framework required to allow the Council to make informed decisions on proposed developments. In considering applications for marine developments (including cable laying) the Council will also consult the Shetland Islands' Marine Spatial Plan, which sets out the spatial development strategy for all marine resource users.

### 4.5.2 *Shetland Islands' Marine Spatial Plan*

The Shetland Islands' Marine Spatial Plan notes that proposals for developments and infrastructure in the coastal zone will only be permitted where the proposal can demonstrate that:

- it will not have a significant impact on the natural, built environment and cultural heritage resources whether in the sea or on land;
- the location, scale and design are such that it will not have a significant adverse impact;
- it does not result in any deterioration in ecological status or potential for any water body or prevent it from achieving good ecological status in the future; and
- there is no significant adverse impact on other users of marine resources, and/or neighbouring land.

For most new marine developments or variations to existing marine infrastructure, proposals will be assessed against the Council's Works Licence Policy.

## 4.6 *INTERNATIONAL MARITIME ORGANISATION*

The *International Convention for the Control and Management of Ships' Ballast Water and Sediments* (BWM Convention) was adopted in 2004 to introduce global regulations to control the transfer of potentially invasive species.

Under the BWM Convention, all ships in international traffic are required to have a ship-specific ballast water management plan to aid in the management of their ballast water and sediments. From 2017 it has been a requirement that all vessels must carry a ballast water record book and an international ballast water management certificate on board. The ballast water management standards are being phased in over a period of time. During the installation of the cable no ballast water exchange will occur within the Scottish TS.

## 4.7 *NATIONAL MARINE PLAN*

Under the *Marine (Scotland) Act 2010* Scottish Ministers have prepared and adopted a National Marine Plan covering both Scottish inshore and offshore waters. Furthermore, the *Marine and Coastal Access Act 2009* requires Scottish Ministers to seek to ensure that a marine plan is in place in the offshore region when a Marine Policy Statement[(i)] is in effect.

Scotland's National Marine Plan covers Scottish inshore and offshore waters, out to 200 nm. The Plan has been prepared in line with the European Union (EU) Directive 2014/89/EU which provides a framework for maritime spatial

(i) UK Marine Policy Statement 2010. https://www.gov.uk/government/publications/uk-marine-policy-statement.

planning and promotes sustainable development of marine areas, and sustainable uses of marine resources.

More local to this Project, the Shetland Islands is one of the first regions to take forward Regional Marine Planning, with the Orkney Islands expected to follow soon. These Regional Marine Plans will be developed by local Marine Planning Partnerships, allowing more local ownership and decision-making about specific issues within their area.

# 5 ENVIRONMENTAL ASSESSMENT METHODOLOGY

## 5.1 ASSESSMENT OF EFFECTS AND EVALUATING SIGNIFICANCE

### 5.1.1 Definition of the Assessment Area

The first step in the EA is to define the licensable activities to be included in the assessment, and the geographic extent of the analysis. The scope of this Project includes the following licensable activities:

1. **Subsea cable installation in Scottish TS,** including the following activities:
    a. cable installation (including clearance of OOS cables, PLGR, and marine cable installation);
    b. operation, maintenance and repair; and
    c. retirement, abandonment or decommissioning.

2. **Rock placement in the UK EEZ,** including the following activities:
    a. pre-lay crossing inspections and "bottom" rock placement;
    b. marine cable installation;
    c. PLIB;
    d. post-installation ("top") rock placement;
    e. operation, maintenance and repair; and
    f. retirement, abandonment or decommissioning.

### 5.1.2 Identification of Effects

The next step in the EA is to identify the Project activities that are likely to result in changes to the natural and human environment throughout the life of the Project. A Scoping Report was submitted to Marine Scotland on 14 May 2018. Marine Scotland in turn consulted with relevant statutory and advisory agencies and provided a Scoping Opinion, recommending a list of resource areas for inclusion in the EA. An overview of these topics is presented in *Section 6.1*.

### 5.1.3 Evaluation of Significance

The significance of the potential impacts of the Project is assessed in terms of:

- magnitude based on the size, extent and duration of the effect; and
- sensitivity of the receiving receptors.

*Predicting Magnitude of Effects*

The term "magnitude" is used to encompass all the dimensions of the predicted impact, including:

- the nature of the change (what is affected and how);
- its size, scale or intensity;
- its geographical extent and distribution;
- its duration, frequency and reversibility; and
- where relevant, the probability of the impact occurring as a result of accidental or unplanned events.

The Scoping Report identified unplanned events (*eg* fuel spills resulting from vessel collision) as potentially significant and these will be assessed further within this EA.

Magnitude is assessed against environmental impact and regulatory compliance. A general definition of levels of magnitude is provided in *Table 5.1.* The magnitude is defined differently according to the type of effect. For readily quantifiable effects, numerical values can be used whereas for other topics a more qualitative definition may be necessary.

***Table 5.1 Magnitude***

| Level | Magnitude | Environmental Impact | Regulatory Compliance |
|---|---|---|---|
| 0 | Positive impact | An enhancement of some ecosystem or population parameter. | N/A |
| 1 | Negligible impact | Slight environmental damage contained within the premises. | No likelihood of breach of regulatory consent limits or corporate/ company goals. |
| | | Impacts unlikely to be discernible or measurable. | |
| | | No contribution to transboundary or cumulative impacts. | |
| 2 | Small impact | Minor environmental damage, but no lasting impacts. | Regulatory terms set defined consent limits. |
| | | Change in habitats or species which can be seen and measured but is at same scale as natural variability. | |
| | | Unlikely to contribute to transboundary or cumulative impacts. | |
| 3 | Medium impact | Environmental damage that will persist or require cleaning up. | Possible minor breach of specific regulatory consent limits resulting in non-compliance. |
| | | Widespread change in habitats or species beyond natural variability with recovery likely within 1-2 years following cessation of activities, or localised medium-term degradation with recovery in 2-5 years. | |
| | | Possible minor transboundary and cumulative impacts. | |

| Level | Magnitude | Environmental Impact | Regulatory Compliance |
|---|---|---|---|
| 4 | Large impact | Severe environmental damage that will require extensive measures to restore beneficial uses of the environment. Widespread degradation to the quality or availability of habitats and/or wildlife requiring significant long-term restoration effort.<br><br>Recovery not expected for an extended period (>5 years following cessation of activity) or that cannot be readily rectified.<br><br>Transboundary impacts or contribution to cumulative impacts anticipated. | Possible major breach of specific regulatory consent limits resulting in non-compliance which can result in Project delays and prosecution. |

*Sensitivity of Receptor*

Assessment of sensitivity is undertaken by considering the conservation significance of the species affected and habitats known to be present. *Table 5.2* presents the definition of sensitivities used in this assessment.

***Table 5.2 Sensitivity***

| Level | Sensitivity | Definition |
|---|---|---|
| A | Low | Receptor with low value or importance attached to them, *eg* habitats or species which are abundant and not of conservation significance. |
| B | Medium | Receptor of importance, *eg* recognised as an area/species of potential conservation significance such as Annex I Habitats and Annex II species. |
| C | High | Receptor of key importance, *eg* recognised as an area/species of potential conservation significance with development restrictions such as species listed as critical on the (International Union for Conservation of Nature) IUCN Red List. |

*Evaluation of Significance*

Once determined, the magnitude of the impact and sensitivity of the receiving environment are then combined to determine the significance of the impact, as shown in *Table 5.3.*

*Table 5.3 Evaluation of Significance*

| | | SENSITIVITY | | |
|---|---|---|---|---|
| | | **A - Low** | **B - Medium** | **C - High** |
| **MAGNITUDE** | 0 - Positive Effect | Positive | Positive | Positive |
| | 1 - Negligible | Negligible | Negligible | Negligible |
| | 2 - Small | Negligible | Minor | Moderate |
| | 3 - Medium | Minor | Moderate | Major |
| | 4 - Large | Moderate | Major | Major |

### *5.1.4 Mitigation*

The EA identifies mitigation measures that can be put in place to prevent, reduce or offset the identified adverse environmental impacts, or create or enhance environmental benefits.

### *5.1.5 Residual Impact*

The iterative impact assessment process takes into account the mitigation measures that have been adopted as part of the Project design and Project plan. As such, each impact is reassessed taking mitigation measures, controls and safeguards into account to determine the residual impact.

## 6.1 OVERVIEW OF EXISTING ENVIRONMENT

The description of the existing environment has been divided into the two main Project areas addressed by this assessment: the 38 km cable route through the Scottish TS and the locations of planned rock installations within the UK EEZ. The latter are within an approximately 169 km stretch of cable east of the TS (*Figure 2.2*).

In cases where the existing environment is substantially the same across both locations, a single description has been provided for the general Project area.

### 6.1.1 Physical Environment

*Metocean Conditions, Geology, Geomorphology and Sedimentary Processes*

Cable Route through Scottish TS

The water depths along the planned cable route through the Scottish TS range from 97 to 126 m through complex topography and moderate to strong water currents. *Annex B* provides a mapbook of substrate types crossed by the marine cable route within the Scottish TS. Based on the seabed survey undertaken in August 2018 the seabed type along the proposed cable route includes:

- sand;
- subcropping rock or till;
- outcropping till; and
- rock.

Rock Installation Locations in the UK EEZ

Water depth in the area of the planned rock installations ranges from 110 to approximately 140 m (see *Table 2.2*). As shown on *Figure 2.2*, the seabed survey identified the following substrate types in the areas designated for rock installation:

- sand; and
- subcropping rock or till.

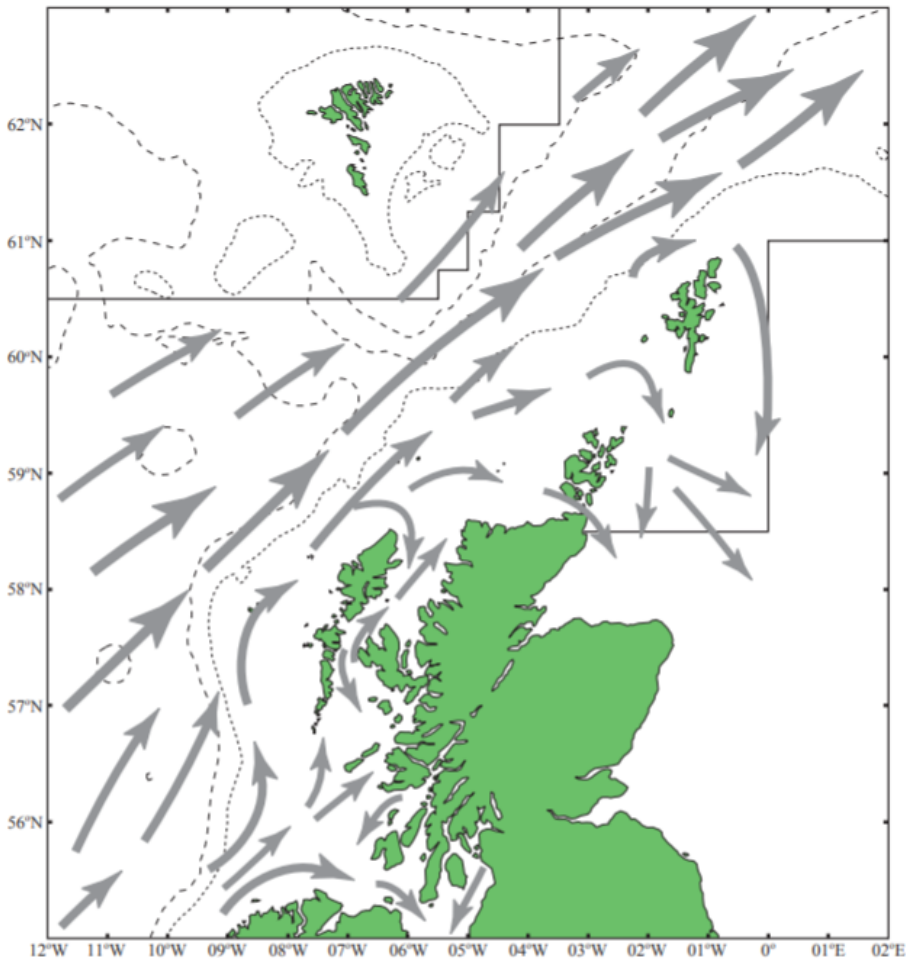
*Water Quality*

The proposed cable route through the Scottish TS passes through an area of offshore marine water north of Fair Isle. *Figure 6.1* shows the direction of movement of water through the Project area as coming from the southwest along the west coast of Scotland towards Shetland. The mainly wind-driven

Fair Isle Current moves between Orkney and Shetland before turning southeast and flowing into the North Sea (Turrell *et al*. 1990).

The offshore waters along the proposed cable route do not show significant anthropogenic contamination (Baxter *et al*. 2011).

***Figure 6.1 Movement of Water Currents through the Project Area***




Source: JNCC, 2000
Bathymetry: short dash (200 m isobath); long dash (1,000 m isobath)

*Noise*

Ambient sea noise comprises a variety of individual sources, some of which are natural and some man-made. Natural noise sources include waves breaking, wind, rain and animal calls, while anthropogenic sources include general shipping, fishing vessels, recreational and military activities, seismic survey activities and drilling.

Anthropogenic sources in the Project area are predominantly generated from vessels transiting through the Fair Isle shipping channel and along the ferry

routes. Fishing vessels will also generate noise and are not confined to charted shipping channels.

### *6.1.2 Biological Environment*

Existing information has been used to support the description of the environment along with more detailed geophysical studies along the cable route. Other information sources include the Marine Habitat Classification for Britain and Ireland (Joint Nature Conservation Committee [JNCC] 2018), the Marine Scotland interactive map and the UK Offshore Energy Strategic Environmental Assessment (Department of Energy & Climate Change [DECC] 2016).

*Benthic Ecology*

Based on the JNCC's predictive mapping the EUNIS (2007) broad habitat types along the proposed cable route include:

- deep-sea muddy sand in waters west of Scotland that are considered to be sparsely populated by benthic organisms;
- deep circalittoral and coarse sediment in the north and northeast that are considered to be quite diverse and generally characterised by robust infaunal polychaete and bivalve species; and
- deep circalittoral mud in areas of the northern North Sea to the east that are dominated by polychaetes but often with high numbers of bivalves such as *Thyasira* spp., echinoderms and foraminifera.

Around Fair Isle, subtidal sediments are relatively sparse, other than coarse shell-gravels. Closer to the coast in sheltered regions, the finer sediments are characterised by species such as the lugworm *Arenicola marina* and the sand-mason *Lanice conchilega* (Wilding *et al.* 2005).

The benthic flora and fauna around the Orkney Islands are dependent on the physical conditions, which vary considerably on a local scale. In the deeper and exposed sublittoral, faunal crusts with the polychaete *Pomatoceros triqueter*, the barnacle *Balanus crenatus* and bryozoans may be present while dead man's fingers *Alcyonium digitatum*-dominated communities may be found on moderately exposed rock. Bryozoans, mussel beds (both *Mytilus* and *Modiolus*), brittle stars and faunal and algal encrusting species with the presence of the sea urchin *Echinus esculentus* form the characteristic species of these communities (Wilding *et al.* 2005).

*Fish and Shellfish Ecology*

The Project area supports spawning of a number of fish species. Although spawning and nursery grounds are likely to change to some degree year on year, depending on the variability of environmental parameters such as water

temperature and food availability, the majority of these species are known to have nursery grounds within the Scottish TS and some also spawn there (Coull *et al.* 1998).

