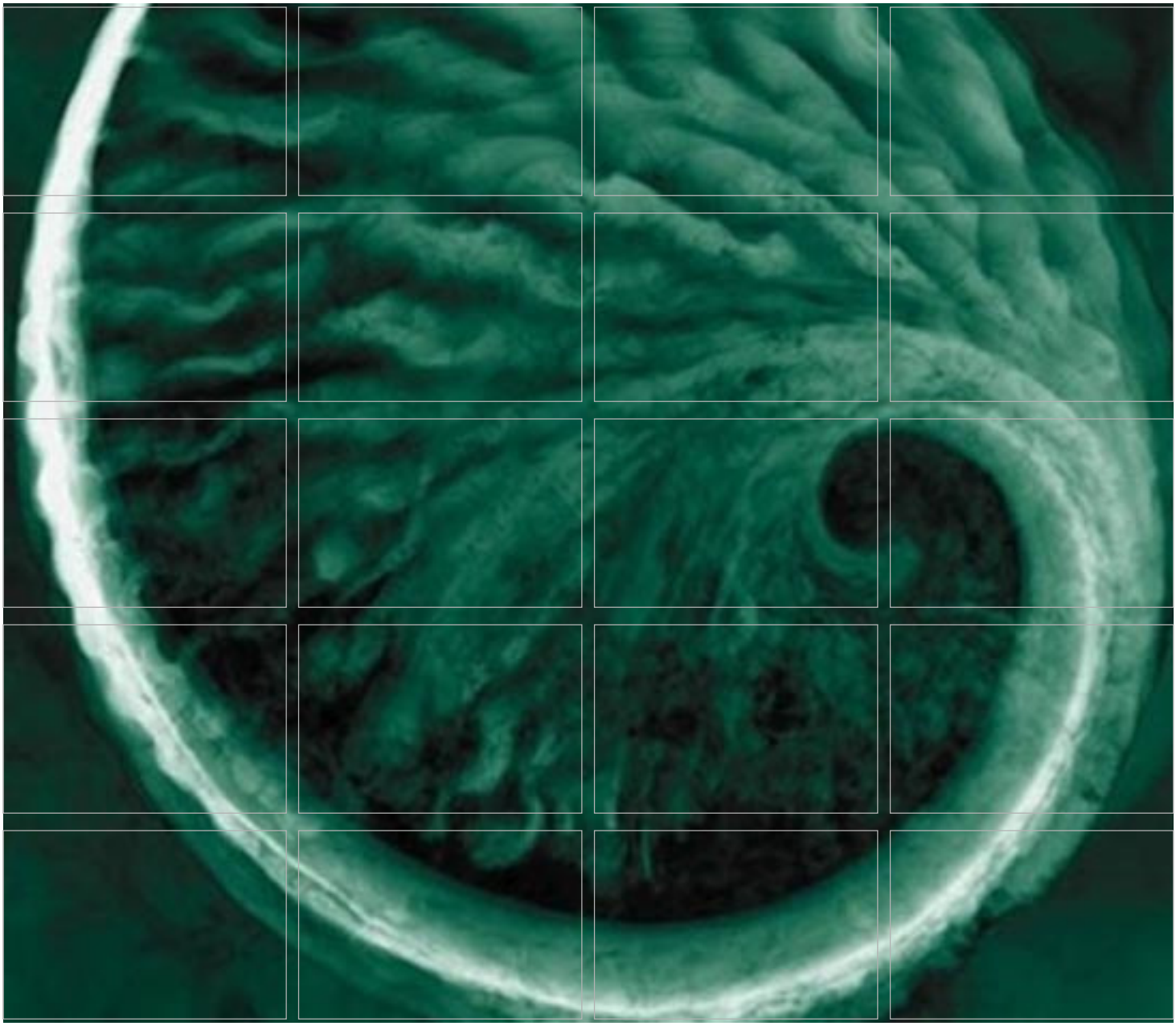

Havfrue Cable System
UK Segment:
Scoping Report

Date: May, 2018

TE connectivity
SUBCOM

ERM

Havfrue Cable System UK Segment:

Scoping Report

11 May, 2018

Project No. 0439685

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ACRONYM LIST

CEFAS	Centre for Environment, Fisheries & Aquaculture Services
cm	Centimetre
DA	Double Armour
DEFRA	Department for Environment, Food and Rural Affairs
DTI	Department of Trade and Industry
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EUNIS	European Nature Information System
FEAST	Feature Activity Sensitivity Tool
JNCC	Joint Nature Conservation Council
Km	Kilometre
LWA	Light Wire Armour
M	Metre
MARPOL	International Convention for the Prevention of Pollution from Ships
MPA	Marine Protected Areas
NCMPA	Nature Conservation Marine Protected Areas
nm	Nautical Mile
OSCP	Oil Spill Contingency Plan
OOS	Out-Of-Service Cable
PCBs	Polychlorinated biphenyl
PLGR	Pre-Lay Grapnel Run
PLIB	Post-Lay Inspection and Burial
ROV	Remotely Operated Vehicle
SCANS	Small Cetacean Abundancy in the North Sea and Adjacent Water Survey
SEA	Strategic Environmental Assessment
TS	Territorial Seas

1 INTRODUCTION

1.1 PROJECT OVERVIEW

The Havfrue Cable System (the Project) is a planned subsea cable system in the Atlantic and North Sea that will link the United States, Denmark, Ireland, and Norway, providing additional connectivity across the Atlantic Ocean and North Sea. The new system will increase telecommunications reliability and diversity between the regions and increase data transmission capacity and speeds, helping to satisfy growing demand in Europe and the USA.

The Havfrue cable owner has contracted Tyco Electronics SubSea Communications LLC (TE SubCom, the Applicant, based in the USA) to supply and install the system. Following installation, the cable will be owned and operated by Optibulk Havfrue AS ("Optibulk"), American Europe Connect 2 Limited ("AEC"), Google Infrastructure Bermuda Limited ("Google") and Edge Network Services Limited ("Edge).

The Project will include a subsea fibre-optic cable, which is less than 4 centimetres (cm) in diameter, to be installed across the seafloor. Where water depths are less than 1,500 metres (m) the cable will be buried, where conditions allow, except where it crosses existing infrastructure. Approximately 38 kilometres (km) of the cable route crosses Scottish Territorial Sea (TS), with a further 925 km crossing within the UK Exclusive Economic Zone (Scottish Zone) (EEZ). Although the Project is entirely within the Scottish Zone the report will refer to it as UK EEZ, where applicable.

This document is the Scoping Report for the Project and presents the UK cable segment transiting through Scottish TS (Cable Route Segments 5, Figure 1.1). This report has been prepared on behalf of TE SubCom by Environmental Resources Management (ERM).