Four fish species listed as threatened on the International Union for Conservation of Nature (IUCN) Red List may be found in the Scottish TS. Basking shark (*Cetorhinus maximus*), tope (*Galeorhinus galeus*) and porbeagle (*Lamna nasus*) are all listed as Vulnerable, and may occur seasonally and in low numbers. Common skate (*Dipturus batis*) is listed as Critically Endangered and can be found at low density throughout the North Sea (Centre for Environment, Fisheries and Aquaculture Science [CEFAS] 2001, IUCN 2014).

*Marine Mammals*

A number of cetacean species listed in Annex II of the EC Habitats Directive are known to occur in the Project area, including the Scottish TS. Harbour porpoise are the most abundance cetacean species in the Scottish TS; however, previous surveys have indicated that the main population concentration shifted further south in 2005 (Hammond *et al.* 2013). In addition to cetaceans, two species of seal breed within the UK EEZ, the harbour seal (also known as common seal, *Phoca vitulina*) and the grey seal (*Halichoerus grypus*). Harbour seals occur throughout the UK EEZ, with over 80 percent of the population occurring in the Scottish TS. Both seal species are listed within Annex II of the EC Habitats Directive.

Minke whales, Risso's dolphins and white-beaked dolphins have also been recorded in low abundances as present in the Project area (JNCC 2000).

*Seabirds*

The Project area has high importance for a number of seabird species; substantial portions of their global populations make use of the area for feeding and breeding either seasonally or throughout the year. The Scottish coast and TS are situated within a major migratory flyway between wintering and breeding grounds.

Additionally, some seabird species have major colonies on Shetland and these birds may forage across the wider area at some distance from land (DECC 2004).

*Designated Sites*

The proposed cable route does not pass through any designated sites in the Scottish TS. The route crosses two MPAs in the EEZ. These are the West Shetland Shelf Nature Conservation Marine Protected Area (NCMPA) and the North-west Orkney NCMPA. Existing conditions and potential environmental impacts on the two MPAs are assessed in Annex C.

### *6.1.3 Human Environment*

*Commercial Fisheries*

The North Sea is a major fishing area for UK and international fleets. The main gear types used to target demersal species are otter trawls and seine nets. The demersal fishing effort over the whole continental shelf north of Scotland is high, particularly in areas northwest of the Northern Isles. The area between Fair Isle and Shetland supports a relatively high intensity of mobile demersal fishing effort (Vessel Monitoring System data, 2009-2013). Most recent (2016) fisheries statistics from International Council for the Exploration of the Sea (ICES) rectangle 48E8 (i) show over 1,000 tonnes shellfish landed, around 20,000 tonnes pelagic species landed and over 2,000 tonnes demersal species landed.

Pelagic offshore fisheries in the area target herring, using purse seines and trawls, and mackerel, using trawlers. Both fisheries are active throughout the year, with peak landings in the summer and early autumn (Marine Management Organisation [MMO] 2018). The pelagic fishing effort is high throughout the continental shelf area north of Scotland. Table 6.1 Fishing Activity in the Project Vicinity*Table 6.1* summarises fishing activity in the Project vicinity.

***Table 6.1 Fishing Activity in the Project Vicinity***

| **Gear Type** | **Bottom (Otter) Trawl** | **Seine Netting** | **Longlining** | **Set Nets** | **Mid-water Trawling** |
|---|---|---|---|---|---|
| Target Species | Flatfish, Nephrops, Shrimp, Queens, Lobster, Crab, Anglerfish, Megrim | Cod, Haddock, Whiting, Mackerel, Salmon, Sea Trout, Flatfish, Sprat | Cod, Haddock, Whiting, Flatfish, Halibut, Cod, Ling, Tusk and Skate in deeper water | Salmon, Sea Trout | Mackerel, Herring, Sprat, Saithe, Hake |
| Areas Fished | Throughout Project Area | Throughout Project Area | Throughout Project Area | Throughout Project Area | Throughout Project Area |
| Depths Fished (m) | 5-2,000 | Any depth in mid-water | Small lines 5-175 Great lines 175-300 (they have been known to go to 1,100 m targeting sablefish) | 1.5-6 | Any depth in mid-water |
| Depth of Seabed Penetration (cm) | 3-4 | 0 | 0 | 0 | 0 |

(i) ICES statistical rectangles are used for the gridding of data to make simplified analysis and visualisation. The cable route passes through ICES rectangle 48E8.

| | | | | | |
|---|---|---|---|---|---|
| Season | Dependent on species targeted | Dependent on species targeted | Dependent on species targeted | Dependent on species targeted | Dependent on species targeted |
| Est. # Active Vessels (Scottish Fleet) | 70 scallop dredgers, 116 inshore trawlers, 79 offshore drawlers | 20 | Limited numbers | Limited numbers | 20 |

*Shipping and Navigation*

The Project area supports a moderate level of shipping traffic, largely comprising merchant ships, supply vessels and tankers. Vessels using routes around the north of Scotland include vessels transiting from the Western Atlantic to the Baltic States and Russia, some of which will use the Fair Isle Channel. In addition, traffic using the Pentland Firth, Orkney Ports (Kirkwall), Shetland Ports (Sullom Voe) and Mainland Scotland Ports provides a relatively high intensity of shipping in the Project area (MMO 2014).

The proposed cable route passes through the Fair Isle shipping channel and crosses three ferry routes (Lerwick–Grutness–Fair Isle, Kirkwall–Lerwick and Aberdeen–Kirkwall–Lerwick). *Figure 6.2* presents the vessel density in the Project vicinity.

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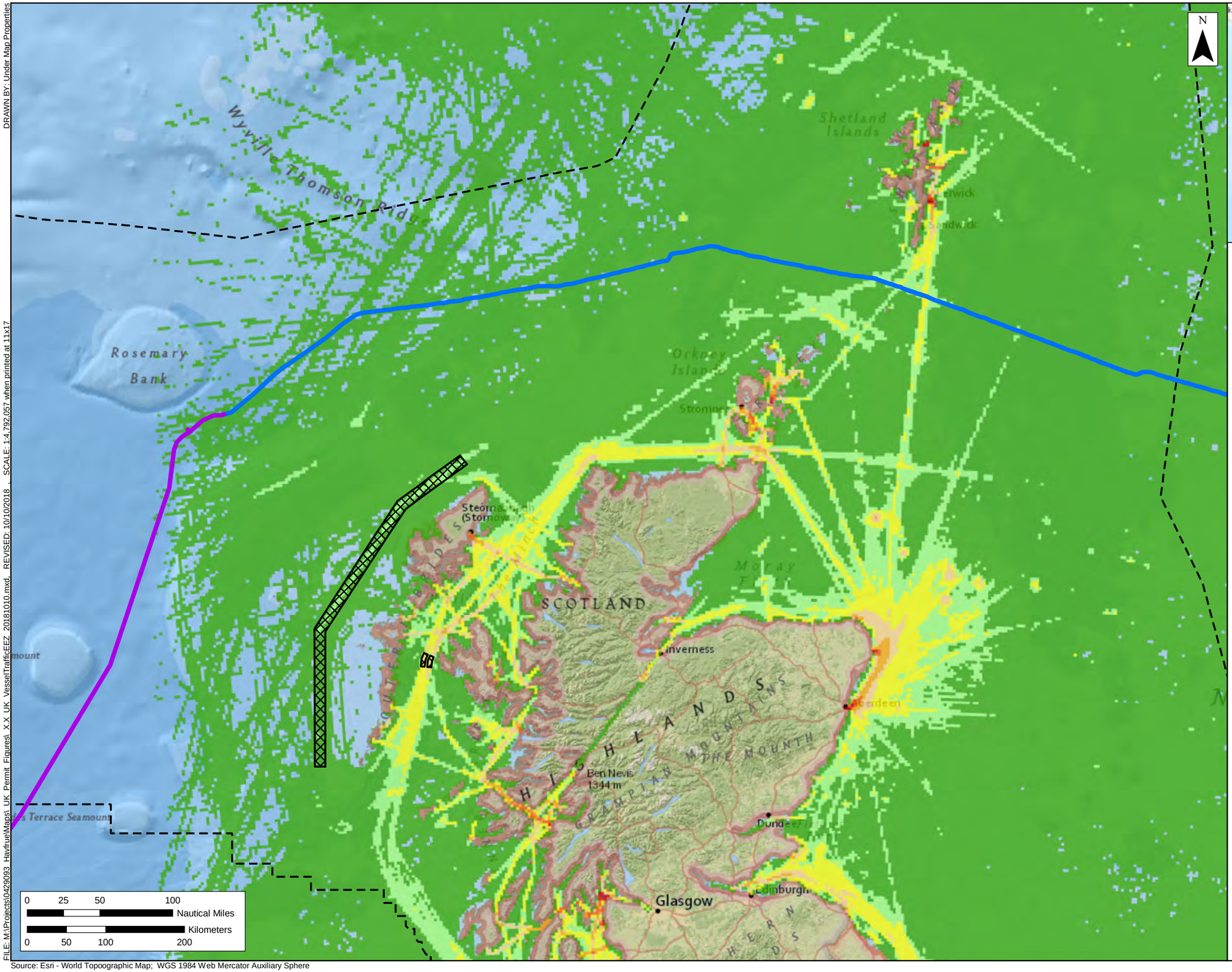




**Legend**

**Havfrue Cable System**

- Segment 3
- Segment 5

**Jurisdictional Boundaries**

- Exclusive Economic Zone (EEZ) - 200 nmi
- Territorial Seas - 12 nmi

**Ships Routeing**

- Traffic Separation Scheme

**Average Weekly Density 2015**

- 0.0 - 0.1
- < 5.0
- 5.1 - 10.0
- 10.1 - 25.0
- 25.1 - 50.0
- 50.1 - 100.0
- 100.1 - 250.0
- 250.1 - 500.0
- 500.1 - 1000.0
- > 1000

**Figure 6.2**
**Vessel Traffic in the UK EEZ**
Havfrue Cable System
United Kingdom Transit
TE SubCom

Environmental Resources Management
www.erm.com
ERM

Source: Esri - World Topoographic Map; WGS 1984 Web Mercator Auxiliary Sphere

*Infrastructure and Other Users*

A number of current and proposed developments and infrastructure are located within or close to the proposed cable route. Most of these are outside the Scottish TS; *Table 2.7* presents details of these developments and their locations. The cable will not interrupt or cross any current or proposed developments within the Scottish TS.

Several inactive and producing hydrocarbon fields are located north of the proposed cable route, west of the Shetlands. There are also several fields close to the proposed cable route, east of mainland Scotland.

The proposed cable route follows a similar route to previously installed main grid and submarine cables around Scotland. Several hydrocarbon pipelines connect producing and inactive hydrocarbon fields to shore; however, the proposed cable route does not cross any of these throughout the Scottish TS. Although the proposed cable route does not cross any pipelines or in-service subsea cables within the boundaries of the Scottish TS, there are crossings within the UK EEZ. Nine of these will require rock protection, as detailed in *Table 2.2.* All infrastructure crossings will require crossing agreements. Standard cable crossing methods are described in *Section 2.4.6.*

There are significant planned options for marine renewable energy operations in the form of tidal and wind energy north and south of the proposed cable route. South of Shetland, the proposed cable route also travels through an area that could potentially be developed as part of the Marine Plan for Wave Energy in Scottish Waters.

The Project area supports a low density of recreational use (sailing, recreational fishing).

The cable route will cross through a Ministry of Defence Danger Area in the EEZ (*Figure 2.10*). The Danger Area supports live firing activities along with international weapon exercises. Whilst firing activities are conducted, marine traffic and personnel are not permitted within the Danger Area as it provides a zone within which any shell fragments and ricochets are confined. The Danger Area is located outside the area of analysis for the EA, but was raised as an issue to address in the Scoping Opinion issued by Marine Scotland. The Project subsequently met with the Ministry of Defence and received concurrence that installation across the area would be acceptable with agreed measures in place. This correspondence has been included in Attachment E of the Marine Licence Application.

There is potential for submarine archaeological remains to occur throughout the region, including within the Project area. Archaeological remains are more likely to have remained intact in deep water, sheltered submerged caves and gullies within sea lochs and enclosed bays. In shallower water or narrow offshore channels, the strong currents, thin sediment cover and exposure to storms make the survival of prehistoric remains and deposits less likely. Numerous ship and aircraft wrecks are present in the vicinity of the cable route through the Scottish TS, including both charted and uncharted sites (Shipwrecks UK, 2018).

The marine cable survey conducted by the Project also serves to identify known or unknown wrecks or large obstructions in the vicinity of the cable route, and re-route as necessary around them. No wrecks or significant obstructions were identified in the cable footprint or rock installation locations in UK waters. The route survey found low sediment cover along the route through the TS; as such, prehistoric remains are considered unlikely in this area.

## *6.2 IMPACT ASSESSMENT*

### *6.2.1 Receptors Scoped into the Assessment*

*Table 6.2* presents the topics to be assessed in further detail in this EA, as well as those topics "scoped out" (*ie* not requiring further analysis), based on the findings of the Scoping Report. These are discussed in detail in this section.

***Table 6.2 Scoping Opinion Results: Topics to be Considered in the Environmental Assessment***

| Topic | Scoping Decision | Assessment Comments |
|---|---|---|
| Emissions to air | Scoped out | Construction vessels will emit pollutants from the engines and auxiliary power generation. However, the contribution of the small number of vessel operating for a limited period at sea is likely to be negligible. Therefore emissions to air are scoped out. |
| Geology, geomorphology and sedimentary processes | Scoped out | Soft sediments will return to near baseline conditions over time. As such the potential for any direct effects on geological features of interest or sedimentary processes along the cable route is minimal. All rock installations are below 100 m water depth where offshore currents are low, so scour of the seabed around the installation is not considered to be an issue. Effects on geology, geomorphology and sedimentary processes have been scoped out. |

| | | |
|---|---|---|
| Water quality | Scoped out<br><br>Unplanned events scoped in | Routine discharges will be managed according to good industry practice and relevant legislation and will have no discernible effect on water quality. As such routine discharges have been scoped out.<br><br>Sediment plumes from cable burial will be localised and short term and have been scoped out.<br><br>Unplanned fuel spills from events such as collisions could affect water quality, including within protected areas. As such unplanned events will be considered in further detail. |
| Noise and vibration | Scoped out | The noise generated by the Project will be similar to normal vessel movements and fishing trawlers operating in the area. Project vessels will only be operating within the Scottish TS for a limited duration of 6 days. As such no significant effects from noise are expected and this effect has been scoped out. |
| Benthic ecology | Scoped in | The impact on the benthic ecology will be limited and temporary along the cable route. Significance of these effects will depend on the sensitivity of the benthic species to disturbance. As such impacts on benthic ecology will be considered in further detail. |
| Fish and shellfish ecology | Scoped in | The impact on the water column and seabed installation activities will be limited. Fish are highly mobile and able to move away from the cable installation activities. Some shellfish in the direct footprint of the cable route may be injured or killed, but there are no known rare or protected species and communities are expected to recover fully. The short-term interaction between marine wildlife and Project installation activities is not expected to cause significant effects. Longer-term impacts are expected at the locations of rock placement, with the current biota displaced to the surrounding habitat; while new, hard substrate-dependent biota colonise the new rocky habitat. Habitat disturbance is low and confined to a clustered area outside the Scottish TS. |
| Marine mammals, seabirds | Scoped out | The impact on the water column and seabed installation activities will be limited. Marine mammals are highly mobile and able to move away from the cable installation activities. Marine mammals in the area will also be accustomed to vessel movements. Seabirds on the water may be disturbed for a short period of time during cable installation. The short term interaction between marine wildlife and the Project installation activities is not expected to cause significant effects. |
| Designated areas | Scoped in | No designated areas are present in the licensable area; however, the proposed cable route does cross two protected areas in the EEZ. Based on the |

| | | |
|---|---|---|
| | | sensitivity of receptors and potential magnitude of effects, there is the potential for significant impacts. Potential effects from cable installation across the MPAs are assessed in Annex C, as cable installation in the EEZ is not a licensable activity and is not otherwise considered in the main text of the EA. No rock placement will take place in the MPAs. |
| Commercial fisheries | Scoped in | Impacts on fish stocks are not expected and displacement from fishing grounds will be short term for installation. Although no impacts on fishing gear are predicted due to cable burial in the Scottish TS the placement of rocks at several locations in the EEZ and the presence of Project vessels during the installation phase may affect fishing vessel operations. |
| Shipping and navigation | Scoped in | Cable installation will likely be undertaken from a single vessel and will have limited interaction with shipping and navigation in the area. However, given the importance of the Fair Isle Channel as a major shipping route, shipping and navigation will be considered further in this EA.<br><br>Unplanned events such as vessel collision are addressed under water quality. |
| Infrastructure | Scoped out | Crossing consultation will be undertaken outside the EA process with other owners/operators of linear infrastructure. |
| Archaeology and cultural heritage | Scoped out | Cable installation will have a very limited footprint. A route survey will be undertaken to avoid all known wrecks and features of potential archaeological interest. |
| Cumulative effects | Scoped in | The potential for a number of impacts to receptors from more than one source will be considered. This will take into account shipping, fishing and other planned/current developments in the vicinity of the cable route. |

### 6.2.2 *Benthic Ecology*

*Cable Route through Scottish TS*

Introduction

Existing public data provides an overview of benthic habitats (biotopes) present in the substrate types identified along the proposed cable route (*Annex B*). Predicted benthic biotopes for the wider area, including the areas identified for rock installation, broadly mirror those present along the cable route through the TS, with deep circalittoral coarse sediment and deep circalittoral sand being present with outcroppings of harder seabed in the form of rock (EMODnet 2018).

The impact on the benthic ecology will be limited and temporary along the cable route. Significance of these effects will depend on the sensitivity of the benthic species to disturbance.

Potential Effects

The potentially significant effects on benthic ecology from cable installation include:

- direct seabed disturbance from grapnel/ploughing/cable burial activities;
- compression of sediment underneath plough sled; and
- increase in suspended sediment concentrations in the water column and subsequent settlement of sediments on the surrounding seabed from ploughing/cable burial activities.

Direct seabed disturbance will occur during PLGR along the length of the cable route to an approximate width of 0.75 m. Where debris is encountered additional passes with the PLGR will be required to determine the extent of the debris field. Secondary seabed disturbance will occur along the cable length to a width of approximately 5 m due to the width of the plough sleds. During cable burial, the sea plough will simultaneously dig the trench and lay the cable. The sediment will backfill the trench, covering the cable. This process will only cause one instance of disturbance at any one point on the seabed and is less intrusive than dredging. Furthermore, backfilling the trench with the same material will promote benthic recovery.

The cable route through the Scottish TS is relatively short; habitat disturbance and seabed compression is temporary and likely restricted to a few metres either side of the cable trench or under the footprint of the rock placement.

Recovery of the seabed is largely dependent on the substrate left following cable installation. Benthic communities in clean sand will have the most rapid recovery rate, whereas communities from muddy sand habitats will recover more slowly (Dernie *et al.* 2003). The marine survey results shows the seabed through the Scottish TS to consist predominantly of outcropping till, sand, rock and subcropping till/rock (TE SubCom 2018). Where burial is possible, the proposed ploughing method allows the sediment to infill rapidly following disturbance enabling habitat recovery to occur quickly (Department for Business Enterprise and Regulatory Reform [BERR] 2008).

As a telecommunication cable, no significant change to electromagnetic fields or thermal radiation (often associated with power cables) is anticipated.

The significance of these effects will depend on the sensitivity of the benthic species to disturbance and suspended sediments and their degree of mobility to avoid impacts. It is noted from the cable route seabed survey that the

species characteristics of the sandy, subcropping rock/till and bedrock habitat along the route through the Scottish TS (*ie* polychaetes, bivalves, urchins and seastars [JNCC 2018]) are not considered sensitive to sedimentation. Furthermore, there are no clear indications that underwater noise caused by the installation of sub-sea cables poses a high risk of harming marine fauna (Nedwell *et al*. 2012, SSE Renewables 2015).

Rates of recovery of invertebrate communities are associated with the rate of recovery of the seabed sediment characteristics. Studies have revealed that when sediment is removed to a depth of 10 cm, recovery of the faunal component occurs within 64 days of the disturbance. However, when sediment is removed to 20 cm depth, recovery is not complete until after 107 days but within 208 days of the disturbance. Thus recovery at more intensely disturbed sites is expected to take almost twice as long. This implies that recovery following cable burial could take longer still due to the depths of disturbance within the burial trench. Nevertheless, the higher intensity disturbance will not have a significantly greater effect on community disturbance (Dernie *et al*. 2002).

Overall, the temporally and spatially restricted nature of the cable installation activities means that the potential effects on the benthic communities are likely to be highly localised and temporary in nature. No maintenance is required for subsea cables once installed. In the event that a repair is required, impacts in the immediate vicinity of the repair will be similar in magnitude to those described for installation.

Mitigation Measures

The cable route has been designed to avoid areas of hard seabed and sensitive habitats to the extent possible. No additional mitigation measures have been identified for this resource area.

Residual Effects

The footprint of temporary habitat disturbance within the Scottish TS is limited and recovery is likely to occur within 1 to 2 years. As such the magnitude of effect during installation or maintenance work is small. Benthic habitats and communities that occur along the cable route are considered common and the route has been designed to avoid hard or sensitive seabed areas where possible and so the habitats and species are of low sensitivity. The impact is therefore considered to be of ***Negligible Significance*** during both installation and operation (maintenance).

*Rock Installation Locations in the UK EEZ*

Introduction

The effect on benthic ecology will be limited to permanent rock installation locations along the cable route. Significance of these effects will depend on the sensitivity of the benthic species to disturbance.

Potential Effects

The potentially significant effects on benthic ecology from rock placement include:

- direct seabed disturbance; and
- increase in species diversity due to colonisation of introduced rock substrate where rock placement is necessary in sections of the EEZ.

Because the sediment type in the Project area is predominantly sand, placement of rock on the seabed is unlikely to cause a significant or lasting plume of sediment into the water column. As such no impacts are predicted from plumes created by the placement of rock on the seabed and this is not considered further.

There are eight crossings where top and bottom rock installation will be required within the EEZ, and at least one location with top rock installation only (60 $m^2$ footprint). Across nine sites this equates to an area of 2,300 $m^2$ of seabed overlaid by rock within the EEZ. Where rock placement is required, habitat change will be permanent within the rock installation footprint. The hard substrate provided by the rock will become colonised over time by opportunistic benthic species and provide habitat and foraging opportunities for fish.

Mitigation Measures

No additional mitigation measures have been identified for this resource area.

Residual Effects

At the nine locations of rock placement within the EEZ the benthic habitat will be permanently changed, providing alternative rocky habitat for colonisation of benthic organisms. Given the limited footprint of the rock placement, the magnitude of effect is considered a small positive effect. The sensitivity of the seabed to the change in substrate type is considered low, given that there are already rocky outcrops across the seabed. As per the methodology presented in *Section 5*, the significance of effect is considered to be ***Positive.***

### *6.2.3 Fish and Shellfish Ecology*

*Cable Route through Scottish TS*

Introduction

The effect on fish and shellfish ecology from cable installation activities will be limited and temporary along the route of the cable. The significance of these

effects will depend on the sensitivity of the fish and shellfish species to disturbance.

Potential Effects

Cable installation has the potential to affect fish and shellfish ecology in a number of ways including:

- direct habitat disturbance;
- smothering from suspended sediments;
- temporary loss of benthic prey species; and
- temporary loss of fish spawning habitat.

Direct habitat disturbance will occur during the PLGR and cable burial. The seabed habitat is expected to be temporarily disturbed during the pre-lay grapnel run to a depth of 0.4 m; the estimated width of disturbance is 0.75 m. Where debris is encountered additional passes with the PLGR will be required to determine the extent of the debris field. The seabed is also expected to be temporarily disturbed to a width of 0.75 m surrounding the cable installation, with secondary disturbance to a width of approximately 5 m on either side of the cable due to the plough skid width.

Benthic fish, pelagic fish, and some shellfish such as crabs, shrimp and scallops are mobile and will be able to avoid the direct effects of cable installation. Four of the fish species found in the Project area, the basking shark, tope, porbeagle, and common skate, are listed as threatened on the IUCN Red List. Each species is mobile and will be able to avoid the grapnel and plough activities. Other shellfish species such as oysters and mussels are immobile. However, these species attach and grow on hard substrate and are unlikely to be affected by the cable installation due to the lack of hard substrate in the installation area. Therefore, direct habitat disturbance due to the pre-installation and installation activities is expected to be temporary with limited effects on fish and shellfish ecology.

Temporary and localised sediment suspension will occur during PLGR and cable burial; however, the predominantly sandy material will settle out of the water column quickly and large plumes are not expected to be generated by the plough. Due to the mobility of the fish and shellfish species in the vicinity of the Project, effects from suspended sediments are expected to be very localised to the cable route, but to some extent will vary with sediment particle size, ambient currents and the mobility of the local species (Carter *et al* 2009). Less mobile, filter-feeding shellfish in the immediate vicinity of the plough might experience some burial, which could result in the loss of individuals, while mobile species are expected to move away from any plume or sedimentation.

The scale of the temporary effects on the seabed habitats along the cable route is not considered likely to have a significant negative effect on fish and shellfish prey availability or spawning/nursery habitats.

No maintenance is required for subsea cables once installed. In the event that a repair is required, effects in the immediate vicinity of the repair will be similar in magnitude to those described for installation.

Mitigation Measures

No further mitigation measures are proposed as all impacts to fish and shellfish as a result of cable burial are considered temporary and minor.

Residual Effects

Given the limited footprint of the Project, that mobile species will be able to avoid impacts and that sessile shellfish communities in the burial areas are anticipated to fully recover within one year, if not sooner (Lu and Wu 2000), the magnitude of effect is small. The sensitivity of the species potentially affected (*ie* sessile species) is low. The impact is therefore considered to be of ***Negligible Significance*** during both installation and operation (maintenance).

*Rock Installation Locations in the UK EEZ*

Introduction

Rock placement will result in physical disturbance and a change in the local habitat directly where the rock is placed and surrounding that area. The significance of these effects will depend on the sensitivity of the fish and shellfish species to disturbance.

Potential Effects

Rock placement has the potential to affect fish and shellfish ecology in a number of ways including:

- direct habitat disturbance;
- smothering from suspended sediments;
- smothering from rock placement;
- temporary loss of benthic prey species;
- temporary loss of fish spawning habitat; and
- localised increases in prey availability and spawning or nursery habitats at rock installation sites.

Rock installations will be placed over nine infrastructure crossings in the UK EEZ. The total footprint at each crossing site will be approximately 240 $m^2$. The habitat in the direct footprint of the rock placement will be permanently change from predominantly sand to rock substrate. Any individuals in the direct footprint will be lost; however, mobile species will move away and

sessile species are generally associated with hard substrates, which the Project will avoid. As such, loss of individuals will be minimal.

Smothering caused by sediment suspension through rock placement might also occur, but given the sediment type and benthic habitat the effect is likely to be minimal. Rocks will be placed on the seabed via a chute from the rock placement vessel directly to the berm. This will keep the amount of sediment disturbed into suspension to a minimum, thus limiting the effects of turbidity on fish and shellfish during rock placement.

The relatively small footprint of the Project will limit any loss of fish spawning habitat. Furthermore, the hard substrate created by the rock installations could provide localised spawning and nursery areas in the EEZ as well as hard substrate habitat that over time will be colonised by a range of benthic species, including shellfish, and attract fish.

Mitigation Measures

No additional mitigation measures have been identified for this resource area.

Residual Effects

At the nine rock placement locations within the EEZ the benthic habitat will change permanently, providing alternative rocky habitat for colonisation of benthic organisms, including shellfish, or used as a fish spawning area. Given the limited footprint of the rock placement and the creation of new habitat, the magnitude of effect is considered a small positive effect. The sensitivity of the fish and shellfish is considered low. As per the methodology presented in *Section 5*, the significance of effect is considered to be ***Positive.***

### *6.2.4 Commercial Fisheries*

*Cable Route through Scottish TS*

Introduction

The North Sea is a major fishing area for UK and international fleets. The northern North Sea has particular importance for demersal fisheries targeting a mix of cod, haddock and whiting throughout the year. The main gear types used are otter trawls and seine nets. The demersal fishing effort over the whole continental shelf north of Scotland is high and is particularly high in areas northwest of the Northern Isles.

Pelagic offshore fisheries in the area target herring and mackerel using purse seines and mid-water trawls. The pelagic fisheries are more international than demersal species fisheries and tend to be undertaken by larger vessels. Both fisheries are active throughout the year, with peak landings in the summer

and early autumn (MMO 2018). The pelagic fishing effort north of Scotland and throughout the continental shelf area is high.

Potential Effects

The main effects of cable installation on commercial fishing activity of potential significance are:

- restricted access to fishing grounds during installation;
- temporary fish stock displacement; and
- snagging of fishing gear on installed cable.

The Havfrue cable route was designed to avoid important fishing areas to the extent possible, including through consultation with the fishing community. Project activities in the TS will last for a total of approximately 6 days, including pre-lay activities (OOS clearance, PLGR) and cable installation. During cable burial, vessel speed typically varies between 0.1 to 1 knot, and a 1 nm exclusion zone is maintained around the main lay vessel. Temporary restrictions on access to fishing grounds will therefore be short term and affect a small proportion of the available fishing grounds. Fish might avoid the cable lay vessel during installation but will likely return quickly to the area once installation is complete.

Once the cable is installed, fishing gear could snag cable segments that are not fully buried or exposed on the seafloor, resulting in gear damage or loss. This could result in financial losses from the abandoned gear and lost fishing time. The fishermen most susceptible to effects on gear are trawlers. Cable burial is the primary avoidance measure undertaken to minimise negative interactions with bottom fishing gear. Where seabed conditions allow, the cable will be buried below the seabed for protection from fishing gear in water depths less than 1,500 m. Target burial is 2 m below the seabed, but in areas where this is not possible due to substrate type, the depth achieved by the plough is expected to be deeper than the seabed penetration depth of trawl gear. This will help protect the cable from damage and prevent fishing gear from snagging.

No maintenance is required for subsea cables once installed. In the event that a repair is required, impacts in the immediate vicinity of the repair will be similar in magnitude to those described for installation.

Mitigation Measures

The following mitigation measures have been identified for commercial fishing, for implementation at several stages of the Project:

- Early consultation with fishermen: Consultation, beginning in the route planning stage, is one of the primary mitigation measures undertaken by

the Project. The SFF, in particular, advised on fishing gear, seasons and location, and reviewed the proposed cable route.
- Ongoing communication with fishermen to be maintained over the life of the Project, with SFF as the main point of contact, as outlined in a Marine Liaison and Mitigation Management Plan.
- Clear and timely notifications of Project activities, as outlined in a dedicated Communication Plan.