1.2 OBJECTIVE OF THIS SCOPING REPORT

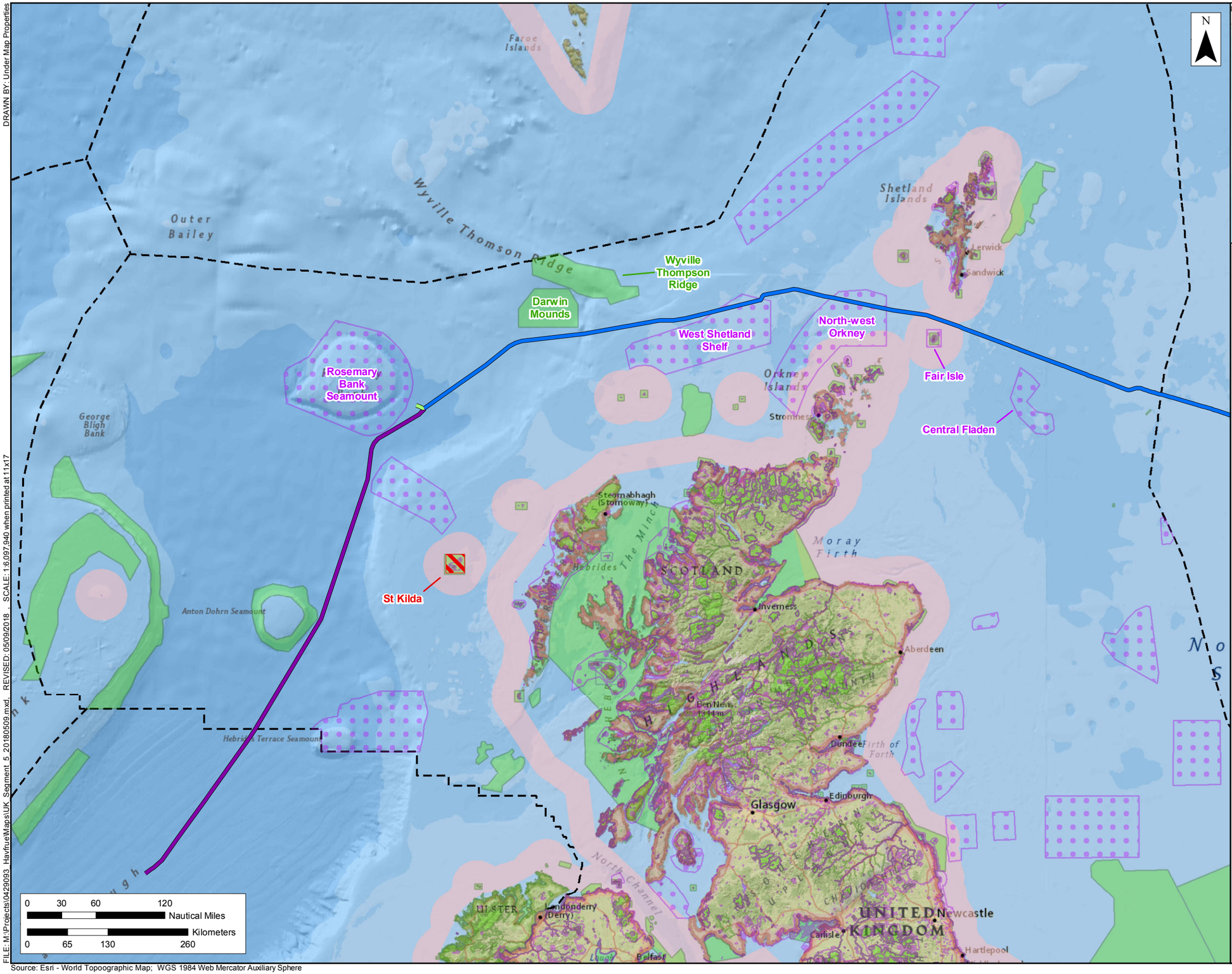
The main objective of this Scoping Report is to identify the environmental issues that might arise during the Project and which will therefore be addressed in more detail as part of the Environmental Appraisal (EA) to support the application for a Marine Licence for the proposed installation, operation and maintenance of the Project. Some potential impacts are not considered likely to be significant by virtue of the magnitude of the effect or due to the sensitivity of receptor. In these cases the potential impacts will not be considered further in the EA (i.e. they are scoped out of the assessment process).

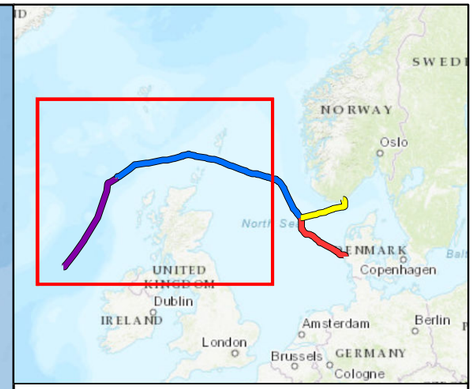
The focus of this report is on the Havfrue cable route in the Scottish TS between Orkney and Shetland, as discussed in Section 1.4. Consenting and Policy Framework.