Residual Effects

Due to the short term and temporary nature of the cable installation activities, and the fact that there will be no loss of species/reduction in stock in the Project area, the magnitude of effect to fishermen is negligible during both installation and operation. The sensitivity of fishermen to changes in fish stocks or fishing area is considered medium given the available fishing areas. As such the significance of the impact is ***negligible***.

*Rock Installation Locations in the UK EEZ*

Potential Effects

The main effects of rock placement on commercial fishing activity of potential significance are:

- restricted access to fishing grounds during installation;
- temporary fish stock displacement; and
- localised increases in prey availability and habitats at rock installation sites.

The total rock placement area on the seabed within the EEZ is approximately 2,300 $m^2$. Although there will be some temporary displacement of fish and loss of access to fishing grounds during installation, rock placement will be a short-term activity (less than one day per site), and access restrictions will therefore be temporary and short term. As noted for effects on fish, mobile fish species are expected to return once installation is complete. Once in place, the rock berms are designed to allow fishing to be conducted across them. The berm specifications (slope ratio, rock size) were specified by SFF so that trawling equipment can be used across them. Therefore, the area available to fishermen will not be affected during operation. Furthermore, new rocky habitat might also provide new feeding and spawning habitat for key target species or attract target species to the new feeding areas.

Mitigation Measures

The primary mitigation measure for fishing is consultation with fishing groups, as noted above. In the case of the rock installations, the rock berm specifications (*eg* slope ratio, rock size) have been designed in consultation with the SFF so that trawling equipment can be used across them without

damage to the cable or fishing gear, avoiding impacts on commercial fishing during the operation phase.

Residual Effects

Due to the short-term and temporary nature of the rock placement activity, the design of the rock installations to be over-trawlable and the potential to create localised habitat for target fish species, the magnitude of effect to fishermen will be negligible during both installation and operation. The sensitivity of fishermen to changes in fish stocks or fishing area is considered medium given the available fishing areas. As such the significance of the impact is ***negligible***.

### *6.2.5 Shipping and Navigation*

*Cable Route through Scottish TS*

Introduction

The Project area supports a moderate level of shipping traffic, largely comprising merchant ships, supply vessels and tankers. Vessels using routes around the north of Scotland include vessels transiting from the Western Atlantic to the Baltic States and Russia, many of which will use the Pentland Firth, making this one of Scotland's busiest seaways. Traffic using the Pentland Firth, combined with traffic using Orkney Ports (Kirkwall), Shetland Ports (Sullom Voe) and Mainland Scotland Ports provides a relatively high intensity of shipping in the Project area (MMO 2014).

For non-port craft, which includes a range of vessels often involved in the offshore support industry, various routes can be identified mainly from Scottish and English North Sea ports to offshore installations (MMO 2014).

Potential Effects

The key affect associated with installation activities is the increased risk of collision with existing navigational users along the cable route. As presented on *Figure 6.2,* the cable route crosses a number of shipping routes between mainland Scotland and Orkney and Shetland, with up to 25 vessels on these routes per week. Cable installation activities in this area will include removal of one OOS cable, PLGR, and cable burial. Each activity will be undertaken by a single, slow-moving vessel (typical speed under 1 knot), allowing time for other vessels to divert if needed. Standard consultation and notification measures will be implemented to provide sufficient notice to other sea users of the temporary activity.

No maintenance is required for subsea cables once installed. In the event that a repair is required, impacts in the immediate vicinity of the repair will be similar in magnitude to those described for installation.

Mitigation Measures

Consultation with local maritime users was undertaken on 25 April 2018 with further consultation through the scoping process with the Maritime and Coastguard Agency, Northern Lighthouse Board, Orkney Fisheries, Royal Yachting Association and SFF. Following these consultations, at the request of Marine Scotland, a Navigational Risk Assessment has been undertaken and appended to the Marine Licence Application (Attachment G). This will detail the proposed operations of the Project vessels and mitigation measures to reduce the risk of collision with other sea users throughout the installation process.

A Notice to Mariners (NTM) will be issued in advance of any Project operations at sea to notify other sea users of the proposed Project vessel movements and intentions. There will be no encroachment on any recognised anchorages. Each Project vessel will fully comply with UK and international maritime safety legislation, including the International Regulations for the Prevention of Collisions at Sea 1972 (COLREGs).

Residual Effects

With mitigation measures in place, vessel collision is considered very unlikely. The transient and temporary nature of the installation operations means that interactions between Project vessels and other vessels in the area will be short-lived and the Project is assessed as having a ***negligible significance*** on shipping and navigation during installation.

*Rock Installation Locations in the UK EEZ*

Introduction

The planned rock installations will be located in an approximately 169 km section of the cable route east of Scottish TS. As shown on *Figure 6.2*, vessel traffic volume in this area is low (fewer than five vessels per week). However, fishing activity is much higher in this area than along the cable route within the TS (Scottish Fishermen's Federation pers comm, 2018), meaning that the total volume of traffic may be slightly greater.

Potential Effects

The key effect associated with rock placement will be the same as for cable installation, *ie* increased risk of collision with existing navigational users along the cable route. Rock placement activities at each site will involve two Project vessels, as well as guard vessels to help reduce collision risk. Rock placement is expected to take less than one day per site; therefore impacts on navigation will be short-term and temporary.

Given the water depth at the rock installation sites and the design of the berms to be over-trawlable, no impact is anticipated on navigation during the operation phase.

Mitigation Measures

Mitigation measures will be the same as described for cable installation, above. Advance notification of fishermen through the NTM and Kingfisher Bulletin will be especially important in this area.

Residual Effects

Taking into consideration the mitigation measures described above, the significance of impacts on shipping and navigation during the installation phase will be ***negligible.*** There will be no impact during operation.

### *6.2.6 Unplanned Events*

*Introduction*

Unplanned fuel spills from accidental events and vessel collisions could affect water quality, including within protected areas. This effect is considered for both cable installation and rock placement activities below.

*Potential Effects*

The presence of a Project vessel will increase the risk of vessel collisions and subsequent pollution incidents. In addition, cleaning fluids, oils and hydraulic fluids used onboard the Project vessel, on the sea plough and during ROV operations could be spilled overboard or accidentally discharged. Many receptors within the marine environment are highly sensitive to hydrocarbon and chemical spills. These spills can have major ecological effects depending on their size and nature.

The consistency of oil can cause surface contamination and smothering of marine biota and its chemical components can cause acute toxic effects and long-term accumulative impacts. Marine life may also be affected during cleanup operations, either directly or through physical damage to marine and coastal habitats.

Plankton, juvenile fish and some shellfish inhabiting surface waters are also susceptible to unplanned release of surface pollutants, due to their limited mobility. Fish, although susceptible, are less vulnerable with some ability to swim away from the polluted area.

An unplanned release of surface pollutants from Project vessels would have the potential to affect marine mammals as they come to the surface. Harbour seals are known to haul out at the southern tip of Shetland, at Horse Island, located approximately 20 km north of the proposed cable route, and would be particularly susceptible to an unplanned release of surface pollutants during the breeding season (June–July) when the density of seals in the water will be at its highest. Minke whales, Risso's dolphins, harbour porpoise and white-

beaked dolphins have also been recorded in low abundances as present in the Project area (JNCC 2000).

Seabirds are vulnerable to any form of oil pollution, as once their feathers have come into contact with any fuel spill they become clogged and inefficient at keeping the bird warm or aiding any form of flight. Furthermore, as the bird preens itself the oil can be ingested and lead to toxic effects.

*Mitigation Measures*

As per Maritime Coastguard Agency recommendations, an NTM will be issued on a segment basis, ahead of any works commencing. Oncoming traffic and mariners, including ferry operators, other commercial traffic and recreational users, will be notified of Project operations when the Project vessel is on site. Watch keeping and collision risk management will be carried out on board the Project vessel to reduce the risk of vessel collision. Furthermore, fishermen operating in the vicinity will be made aware of Project operations through an FLO. The Project vessel will be fitted with a tracking system which relays live (and historical) positional data to a publicly available website which local vessel operators can monitor.

Standard commercial operational regulations and standards, such as Safety of Life at Sea Convention (SOLAS) and the International Convention for the Prevention of Pollution from Ships (MARPOL) will be adhered to throughout the cable installation.

The Project vessel will have a shipboard oil pollution emergency plan (SOPEP) in operation with trained personnel to coordinate its implementation. No Project work is proposed in shallow water or near any known reefs, so the likelihood of the vessel grounding is low.

*Residual Effects*

When these mitigation measures are implemented, the potential for an unplanned event leading to a fuel or chemical spill is low. In the unlikely event of a spill, emergency plans will address response actions. Given the potential spill volume on Project vessels (*ie* the vessel fuel tanks) and the onboard spill response, the significance of effect is considered ***minor***.

### *6.2.7 Cumulative Effects*

*Introduction*

Cumulative effects are considered to be effects on the environment caused by an action in combination with other past, present and future activities. As discussed above, the proposed cable route will pass through the Fair Isle shipping channel and cross three ferry routes. There could also be fishing

vessels operating in the vicinity and Project vessels transiting to the renewable power lease sites south of Shetland. Each of these activities has the potential to interact and cause cumulative effects to sensitive receptors.

During the pre-lay survey all OOS cables were located along the cable corridor, and these will be cleared ahead of laying the new cable.

*Potential Effects*

The potentially significant cumulative effects on sensitive receptors include:

- underwater noise generated from multiple vessel sources (*eg* ferries, Project vessels, fishing vessels, commercial vessels transiting through the Fair Isle shipping channel) affecting marine mammals;
- seabed habitat change from a number of seabed installations, including rock placement (*eg* existing pipelines and cables); and
- seabed disturbance from cable installation activities and trawler fishing.

The Project will contribute to underwater noise in the region; however, only one vessel will operate at any one time, the duration of installation will be limited (6 days within the TS) and the dominant noise source is expected to be from the engines. This additional noise could temporarily increase the zone within which marine mammals will avoid loud noises. However, as the noise generated by the Project is expected to be in line with other vessels operating in the region and marine mammals are already accustomed to some underwater noise generated from vessel traffic, the significance of cumulative effect of underwater noise is considered ***negligible***.

The Project will contribute to the area of seabed affected by installations from this and other projects, including from rock placement in the EEZ. Recovery of benthic species in soft sediments is expected to be relatively fast (within 1-2 years) and as such there are no permanent effects from this, or likely from other similar projects. Rock placement will permanently change the habitat type to create new habitat types and is considered a positive effect. Given the recovery time in soft sediments and small area affected by the Project where rocky habitat will be created, the significance of cumulative effects on seabed habitat change is considered ***negligible***.

The seabed and associated benthic habitats along the cable route will be disturbed during the cable installation process, and in places the same section of seabed could also be disturbed as a result of commercial fishing activities. As such the Project will contribute to the cumulative area of seabed disturbed by anthropogenic activities. Given the small area of seabed affected by the Project compared to the area affected by fishing, and the anticipated recovery of the seabed over time, the significance of cumulative impact of the Project along with fishing affecting the seabed is considered to be ***negligible***.

Following implementation of the mitigation measures detailed above, no significant residual impacts to sensitive receptors are predicted as a result of the Project. Installation activities are short-term and have been designed to cause minimal disturbance to the marine environment. The permanent structures on the seabed, *ie* the subsea cable and rock installations, were likewise found to have no significant negative impacts on the identified receptors. In the case of rock installations, there could be some positive impacts in terms of habitat creation. *Table 7.1* Summary of Impact Findings provides a summary of the impact findings from this analysis. Potential impacts on designated sites are discussed in Annex C.

***Table 7.1 Summary of Impact Findings***

| Receptor | Mitigation Measures | Residual Impact Rating |
|---|---|---|
| Benthic ecology | None identified | Cable installation: ***Negligible*** |
| | | Rock placement: ***Positive*** |
| Fish and shellfish ecology | None identified | Cable installation: ***Negligible*** |
| | | Rock placement: ***Positive*** |
| Commercial fisheries | • Consultation with fishermen, including consultation on routing and schedule, and specifications for rock installations.<br>• Clear and timely notifications of Project activities, as outlined in a dedicated Communication Plan.<br>• Assignment of an FLO to maintain ongoing communication with fishermen over the life of the Project. | Cable installation: ***Negligible*** |
| | | Rock placement: ***Negligible*** |
| Shipping and navigation | • A Notice to Mariners (NTM) will be issued in advance of any Project operations at sea to notify other sea users of the proposed Project vessel movements and intentions. | Cable installation: ***Negligible*** |
| | | Rock placement: ***Negligible*** |
| Unplanned events | • A NTM will be issued in advance of any Project operations at sea to notify other sea users of the proposed Project vessel movements and intentions.<br>• Watch keeping and collision risk management will be carried out on board the Project vessel in order to reduce the risk of vessel collision. | All activities: ***Minor*** |
| Cumulative effects | No additional mitigation measures identified. | All activities: ***Negligible*** |

Aken, H.M.V. and Eisma, D. 1987. The circulation between Iceland and Scotland derived from water mass analysis. *Netherlands Journal of Sea Research*, 21 (1): 1-15.

Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B. and Moffat, C.F. (Editors). 2011. Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh. pp. 191

BERR (Department for Business Enterprise and Regulatory Reform). 2008. Atlas of UK Marine Renewable Energy Resources: Atlas Pages. A Strategic Environmental Report. March 2008. Produced by ABPmer, The Met Office, Proudman Oceanographic Laboratory with DEFRA. Available online from: http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk/files/file43527.pdf

Carter, L., Burnett, D., Drew, S., Hagadorn, L., MArle, G., Bertlett-McNeil, D., Irvine, N. 2009. Submarine Cables and the Oceans – Connecting the World. UNEP-WCMC Biodiversity Series, Vol. 31. ICPC/UNEP/UNEP-WCMC. 64.

Centre for Environment, Fisheries and Aquaculture Science (CEFAS). 2001. Technical Report produced for Strategic Environmental Assessment – SEA2: North Sea Fish and Fisheries.

Construction Industry Research and Information Association (CIRIA). 2015. Assessment and management of unexploded ordnance (UXO) risk in the marine environment.

Coull, K.A., Johnstone, R. and Rogers, S.I. 1998. Fisheries Sensitivity Maps in British Waters. Published and distributed by UKOOA Ltd.

Department of Energy & Climate Change (DECC). 2004. Strategic Environmental Assessment 5: Environmental Report. SEA 5 – Offshore Oil and Gas Licensing

DECC. 2016. UK Offshore Energy Strategic Environmental Assessment. OESEA3 Environmental Report. Future leasing/licencing for offshore renewable energy, offshore oil & gas, hydrocarbon gas and carbon dioxide storage and associated infrastructure. < https://assets.publishing.service.gov.uk/government/uploads/system/

uploads/attachment_data/file/504827/OESEA3_Environmental_Report_Final.pdf>

Dernie, K.M., Kaiser, M.J., Richardson, E.A. and Warwick, R.M. 2002. Recovery of soft sediment communities and habitats following physical disturbance. *Journal of Experimental Marine Biology and Ecology*, 285 – 286: 415-434.