DRAWN BY: Under Map Properties

FILE: M:\Projects\0429093 HavfrueMaps\UK Segment 5 20180509.mxd, REVISED: 05/09/2018 , SCALE: 1:6,097,940 when printed at 11x17

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





Legend

Havfrue Cable Segment
- 3
- 4
- 5
- 6
- 7

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

Protected Areas
- Nationally Designated Area
- World Heritage Marine Program
- Natura2000 Area

Sources:
VLIZ (2012). Intersect of IHO Sea Areas and Exclusive Economic Zones (version 2). Available online at http://www.marineregions.org/. Consulted on 2018-03-29.
Nationally designated areas (CDDA), Natura 2000
© European Environment Agency (EEA), 2017
© OSPAR Commission. 2016
Flanders Marine Institute (2016). Maritime Boundaries Geodatabase, version 1

Figure 1.1
Jurisdictional Boundaries and Protected Areas
Havfrue Cable System
United Kingdom Transit
TE SubCom

Environmental Resources Management
www.erm.com
ERM

1.3 CONSULTATION AND COMMUNICATION

The Project team has undertaken consultation with Crown Estate Scotland, Marine Scotland and the Joint Nature Conservation Committee (JNCC), and has included meetings and e-mail correspondence. Through this consultation, Marine Scotland has confirmed that a Marine Licence is required for the installation of the cable within Scottish TS (defined by the 12 nautical mile [nm] limit). A Marine Licence application must be supported by an EA, Construction Method Plan, Decommissioning Plan, Fisheries and Navigational Communication Plan, and a Protection Plan.

This consultation also confirmed that in the absence of specified activities (e.g. rock placement), no Marine Licence is required for installation of a marine cable outside of Scottish TS, including sections within Marine Protected Areas (MPAs), which are in the UK EEZ. No use of mattressing or rock placement is planned at this time. In the event that rock placement is required a separate Marine License would be required.

Consultations with Marine Scotland and the JNCC confirmed that cable installation is not a licensable activity in areas outside Scottish TS. It is therefore exempt from any requirements for a formal habitat/MPA assessment. However, Marine Scotland did recommend that, for the sake of completeness and clarity of process, information on the MPAs be provided with the scoping report to accompany the Marine Licence application for cable installation. Consultees recommended that potential impacts on MPAs be discussed within the EA and that industry best practice should be followed during the cable installation activities. In response to these requests, this Scoping Report includes Appendix A describing the cable route in the UK EEZ and efforts during the design phase to avoid designated areas to the extent feasible. Industry best practices for cable installation would be applied as standard practice for the full extent of the proposed cable route.

Crown Estate Scotland has not raised concerns in relation to the Project beyond the requirements for a licence agreement.

The Applicant engaged commercial fishing groups during the route planning stage for the subsea cable, and is currently undertaking a broader stakeholder communication effort with fishermen and fishing federations. Additional detail on the communication plan and process will be provided with the EA and Marine License application.

The following organizations in the UK have been contacted to date:

- Scottish Fishing Federation (SFF) (Raymond Hall) 24 Rubislaw Terrace, Aberdeen AB10 1XE, UK
- National Federation of Fishermen's Organisations (NFFO) 30 Monkgate. York YO31 7PF.
- The Kingfisher Information Service, Seafish, Origin Way, Europarc, Grimsby, DN37 9TZ,UK

1.4 CONSENTING AND POLICY FRAMEWORK

As described above, a Marine Licence is required for the installation and operation of submarine cables on and under the seabed in the Scottish TS. This is a requirement under Part 4 of the *Marine (Scotland) Act 2010.* The installation of cables is not 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 application. However, the project will require a number of consents and licences, of which the main ones are summarised in Table 1.1.

TABLE 1.1 UK PERMIT & CONSENT REQUIREMENTS

Permitting Authority	Permit/Consent	Description
Marine Scotland	Marine Licence (cable installation)	The installation of a subsea cable is licensable activity within the TS under the Marine Scotland Act 2010.
Marine Scotland	European Protected Species Mitigation Licence	Certain species are protected by international, national and European wildlife legislation throughout Scotland. This includes protection from intentional or reckless disturbance, taking, harming and killing, and in some cases possessing or sale of the species. A licence is required to undertake certain construction work.
Crown Estate Scotland	Seabed Licence	The Crown Estate Scotland owns and manages the seabed out to 12 nm. A Crown Estate Seabed Licence will be required for the right to install and operate Havfrue.
Shetland Island Council	Work Licence	For developments within 12 nm of the Shetland Islands, a work licence is required.

The proposed Project can be considered to be of a limited scale as the cable is 4 cm in diameter and crosses approximately 38 km within the licensable Scottish TS (total traverse of UK waters is 925 km); thus, the potentially affected area is relatively small. However, as cable installation will take place within Scottish TS a number of issues in respect of potential environmental effects are addressed in this scoping report. Advice from Marine Scotland, in their Guidance for Marine Licence Applicants (Marine Scotland, 2015) notes the need for a proportionate environmental assessment, which will be undertaken through the EA.

2 PROJECT DESCRIPTION

2.1 PROJECT OVERVIEW AND OBJECTIVES

The Havfrue Cable System (the Project) is a planned subsea cable system in the Atlantic and North Sea linking the countries of United States, Denmark, Ireland, and Norway. The Havfrue cable owner has contracted Tyco Electronics SubSea Communications LLC (TE SubCom, the Applicant) to supply and install the system.

This document assesses the cable segments transiting through the Scottish TS (Segment 5, Figure 1.1). Approximately 38 km of cable will cross Scottish TS, with an additional 925 km crossing within the UK EEZ. The Project will include a subsea fibre-optic cable, (less than 4 cm in diameter) to be installed across the seafloor and buried out to the 1,500 m depth contour off the coast, where conditions allow. The cable will not cross any in-service cables or pipelines within TS. Where it does cross existing infrastructure (within the EEZ), alternatives to burial will be investigated.

The Project will be installed by TE SubCom , and will be owned and operated by Optibulk Havfrue As ("Optibulk"), America Europe Connect 2 ("AEC") Limited, Edge Network Services Limited ("Edge") , and Google Infrastructure Bermuda Limited ("Google").

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

2.1.1 *Project Objectives*

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 USA.

2.2 PROJECT LOCATION

Table 2.1 provides an overview of the cable route through UK waters. There is no landing site in the UK. The cable will traverse Scottish TS between the following locations:

Table 2.1: Havfrue Cable Entry and Exit Locations through Scottish TS

Enter		Exit	
Lat	Long	Lat	Long
59º 42.8792´ N	001º 52.2613´ W	59º 36.8278´N	001º 13.7444´ W

Datum: WGS 1984

2.2.1 *Project Activities*

The main Project activities are the installation of the subsea cable within the Scottish TS, the operation of the Havfrue Cable System, as well as its retirement, abandonment and / or removal.