Dernie, K.M., Kaiser, M.J., and Warwick, R.M. 2003. Recovery rates of benthic communities following physical disturbance. < https://besjournals.onlinelibrary.wiley.com/doi/full/10.1046/j.1365-2656.2003.00775.x>

Dooley, H.D. 1974. Hypothesis concerning the circulation of the northern North Sea. *Journal du Conseil Permanent International pour L'Exploration de la Mer*, 36: 54-61.

European Environment Agency (EEA). 2008. EN15 Accidental Oil Spills from Marine Shipping. Copenhagen. <https://www.eea.europa.eu/data-and-maps/indicators/en15-accidental-oil-spills-from/en15-accidental-oil-spills-from>

EMODnet. 2018. Seabed Habitats. < https://www.emodnet-seabedhabitats.eu/access-data/launch-map-viewer/>

The European Nature Information System (EUNIS). 2007. Habitat Classification. <http://eunis.eea.europa.eu/habitats.jsp>

Hammond, P.S., Macleod, K., Berggren, P., Borchers, D.L., Burt, L., Cañadas, A., Desportes, G., Donovan, G.P., Gilles, A., Gillespie, D., Gordon, J., Hiby, L., Kuklik, I., Leaper, R., Lehnert, K., Leopold, M., Lovell, P., Øienm, N., Paxton, C.G.M., Ridoux, V., Rogan, E., Samarra, F., Scheidat, M., Sequeira, M., Siebert, U., Skov, H., Swift, R., Tasker, M.L., Teilmann, J., Van Canneyt, O. and Vázquez, J.A. 2013. Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management. Biological Conservation 164: 107-122.

International Union for Conservation of Nature (IUCN). 2014. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>.

Joint Nature Conservation Committee (JNCC). 2000. The distribution of seabirds and marine mammals in the Atlantic Frontier, north and west of Scotland. ISBN 1 86107 5057. <http://jncc.defra.gov.uk/pdf/part1.pdf>

JNCC. 2018. North West Orkney MPA. < http://jncc.defra.gov.uk/page-6484>

Lindeboom, H.J., Kouwenhoven, H.J., Bergman, M.J.N., Bouma, S., Brasseur, S., Daan, R., Fijn, R.C., de Haan, D., Dirksen, S., van Hal, R., Hille Ris Lambers, R., ter Hofstede, R., Krijgsveld, K.L., Leopold, M. and Scheidat, M. 2011. Short-term ecological effects of an offshore wind farm in the Dutch coastal zone; a compilation. *Environmental Research Letters.* Volume 6, issue 3.

Lu, L. and Wu, R.S.S. 2000. An experimental study on recolonization and succession of marine macrobenthos in defaunated sediment. MarBiol 136: 291–302.

Marine Management Organisation (MMO). 2014. Mapping UK Shipping Density and Routes from AIS. MMO Project No: 1066. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/317770/1066.pdf

MMO. 2018. Monthly Sea Fisheries Statistics 2017. Available at: https://www.gov.scot/publications/scottish-sea-fisheries-statistics-2017/pages/6/

Nedwell, J.R., Brooker, A.G. and Barham, R.J. 2012. Assessment of underwater noise during the installation of export power cables at the Beatrice Offshore Wind Farm. < http://marine.gov.scot/datafiles/lot/bowl/ES/ES%20Volume%204%20-%20Annexs/7B%20OfTW%20Underwater%20Noise/Annex%207B%20OfTW%20Underwater%20Noise.pdf>

Newell, R.C, Seiderer, L.J. and Hitchcock, D.R. 1998. The impact of dredging works in coastal waters: a review of the sensitivity to disturbance and subsequent recovery of biological resources on the sea bed. *Oceanography and Marine Biology: an Annual Review 1998, 36, 127-78.* A. D. Ansell, R.N., Gibson and Margaret Barnes, Editors UCL Press.

Petersen, K.J. and Malm, T. 2006. Offshore windmill farms: threats or possibilities to the marine environment. 35. 29-34.

Red Penguin Associates Ltd. 2012. 'Submarine Cables and Onshore Energy Installations – Proximity Study Report'. The Crown Estate. Revision 5.0/24-04-2012.

Scottish Fisherman's Federation (SFF). 2018.Personal Communication / Confidential Fishing Data provided in Consultation w/ SFF.

Shipwrecks UK. 2018. < http://www.shipwrecks.uk.com/info1_2.htm>

SSE Renewables Developments (UK) Ltd. 2015. Brims Underwater Noise Assessment Underwater Noise Assessment Report.

Turrell, W.R., Henderson, E.W. and Slesser, G. 1990. Residual transport within the Fair Isle Current observed during the Autumn Circulation Experiment (ACE). *Continental Shelf Research*, 10 (6): 521-543.

Tyco Electronics SubSea Communications LLC (TE SubCom). 2018. Marine Route Survey Results.

Wilding, T.A., Hughes, D.J. and Black, K.D. (2005) The benthic environment of the North and West of Scotland and the Northern and Western Isles: sources of information and overview. Report 1 to METOC. Scottish Association for Marine Science, Oban, Scotland, PA37 1QA.

Wilson, J.C. and Elliot, M. 2009. The habitat-creation potential of offshore wind farms. *Wind Energy*. Volume 12, Issue 2.

*ANNEX A: VESSEL AND EQUIPMENT SPECIFICATIONS*

Detailed specification sheets are attached for the following vessels and equipment to be used in the cable installation: [i]

- Main Lay Cable Installation: Reliance Class Vessel
- ROV Vessel for PLIB & Rock Placement Support: Ocean Investigator
- Rock Placement: DPS Fall-Pipe Vessel – *Vessel not yet selected*
- Cable Burial during main lay cable installation: Sea Stallion sea plough
- Post-lay inspection and burial operations; pre-lay crossing inspections: UTV400 ROV

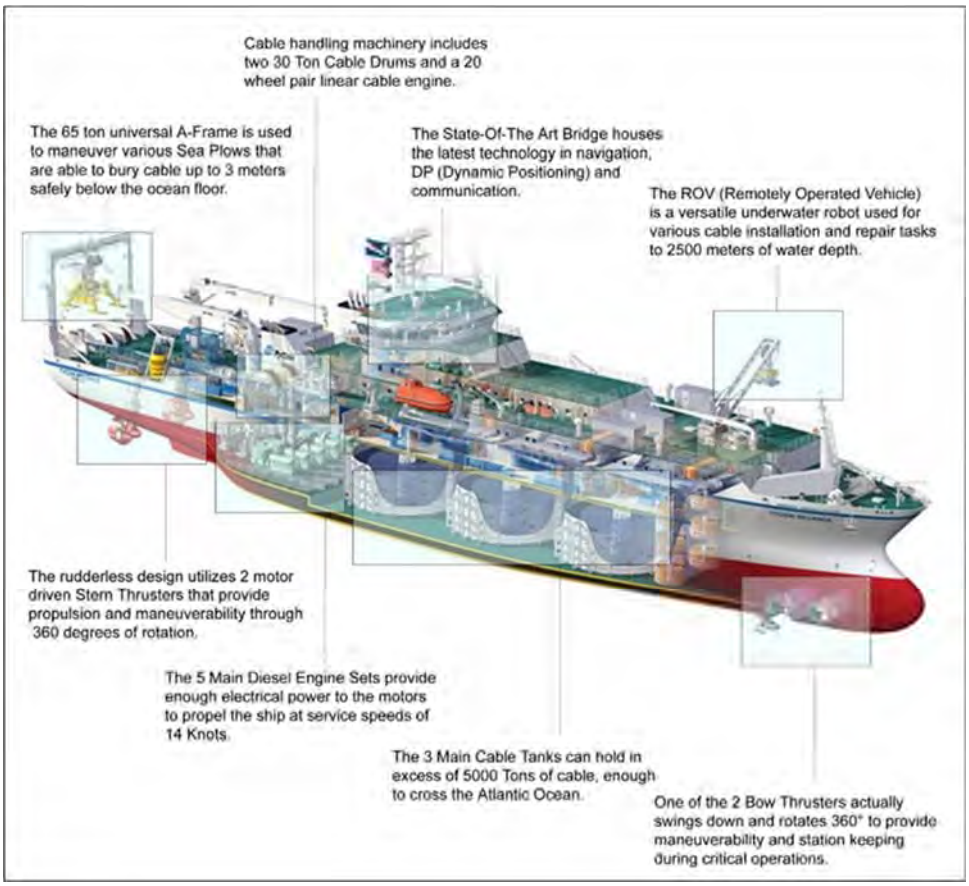
[i] Expected equipment type / models at the time of writing, The Project may utilize different but roughly equivalent equipment depending on availability and constraints at the time of installation.

*MAIN LAY VESSEL SPECIFICATIONS AND OVERALL INSTALLATION INFORMATION*

### *MAIN LAY VESSEL*

TE SubCom will be using a "Reliance Class" vessel for the installation of the cable. *Figure 0.1* provides a generic overview of a "Reliance Class" cable ship.

***Figure 0.1 Three-dimensional Schematic of a Typical Main-Lay Vessel and Supporting Equipment.***




Source: TE SubCom

These powerful, dynamically positioned vessels are capable of sustained cable operations in harsh weather conditions. Each vessel is outfitted with a cable trenching ROV and sea plough system capable of targeting a burial depth of 2 m. Cable handling machinery includes two 30 ton cable drums and 20 wheel pair linear cable engines allowing for precise handling and monitoring of all aspects of the cable installation.

### *MAIN LAY NAVIGATION*

The main lay vessel will use state of the art navigational systems and cable installation software (MakaiLay or equivalent) that allow precise surface positioning and prediction of the installed cable position on the seabed. As discussed in *Section* ***Error! Reference source not found.***, information such as the planned cable route, bathymetry, ship heading, position, speed, cable

characteristics and layout speed are integrated into the software to optimise the real-time monitoring of the cable installation. This software will use an advanced 2D force-based cable model to predict touchdown. The ship route will then be adjusted by the predicted offset distance calculated by the model to ensure the cable touchdown point will be closely positioned along the planned rote. Current vector data may also be used to improve prediction of as-laid accuracy within certain depth ranges.

Surface lay accuracy will be limited to the accuracy of the dual frequency GPS receivers, the motion of the vessel and the force-based software touchdown calculations based on cable type. Therefore, accuracy figures for the cable position relative to the planned route are to be given in relation to water depth, except in shallow water areas where the ship surface positioning is more critical.

***Main Lay Vessel Speed***

Cable laying activities will be closely monitored and the onboard engineer will be utilising the latest advancement in the subsea cable installation industry in order to ensure the cable is laid according to the as-engineered design. *Table 0.1* provides an overview of vessel speed during cable installation.

***Table 0.1 Vessel Speed Relative to Cable Laying Activities***

| Activity | Speed |
|---|---|
| Burial | 0.1 to 1.0 kt (185.2 m to 1,852 m/hr) |
| Surface Lay | 0.1 to 5.0 kt (185.2 m to 9,260 m/hr) |
| Transit | 0.1 to 10 kt (185.2 m to 1,852 m/hr) |

Throughout the majority of cable installation activities, the main-lay vessel will be travelling at 1-5 knots in open ocean waters, however, speed will vary depending on weather, seabed, and location.

# VESSEL GENERAL DESCRIPTION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# Ocean Investigator

## Multipurpose Offshore Support Vessel

MARITECHUSA
ENGINEERING & MARINE PROJECT SERVICES

The Ocean Investigator is a dynamically positioned offshore support and WROV vessel. The high power availability, DP-2 system and large moon-pool make her perfect for working close to platforms and in adverse conditions. The Vessel has proven capability in providing ploughing support, offshore operations, intervention support as well as support for construction work scopes. The proven and reliable design allows rapid deployment worldwide. Ocean Investigator has an advanced fuel efficient diesel electric propulsion system, providing excellent sea keeping capabilities. The vessel is also prepared for installation of any large work ROV on the on-board Mezzanine deck. Maritech Plans to upgrade the ROV on-board to a 400kW Trenching & WROV during Q2, 2017.

### FEATURES

- Class 2 Dynamic Positioning
- Fully Rebuilt & Modernized in 2014

### SERVICES

- Cable Lay & PLIB
- Inspections
- PLGR & RC Work
- Construction support
- Surveys


MARITECH USA
4520 Hudson Drive
Stow, Ohio, 44224
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www.maritechus.com


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# Ocean Investigator
## Multipurpose Offshore Support Vessel

MARITECH ENGINEERING & MARINE PROJECT SERVICES

### General

| | |
|---|---|
| **Call Sign** | H3MV |
| **Classification** | DnV, 1A1 Supply Vessel Fire Fighter I and II SF E0 DYNPOS-AUTR dk(+) pwdk, Tug / Supply Vessel, SF, EO, FiFi 1+2, Dyn Pos AutR |
| **Design** | UT 716 |
| **Port Of Registry** | Panama |

### Propulsion / Positioning

| | |
|---|---|
| **Main Engines** | 2 x 4000 BHP, Bergen Diesel KVMB-16/2 x 2940kW<br>2 x 2600 BHP, Bergen Diesel KVM-12/2 x 1910kW |
| **Fuel Type** | Gas Oil |
| **Propellers** | 2 x controllable pitchpropellers dia 3,600mm in nozzles |
| **Thrusters** | 1 x 1,200 BHP, forward (in tunnel)<br>1 x 1,000 BHP, VROS Retractable, forward,<br>2 x 1,000 BHP, aft (in tunnel) |
| **Rudders** | 2 x Ulstein Highlift Rudders |
| **Joy Stick** | 1 x Ulstein Manoeuvring System - Poscon |

### Tonnage

| | |
|---|---|
| **Gross** | 3.327 tonnes |
| **Net** | 999 tonnes |
| **Deadweight** | 2.254 tonnes |
| **Displacement** | 5.230 tonnes |
| **Light Ship** | 2.976 tonnes |

### Bollard Pull

| | |
|---|---|
| **Continuous** | 155 tonnes (DnV-approved) |

### Dimensions

| | |
|---|---|
| **Lenght OA** | 79.70 metres |
| **Lenght BP** | 68.60 metres |
| **Breadth, moulded** | 18.00 metres |
| **Depth, moulded** | 8.50 metres |
| **Draft, summer** | 5.95 metres |
| **Freeboard, summer** | 2.55 metres |

### Speed / Consumption

| | |
|---|---|
| **Idling/Stand by** | Abt. 2 tn / 24hrs. |
| **@ 8 Knots** | Abt. 7 tn / 24hrs. |
| **@ 10 Knots** | Abt. 14 tn / 24hrs. |
| **@ 12 Knots** | Abt. 21 tn / 24hrs. on direct drive with 2 engines |
| **@ 16 Knots** (or max) | Abt. 48 tn / 24hrs. on direct drive with 4 engines |
| **DP Mode** | 8,5-13 tn/24hrs |