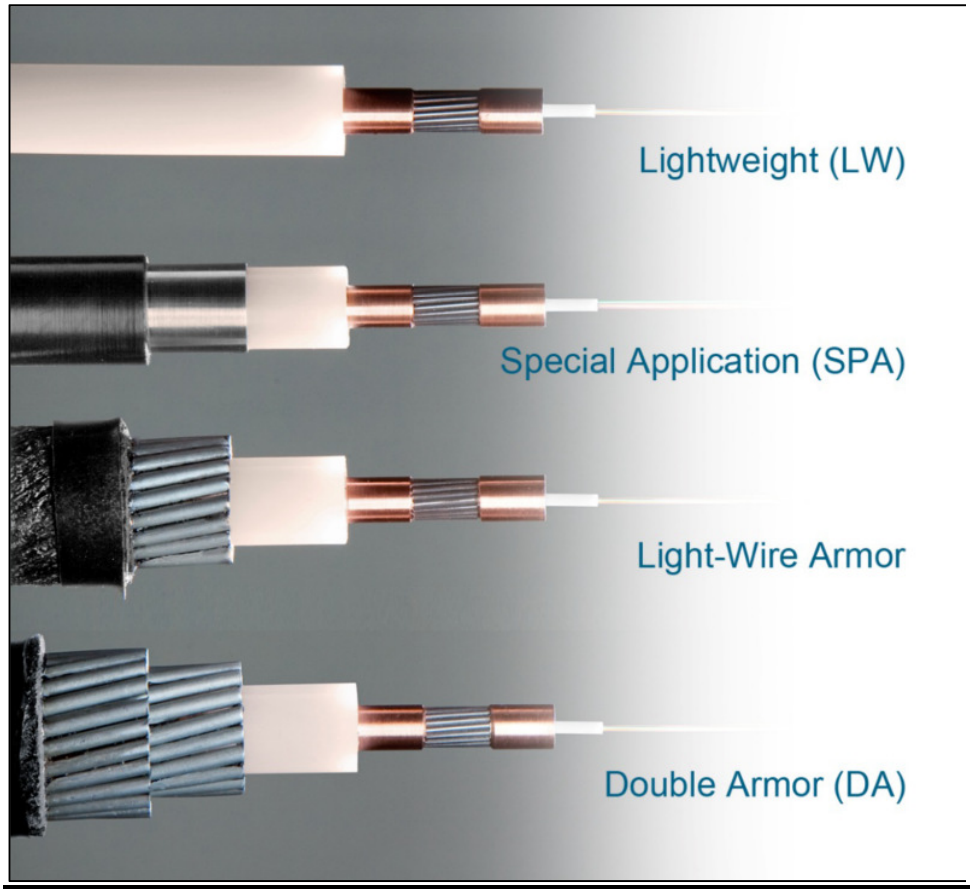
- Route Selection: The cable route is engineered through a desktop study and refined through a marine survey. The route engineering exercise is undertaken to select and design a route that offers security to the cable by minimising the amount of hard bottom crossed, avoiding hazards, sensitive habitats, and protected areas in accordance with reasonable best practice.
- Installation: The subsea cable will be installed offshore by a cable ship (special-purpose vessel). The subsea cable will be buried to a target depth of 2 m below the seabed, as seabed conditions allow, out to 1,500 m water depth, including the full length of the cable through the Scottish TS.
- Operation: Once installed, the subsea cable will not require routine maintenance. Cable faults requiring a cable repair are rare; when a repair is necessary, this is typically undertaken by a cable ship and ROV (in deeper waters).
- Retirement, Abandonment, and Removal: The Project's life expectancy is approximately 25 years. In accordance with standard permit conditions, prior to taking the cable out-of-service, the Applicant would advise Marine Scotland and Crown Estate Scotland of the status and proposed disposal of the inactive cable. Similarly, the disposal of installed infrastructure would be considered at the time of abandonment in line with the submitted Decommissioning Plan.

2.3 *PROJECT COMPONENTS AND INSTALLATION ACTIVITIES*

2.3.1 *Subsea Cable*

The basic design of a subsea cable includes steel wire and copper sheathing, and polyethylene insulation surrounding a core of optical fibres (see Figure 2.1). Additional layers of protection can be added to the basic lightweight cable. The degree of protection (e.g. double - versus light-wire-armoured) will depend on the seabed substrate and the potential for external aggression (e.g. fishing interaction). Through Scottish TS, the Havfrue Cable System will use Double Armoured (DA) cable, and will be buried, as seabed conditions allow, for the entire transit of the TS.

FIGURE 2.1 SUBSEA CABLE TYPES



(Source: TE SubCom)

2.3.2 *Existing Infrastructure Crossings*

The Havfrue Cable System will not cross existing pipelines or subsea cables within Scottish TS.

The cable route will cross existing infrastructure within the UK EEZ. The agreed approach for each crossing will be negotiated with the owners of the existing infrastructure. The cable can be fitted with a URADUCT® sleeve to provide separation between the subsea cable and the pipeline or cable, minimising the risk of abrasion damage. The sleeving is manufactured from a polyurethane elastomer with strong abrasion and impact resistance. It is fitted over the cable in interlocking cylindrical half shells, and held in place by corrosion resistant strapping located in recessed grooves. No use of mattressing or rock placement for cable protection is planned at this time. In the event that rock placement is required within the EEZ, this issue would be addressed under a separate licence.

2.4 *CABLE INSTALLATION*

The subsea cable installation effort includes the following activities:

1. **Cable Route Survey and Design:** Desktop study and field studies undertaken to identify and refine a marine route for the subsea cable.

2. **Installation**:

   a. Route Clearance of Out-of-Service (OOS) Cables: This operation involves locating and cutting through the OOS cable. The cables will be located and cleared with the assistance of detrenching/cutting/holding drags and/or a Remotely Operated Vehicle (ROV) if needed. The severed section of cable will be recovered and removed from the area. The remaining OOS cable will remain undisturbed on the seabed.

   b. Pre-lay Grapnel Run (PLGR): A support boat towing a flatfish grapnel would clear the seabed surface along the cable route of debris that could obstruct the installation; and

   c. Main Lay: The subsea cable would be installed by a cable ship through the Scottish TS; the cable would be buried, as seabed conditions allow, to a target depth of 2 m below the sea floor out to 1,500 m water depth (Seg 5), and surface-laid across hard bottom areas (if applicable) and beyond 1,500m water depth (Seg 3).