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## DP Capability Plot

KONGSBERG

# DP Capability Plot

## NORTHERN COMMANDER

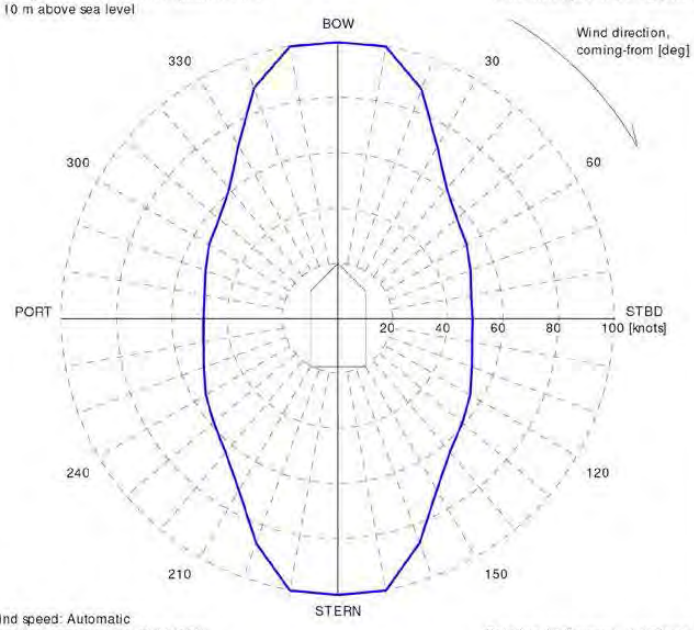
Case number : 1
Case description : Optimum use of all thrusters
Thrusters active : T1-T6
Rudders active :

| | | |
|---|---|---|
| Version | : | StatCap v. 2.9.0 |
| Input file reference | : | Foot_5848_RevA.scp |
| Last modified | : | 2014-05-21 15.44 |
| Length overall | : | 79.7 m |
| Length between perpendiculars | : | 68.6 m |
| Breadth | : | 18.0 m |
| Draught | : | 6.0 m |
| Displacement | : | 5476.0 t (Cb = 0.72) |
| Longitudinal radius of inertia | : | 17.1 m (= 0.25 * Lpp) |
| Pos. of origin ahead of Lpp/2 (Xo) | : | 0.0 m |
| Wind load coefficients | : | Calculated (Blendermann) |
| Current load coefficients | : | Database (Scaled by Draught/Length) |
| Wave-drift load coefficients | : | Database (Scaled by Breadth/Length) |
| Tidal current direction offset | : | 0.0 deg |
| Wave direction offset | : | 0.0 deg |
| Wave spectrum type | : | JONSWAP (gamma = 3.30) |
| Wind spectrum type | : | NPD |
| Current - wave-drift interaction | : | OFF |
| Load dynamics allowance | : | 1.0 * STD of thrust demand |
| Additional surge force | : | 0.0 tf |
| Additional sway force | : | 0.0 tf |
| Additional yawing moment | : | 0.0 tf.m |
| Additional force direction | : | Fixed |
| Density of salt water | : | 1026.0 kg/m³ |
| Density of air | : | 1.226 kg/m³ (15 °C) |
| Power limitations | : | OFF |
| Thrust loss calculation | : | ON |

| # | Thruster | X [m] | Y [m] | F+ [tf] | F- [tf] | Max [%] | Pe [kW] | Rudder |
|---|---|---|---|---|---|---|---|---|
| 1 | TUNNEL | 29.2 | 0.0 | 13.2 | -13.2 | 100 | 883 | |
| 2 | AZIMUTH | 25.5 | 0.0 | 13.0 | -8.0 | 100 | 736 | |
| 3 | TUNNEL | -26.8 | 0.0 | 11.0 | -11.0 | 100 | 736 | |
| 4 | TUNNEL | -29.5 | 0.0 | 11.0 | -11.0 | 100 | 736 | |
| 5 | PROP_AS | -34.3 | -5.3 | 52.1 | -36.4 | 100 | 2945 | SPADE |
| 6 | PROP_AS | -34.3 | 5.3 | 52.1 | -36.4 | 100 | 2945 | SPADE |

VARIABLE WIND AND WAVES
Limiting 1 minute mean wind speed in knots
at 10 m above sea level

ERN = 99.
ERN are subject to DNV approval




Wind speed: Automatic
Significant wave height: DNV (ERN)
Mean zero up-crossing period: DNV (ERN)

Rotating tidal current: 1.46 knots
Rotating wind induced current: 0.000*Uwi knots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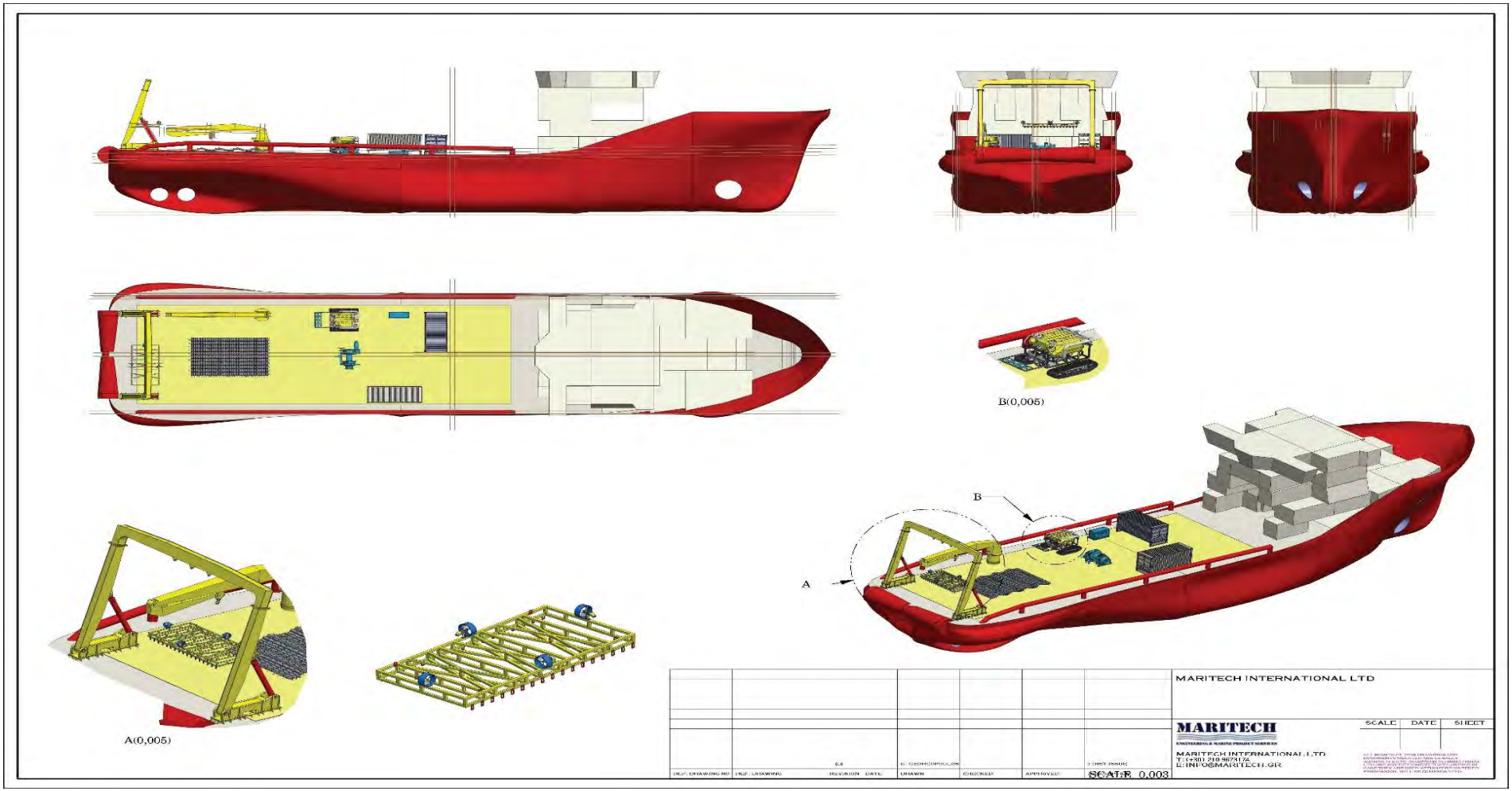


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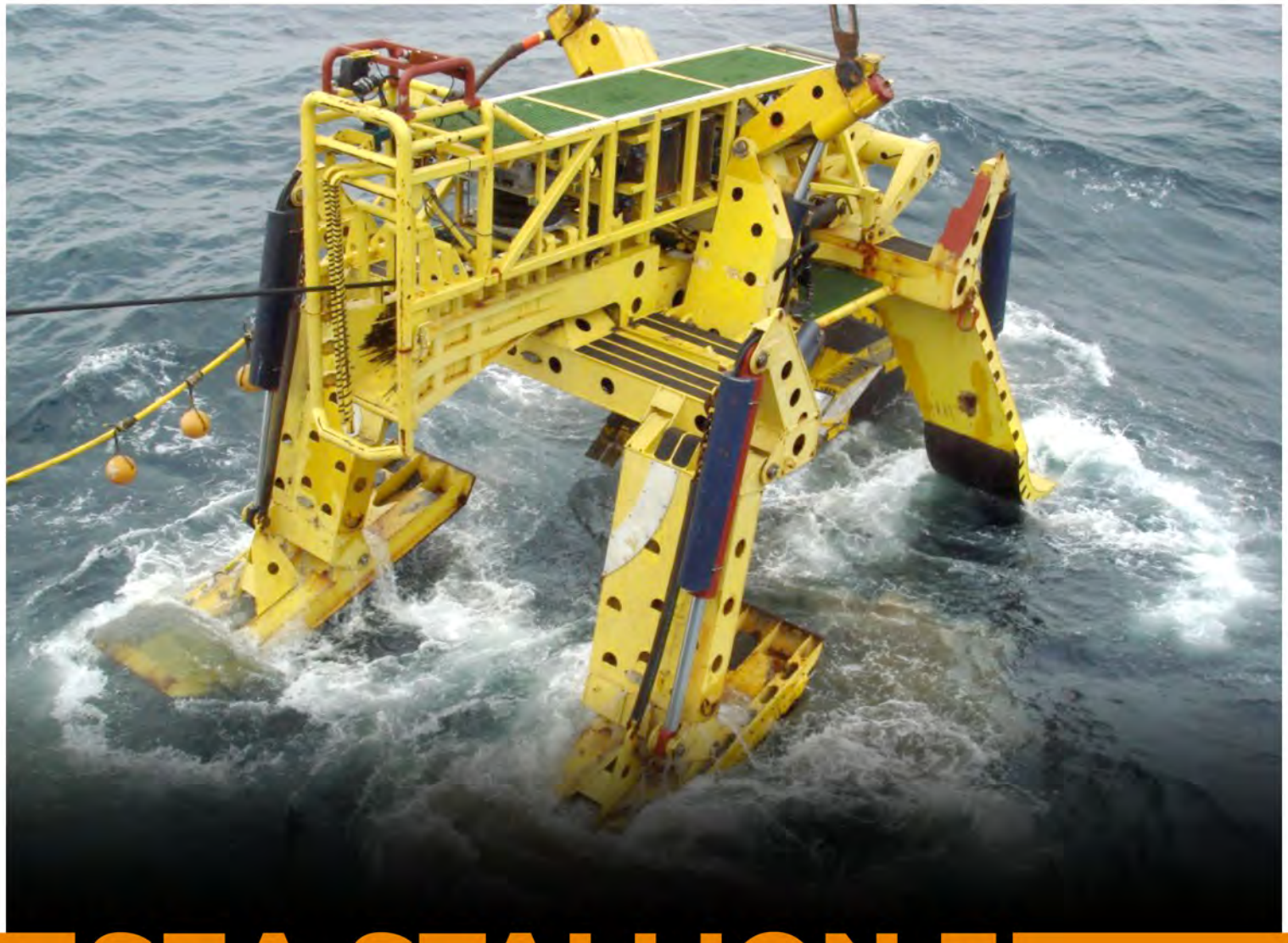

# SEA STALLION 3

## PLOW SPECIFICATIONS

SSP1 / SSP2 / SSP3

The cable plow system Sea Stallion is an EB SS3 Plow uniquely designed and capable of a 100 Ton bollard pull. It can trench and bury submarine cable to a depth of 3.0 meters, in up to 1,500 meters of water depth, and operate in a wide variety of seabed environments, ranging from sand to firm clays.



TE connectivity

SUBCOM

# W-ROV GENERAL DESCRIPTION (PHAROS OFFSHORE)

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MARITECH
ENGINEERING & MARINE PROJECT SERVICES

# UTV400 Trenching ROV


The UTV400 is capable of undertaking all aspects of cable maintenance, seabed survey and cable burial work of long duration, at depths down to 2,500 metres.

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## UTV400 DETAILS:

**Operating Depth:**
5 - 2500m

**Dimensions:**
L 3.8m x W 3.7m (with tracks attached) Hx 2.7m

**Weight in Air:**
8000kg (skids attached)
9200kg (tracks attached)

**Weight Aubmerged:**
50kg buoyant (skids attached)
750kg heavy (tracks attached)

**Max Bollard Pull:**
1000kg

**Vehicle Power:**
1 x 280kW electro-hydraulic power pack
3.3kV 4 pole 1760 rpm

**Cameras:**
1 x Kongsberg 1358-0702 Camera
3 x Kongsberg 14-110-0845 Camera
1 x Kongsberg 14-366-0120 Camera
1 x Kongsberg 1366-0509 Camera
Optional:
1 x Imenco (Tiger) Shark Range SDS1410 Duplex Digital Stills Camera
1 x Mini Zeus High Definition Camera

**Lighting:**
2 x Sealite Lights 110v (Deepsea Power & Light)
5 x Subeng LED Light

**Pan & Tilts:**
2 x Sub Atlantic 0058-MAF Pan & Tilt
1 x Sub Atlantic 0245-MAF Tilt Rotator

**Transponders/Responders:**
To suit owner supplied beacons.

**Cable Cutter:**
1 x Webtool WCD 75D
1 x Webtool WCO 38
1 x Stanley GR29 Grinder

**Cable clamp:**
1 x Slingsby TA17 complete with set of jaws

**Search & OA Sonar:**
Kongsberg 1071 Sonar

**Cable Tracking System:**
TSS deployment frame
To suit owner supplied TSS440/ 350 system

**Depth Sensor:**
Digi Quartz Depth sensor 8CB 2000-I

**Manipulators:**
2 x 7 function Conan Manipulators

**Gyro:**
Watson Industries solid state gyro

**Altitude:**
Teledyne Altimeter PSA-916 (007601)

**Pressure Transducers:**
Pump 1 System pressure
Pump 1 Boost pressure
Pump 2 System pressure
Pump 2 Boost pressure
Water depth
Water Manifold Pressure

**Linear Transducers:**
Oil reservoir volume
1 x Jetter depth
1 x Depressor Height
2 x Jet leg seperation

**Water Tngress:**
Oil reservoir
Valve tanks x 7
Electrical termination
Electronics Pod

**Cable Detection:**
2 proximity sensors depressor

**Configuration:**
Twin jet legs with multiple low pressure water jets.
Positive cable depressor
Fwd mounted tool

**Water Pump:**
3 x Variable speed hydraulically driven single stage water pumps.

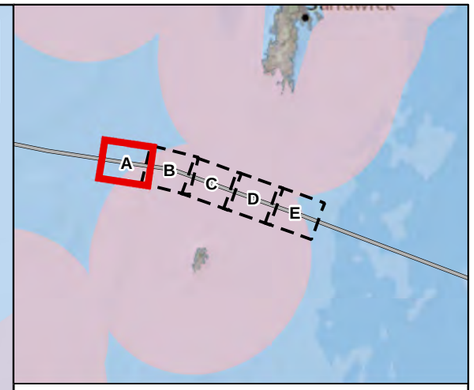
**Maximum Jet Pressure:**
5 bar

**Maximum Water Flow:**
6,000LPM/ pump

**Water Power Consumption:**
100 - 210kW

**Burial Tool Control:**
Depressor 0 - 1.0m
Tool width 0.1 - 0.4m
Tool depth 0 – full depth (tool dependent)
1.0/ 1.5 & 2.0m tools available

## *ANNEX B: SUBSTRATE TYPES AND BURIAL PLAN IN TERRITORIAL SEAS*


**Legend**

**Havfrue Cable System - Segment 5**

Burial Category

Burial < 0.5 m cover depth

Substrate

Sand

Subcropping Rock or Till

Jurisdictional Boundaries

Territorial Seas - 12 nmi

**Figure 1-A**
**Burial Plan in Scottish Territorial Seas**
Havfrue Cable System
United Kingdom Transit
TE SubCom

Environmental Resources Management
www.erm.com
ERM

Source: Esri - World Topoographic Map; WGS 1984 Web Mercator Auxiliary Sphere

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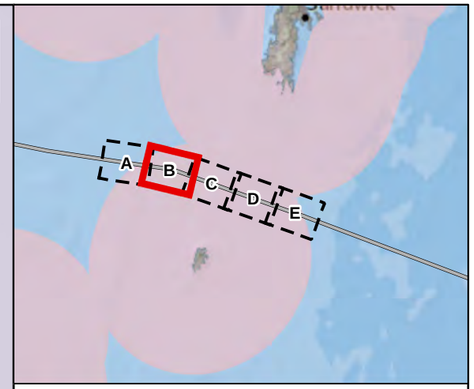


**Legend**

**Havfrue Cable System - Segment 5**

Burial Category

Burial < 0.5 m cover depth

Substrate

Sand

Outcropping Till

Subcropping Rock or Till

Jurisdictional Boundaries

Territorial Seas - 12 nmi

**Figure 1-B**
**Burial Plan in Scottish Territorial Seas**
Havfrue Cable System
United Kingdom Transit
TE SubCom

Environmental Resources Management
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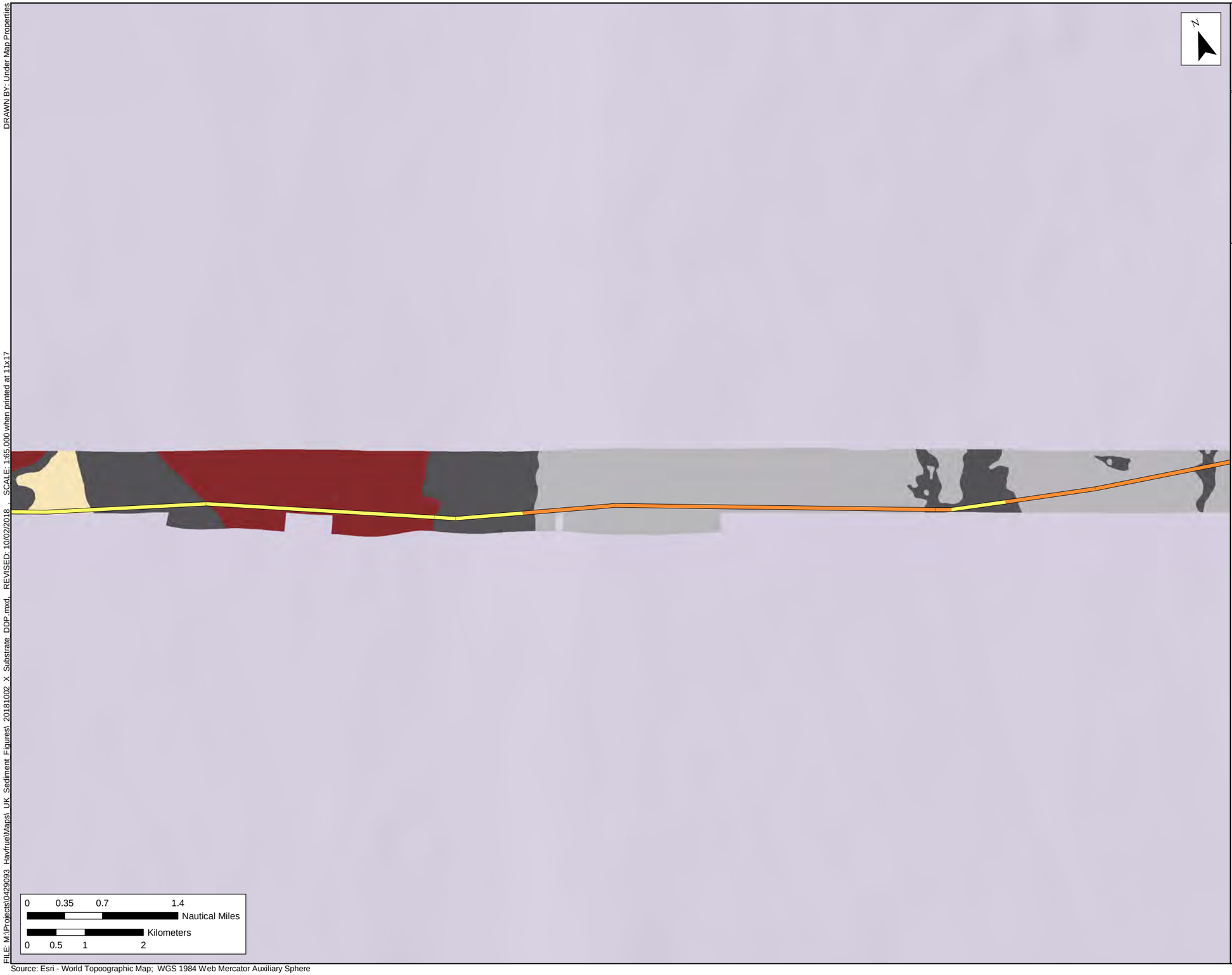
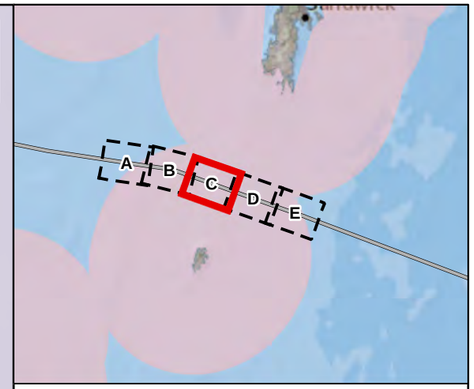
ERM

Source: Esri - World Topoographic Map; WGS 1984 Web Mercator Auxiliary Sphere




**Legend**

**Havfrue Cable System - Segment 5**

Burial Category

- Burial < 0.5 m cover depth
- Surface Lay

Substrate

- Sand
- Outcropping Till
- Rock
- Subcropping Rock or Till

Jurisdictional Boundaries

- Territorial Seas - 12 nmi

**Figure 1-C**
**Burial Plan in Scottish Territorial Seas**
Havfrue Cable System
United Kingdom Transit
TE SubCom

Environmental Resources Management
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Source: Esri - World Topoographic Map; WGS 1984 Web Mercator Auxiliary Sphere

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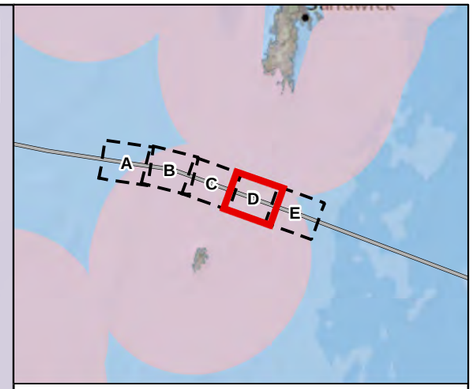


**Legend**

**Havfrue Cable System - Segment 5**

Burial Category

- Burial > 0.5 m and < 2 m cover depth
- Burial < 0.5 m cover depth
- Surface Lay

Substrate

- Sand
- Rock
- Subcropping Rock or Till

Jurisdictional Boundaries

- Territorial Seas - 12 nmi

**Figure 1-D**
**Burial Plan in Scottish Territorial Seas**
Havfrue Cable System
United Kingdom Transit
TE SubCom

Environmental Resources Management
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Source: Esri - World Topoographic Map; WGS 1984 Web Mercator Auxiliary Sphere

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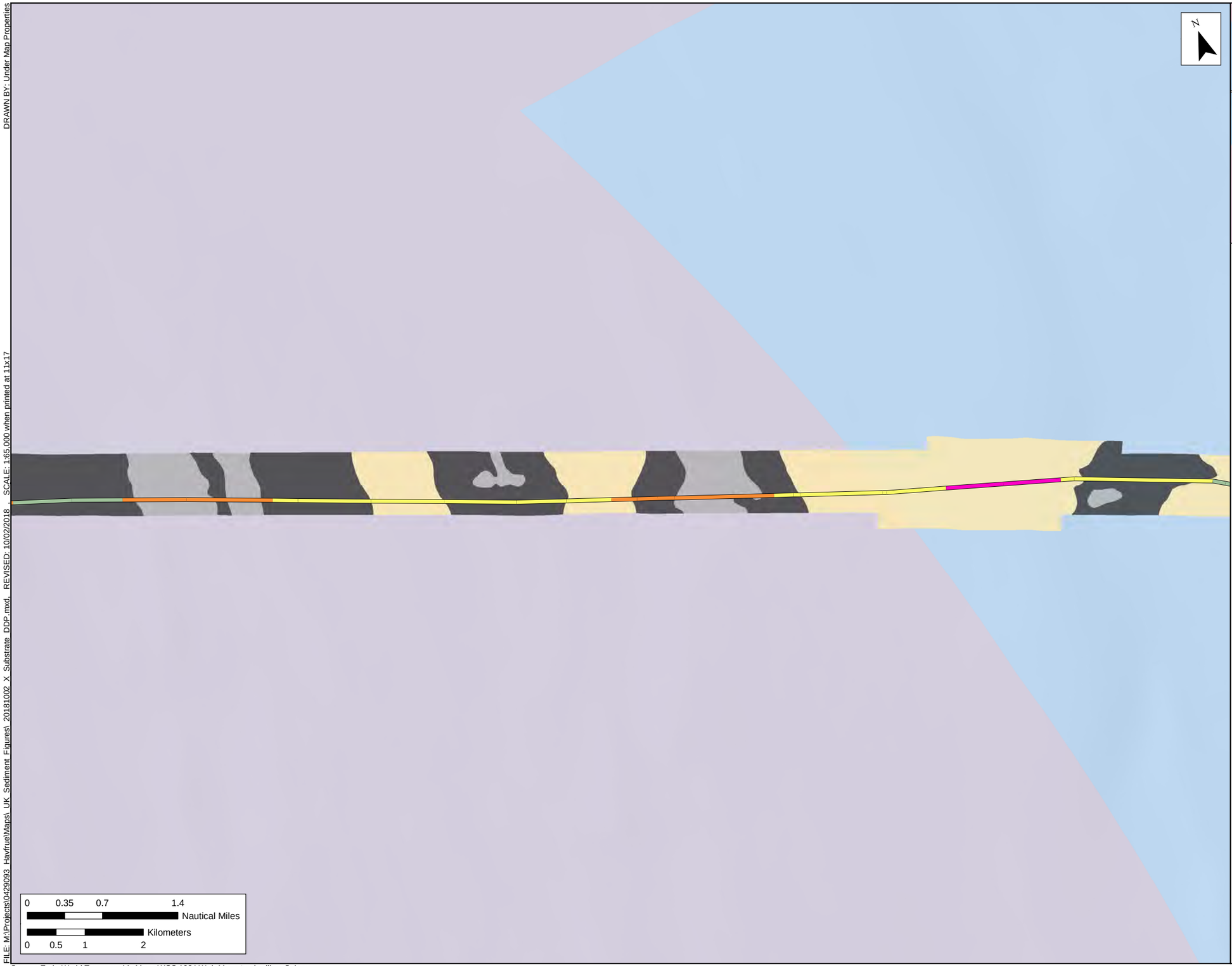


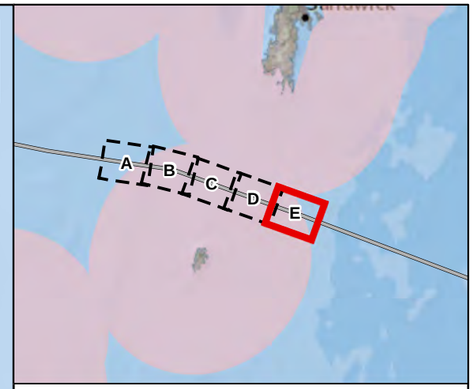


**Legend**

**Havfrue Cable System - Segment 5**

Burial Category

- Burial > 0.5 m and < 2 m cover depth
- Burial < 0.5 m cover depth
- Surface Lay
- Post-Lay Burial (PLB)

Substrate

- Sand
- Rock
- Subcropping Rock or Till

Jurisdictional Boundaries

- Territorial Seas - 12 nmi

**Figure 1-E**
**Burial Plan in Scottish Territorial Seas**
Havfrue Cable System
United Kingdom Transit
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Source: Esri - World Topoographic Map; WGS 1984 Web Mercator Auxiliary Sphere

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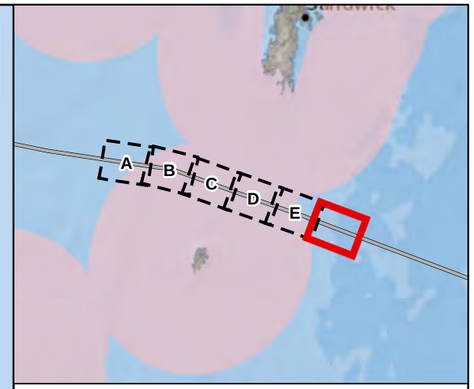


**Legend**

**Havfrue Cable System - Segment 5**

Burial Category

- Burial > 0.5 m and < 2 m cover depth
- Burial < 0.5 m cover depth

Substrate

- Sand
- Rock
- Subcropping Rock or Till

Jurisdictional Boundaries

- Territorial Seas - 12 nmi

**Figure 1-F**
**Burial Plan in Scottish Territorial Seas**
Havfrue Cable System
United Kingdom Transit
TE SubCom

Environmental Resources Management
www.erm.com

Source: Esri - World Topoographic Map; WGS 1984 Web Mercator Auxiliary Sphere

# Annex C: Designated Sites Impact Assessment

# 1 ANALYSIS OF IMPACTS ON DESIGNATED SITES

## 1.1 INTRODUCTION

This section considers the potential effects of the Project on marine designated sites within the UK Exclusive Economic Zone (EEZ). The routing of the cable has been designed to avoid crossing Marine Protected Areas (MPAs) where possible, and no MPAs are crossed within Scottish TS. However, the cable route passes through two designated MPAs within the UK EEZ: the West Shetland Shelf Nature Conservation Marine Protected Area (NCMPA) and the North-West Orkney NCMPA. As discussed in more detail in the Scoping Document submitted for the Project, the route across the MPAs, shown in *Figure C.1,* was optimised to reduce the length of the MPAs crossed by the cable by 53 percent compared to the original route.

## 1.2 PROJECT ACTIVITIES WITHIN DESIGNATED SITES

The following Project activities will be undertaken within the two MPAs identified above. Additional detail on each activity is provided in Section 2 of the main Environmental Assessment (EA) text.

- Pre Lay Grapnel Run (PLGR) will be undertaken along the cable route, including within the MPAs, to remove surface debris in areas where cable burial is planned.

- Through soft-bottom areas, the cable ship will install and bury the cable simultaneously using a sea plough. The sea plough is a burial tool resembling a large sled, approximately 5 m wide, attached to the cable ship with a tow wire (full specification in Annex A). In hard bottom areas, the cable will be surface-laid on the ocean floor.

## 1.3 DESIGNATED SITES - BASELINE ENVIRONMENT

The Project route crosses the two MPAs described below:

- *The West Shetland Shelf NCMPA* is designated for the variety of sediment habitats present in the area. The sediments range from fine-grained sands to coarse gravels, which provide a wide range of habitat conditions for benthic species (JNCC 2018). Though this habitat is relatively common in Scottish seas, this particular area provides a greater diversity of species than other areas in Scotland. The coarser sediments, including cobbles and pebbles, support anemones, cup corals, hermit crabs, and squat lobsters. The finer sediment sections support species such as urchins and seastars (JNCC 2018).

- *The North-West Orkney NCMPA* is designated for sandeels and geomorphological features, including sandbanks, sand wave fields and

sediment wave fields. The area is characterised by areas of rough substrate within the areas of sediment, which make it suitable for sandeel colonisation. The MPA plays an important role in supporting wider populations of sandeels in Scottish waters. Specifically, newly hatched sandeel larvae from this region are transported by currents to sandeel grounds around Shetland and the Moray Firth (JNCC 2018).

A number of other MPAs are located close to, but not directly affected by the cable route in the Scottish TS and UK EEZ. *Figure C.2* shows designated sites in the vicinity of the cable route. The following designated sites have been identified within 25 nm of the Project route and within the Scottish TS:

- Sumburgh Head: distance approximately 25 nm; and
- Fair Isle: distance approximately 10 nm.

The following designated sites have been identified within 25 nm of the Project route, outside the Scottish TS, but within the UK EEZ:

- Braemar Pockmarks: distance approximately 15 nm;
- Central Fladen: distance approximately 15 nm;
- Wyville Thompson Ridge: distance approximately 20 nm;
- Darwin Mounds: distance approximately 5 nm;
- Rosemary Bank Seamount: distance approximately 1-2 nm;
- Geikie Slide and Hebridean Slope: distance approximately 3-4 nm; and
- Anton Dohrn Seamount: distance approximately 1 nm.

These other MPAs have been scoped out of the assessment because the distance to the MPAs (minimum of 1 nm) is considered to be outside the area of impact associated with cable lay activities, which are highly localised.

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West Shetland Shelf

N

0 5 10 Nautical Miles

North-west Orkney

N

0 5 10 Nautical Miles

N

Wyville Thompson Ridge

Darwin Mounds

West Shetland Shelf

North-west Orkney

Fair Isle

Central Fladen

Lerwick

Sandwick

Stromness

Orkney Islands

Steornabhagh (Stornoway)

Outer Hebrides

The Minch

Moray Firth

SCOTLAND

Inverness

0 20 40 80 Nautical Miles

0 40 80 160 Kilometers

North Sea

UNITED KINGDOM

## Legend

**Havfrue Cable System**

Segment 5

**Protected Areas**

Nationally Designated Area

Natura2000 Area

**Jurisdictional Boundaries**

Territorial Seas - 12 nmi

**Burial Category**

Burial > 0.5 m and < 2 m cover depth

Burial < 0.5 m cover depth

Surface Lay

Post-Lay Burial (PLB)

**Substrate**

**Class**

Sand

Outcropping Till

Rock

Scattered Rock

Subcropping Rock or Till

**Figure C.1**
**Burial Categories in Marine Protected Areas**
Havfrue Cable System
United Kingdom Transit
TE SubCom

Environmental Resources Management
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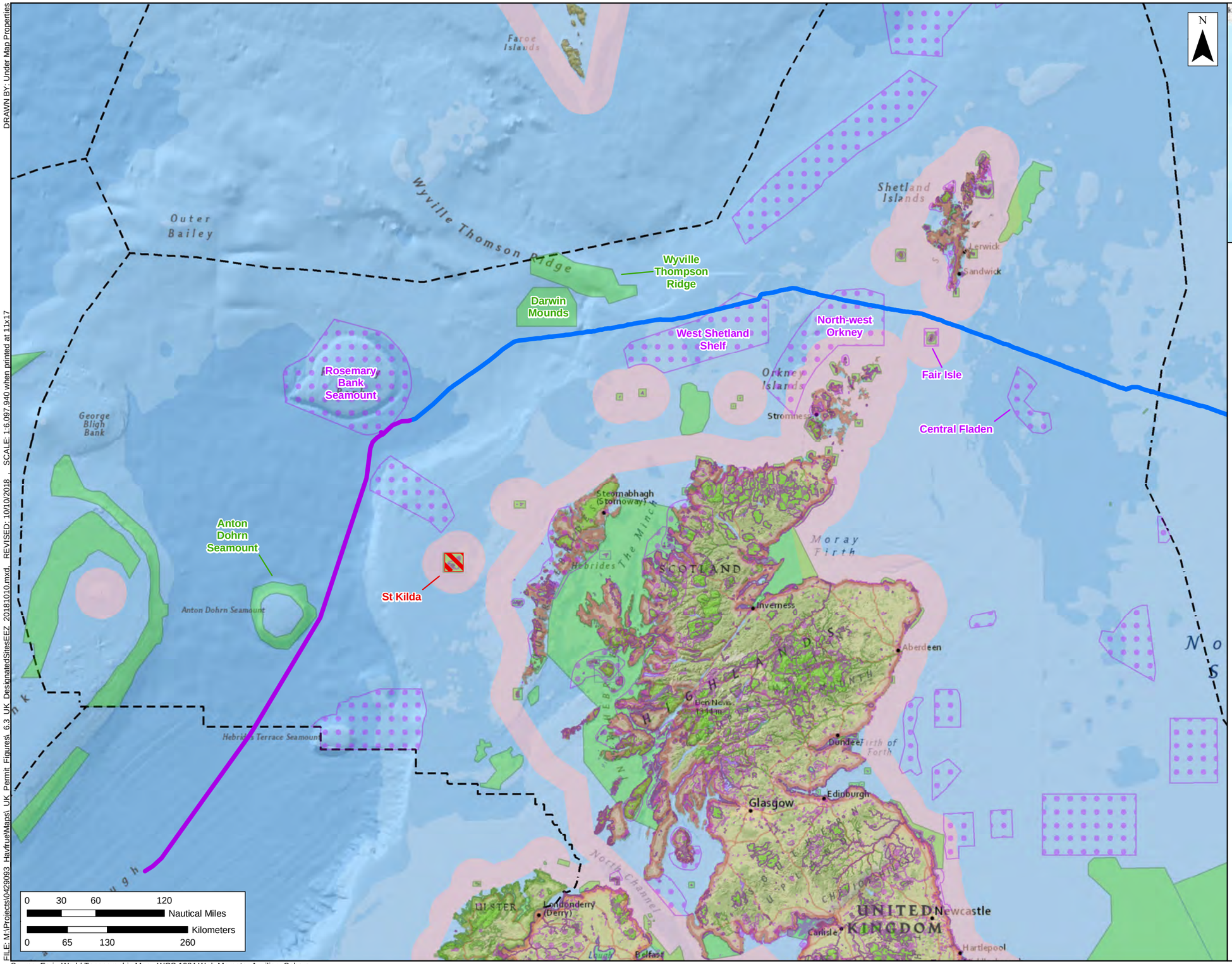
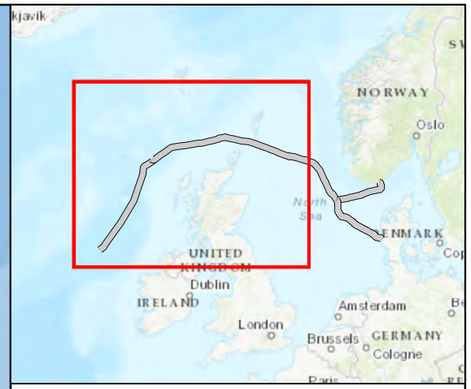
Source: Esri - World Topoographic Map; WGS 1984 Web Mercator Auxiliary Sphere




**Legend**

**Havfrue Cable System**

- Segment 3
- Segment 5

**Jurisdictional Boundaries**

- Exclusive Economic Zone (EEZ) - 200 nmi
- Territorial Seas - 12 nmi

**Designated Areas**

- Marine Protected Area
- Natura2000 Area
- World Heritage Marine Program

**Figure C.2**
**Designated Sites in the UK EEZ**
Havfrue Cable System
United Kingdom Transit
TE SubCom

Environmental Resources Management
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Source: Esri - World Topoographic Map; WGS 1984 Web Mercator Auxiliary Sphere

### *1.3.1 Potential Effects – West Shetland Shelf NCMPA*

The potentially significant effects on the conservation objectives for the site include:

- Changes to the extent of offshore subtidal sands and gravels; and
- Changes to the structure and function, quality, and the composition of characteristic biological communities found in the offshore subtidal sands and gravels.

The total length of the cable route across the MPA will be 39.5 km. At approximately 4 cm width, the permanent footprint of the cable across the MPA will be approximately 1,580 m$^2$, representing a small fraction of the MPA area. Based on the results of the marine survey and burial feasibility analysis, cable burial is planned through the MPA at depths ranging from 0.15 m to 0.5 m.

While the seabed sediments will be disturbed by the PLGR and sea plough, and sediment structure along the cable route will be temporarily altered, the extent of the offshore subtidal sands and gravels will remain the same. No rock placement is planned in the MPA as part of the project. Calculating the disturbance area as the full width of the sea plough (5 m), the temporary impact area would be approximately 197,500 m$^2$, or 0.00005% of the total area of the West Shetland NCMPA. Given the very small proportion of the MPA affected by the cable lay activities, and that the extent of the protected area is not altered, this is not anticipated to affect the conservation objective relating to the extent of offshore subtidal sands and gravels. As such, the magnitude of effect is negligible. In addition, as advised by JNCC, any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery from such deterioration (JNCC 2018b).

Cable lay activities will temporarily affect the structure and function, quality, and the composition of characteristic biological communities found in the offshore subtidal sands and gravels. As discussed in *Section 6.2.2* of the EA, recovery of the seabed is largely dependent on the substrate left following cable installation. Benthic communities in clean sand will have the most rapid recovery rate, whereas communities from muddy sand habitats will recover more slowly (Dernie *et al.* 2003). The marine survey results show the seabed through the West Shetland Shelf NCMPA to consist of a veneer of sand and gravel over rock, subcropping rock, or till, and as such recovery is expected to be relatively rapid. Given the very small proportion of the MPA affected and the expected fast recovery, the magnitude of impact is **negligible**.

*Mitigation Measures*

Mitigation measures inherent to the project design include avoiding MPAs where possible, and minimising the extent of route through the MPA where avoidance has not been possible. No further measures are necessary.

*Residual Effects*

The results from the online Feature Activity Sensitivity Tool (FEAST) indicate that subtidal coarse sediments range in sensitivity from low to medium when exposed to sub-surface abrasion / penetration caused by laying cables (Marine Scotland Website 2018). The degree to which particular examples of the habitat is sensitive to the pressure is dependent on the species present. However, given the magnitude of effect on both conservation objectives for the site is negligible, the significance of impact is **negligible**.

### *1.3.2 Potential Effects – North-West Orkney NCMPA*

The potentially significant effects on the conservation objectives for the site include:

- changes to quality and quantity of sandeel habitat and the composition of its population so that population numbers are not maintained; and
- changes to the extent, integrity, structure, and functioning of sand banks, sand wave fields and sediment wave fields representative of the Fair Isle Straight Marine Process Bedforms Key Geodiversity Area.

Approximately 45.8 km of cable will be installed through the North-west Orkney NCMPA using a combination of surface lay and burial depending on the substrate. The cable will be buried where sea bottom substrate allows. In substrates such as shallow sand over rock or subcropping till, the cable will be buried to a depth up to 0.50 m (sometimes less, where rock is closer to the surface or sediments are cemented). In areas with deeper sand over subcropping rock or till, the cable will be buried to between 0.50 m and 1.5 m. Surface lay will occur over areas of rock or outcropping till. Figure C.1 shows the location and target depths of surface lay and burial within the two MPAs, based on the marine survey results and burial feasibility analysis conducted by the Project. No rock placement is planned in the MPA as part of the Project.

In areas where the cable is surface laid, it is unlikely sandeel habitat will be affected, as sandeel prefer sand, slightly gravelly sand and gravelly sand as their habitat. The structure and function of the supporting habitat plays an important role in determining the presence and distribution of the sandeels (JNCC 2018). Sandeels are typically found buried within seabed sediments with a high proportion of coarse sand to between 8 cm and 12 cm depth.

As such, in areas where the cable is buried, a small proportion of the available sandeel habitat will be temporarily disturbed and as sandeel are faithful to a discrete area of seabed sediment after recruitment (MarineSpace Ltd. *et al* 2013) it is possible some sandeel individuals will be displaced. It is also possible a small number of individuals will be injured or killed by the sea plough but sandeel are mobile species and most will be able to avoid injury.

Approximately 27 km of cable will be buried in the MPA, with the remainder surface-laid across hard substrate. Using a conservative temporary impact area of 5 m – the width of the plough - approximately 135,000 m² of bottom substrate would be temporarily disturbed, or less than 0.00003% of the available habitat within the MPA. The permanent footprint of the cable will represent an even smaller proportion of the MPA area. Therefore, any displacement or loss of individuals is unlikely to affect the composition of the sandeel population or affect population numbers. In addition, once cable installation is complete, the hydrodynamic regime will return the seabed to conditions similar to the baseline and the seabed will once again be available for colonisation by sandeel.

Sandeel spawn a single batch of eggs in December-January, several months after ceasing to feed. The eggs are deposited on the seabed. The larvae hatch after several weeks, usually in February-March, and drift in the currents for one to three months, after which they settle on the sandy seabed (MarineSpace Ltd. *et al* 2013). At this time, installation is planned for late spring to summer, and would avoid the spawning period.

Given the small proportion of sandeel habitat affected, but recognising that there will be a temporary change in available habitat and potential direct effect on some sandeel individuals, the magnitude of effect is assessed as **small** during installation, dropping to **negligible** once in operation**.**

The surface-laid cable will not affect the extent, integrity, structure, and functioning sandbanks, sand waves fields or sediment wave fields as it will be placed on rock and not on the active bedforms. However, the buried cable will temporarily affect the structure of the sediments representative of the Fair Isle Straight Marine Process Bedforms Key Geodiversity Area. Given these shelf tidal bedform features are active and are maintained under a specific range of tidal current conditions (JNCC 2018), the bedforms will return to their baseline conditions in time. In addition, the overall proportion of seabed affected is very small, and as such the magnitude of effect is considered **negligible**.

*Mitigation Measures*

Mitigation measures inherent to the project design include avoiding MPAs where possible, and minimising the extent of the route through the MPA where avoidance has not been possible.

*Residual Effects*

The results from the online Feature Activity Sensitivity Tool (FEAST) indicates sandeels burrow near the seabed surface and so they have a high sensitivity when exposed to sub-surface abrasion / penetration caused by laying cables (Marine Scotland 2018). Given the small magnitude of effect, the impact is therefore considered to be of **moderate significance** during the installation period, reducing to **negligible** once operational.

The results from the online Feature Activity Sensitivity Tool (FEAST) indicates the soft unconsolidated sediments of sediment wave fields, sand wave fields and sand banks have some ability to recover from disturbance (Marine Scotland 2018). They are all considered to have high resilience but medium resistance to disturbance from cable installation. Given the magnitude of effect on the conservation objective for the bedforms is negligible, the significance of impact is **negligible**.