3. **Post-Lay Inspection and Burial (PLIB):** Following completion of the main lay, a post lay inspection may be carried out in certain areas to inspect the proper laying and burial of the cable in the seabed. Such requirement would be based on the performance of the main lay operations. If required, a Remotely Operated Vehicle (ROV) would be passed along the route to inspect the cable and attempt burial where plough burial was not possible as part of the main lay cable installation (e.g. plough recoveries for equipment maintenance or existing infrastructure crossings).

These phases of work are discussed in more detail below.

2.4.1 Route Selection

Figure 1.1 shows the proposed cable alignment for the Havfrue Cable System within the Scottish TS. The cable route was designed to avoid marine hazards and features (e.g. military practice areas, shipwrecks, anchorage areas, fishing and protected areas, and other restricted areas). The route was engineered first through a desktop study, and then refined through a marine survey using geotechnical and geophysical survey techniques, including side scan sonar, multibeam echo sounder, backscatter data, and core samples to characterise seabed and potential hazards along the route. The route selection exercises are designed to select a route that will minimise hard bottom crossed and avoid hazards, sensitive habitats, and protected areas to the extent possible.

2.4.2 Pre-Lay Grapnel Run

Immediately prior to installation of the subsea cable, a PLGR would be carried out along the proposed cable route at each location where burial is required, commencing at the 12-20 m water depth contour to approximately 1,500 m water depth offshore. The intention of the PLGR is to clear seabed surface debris (e.g. wires or hawsers, derelict fishing gear) that may have been deposited along the route.

The vessel would lower a suitable grapnel or an array of grapnels to the seabed and proceed to tow the grapnel across the seabed along the cable route. As the

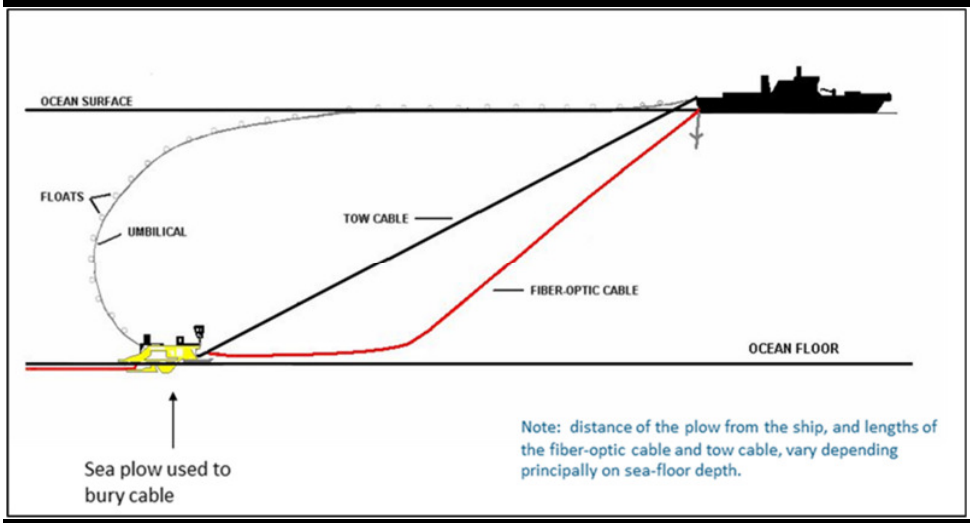
grapnel is pulled across the seabed, typical blade penetration of up to 40 cm is achieved, depending on seabed composition. The grapnel activity would not be conducted in hard bottom areas and will avoid existing buried cables or other seabed infrastructure. Debris recovered during these operations would be disposed of appropriately onshore upon completion of the operation.

The PLGR is planned to start in April 2019.

2.4.3 Cable Laying and Ploughing

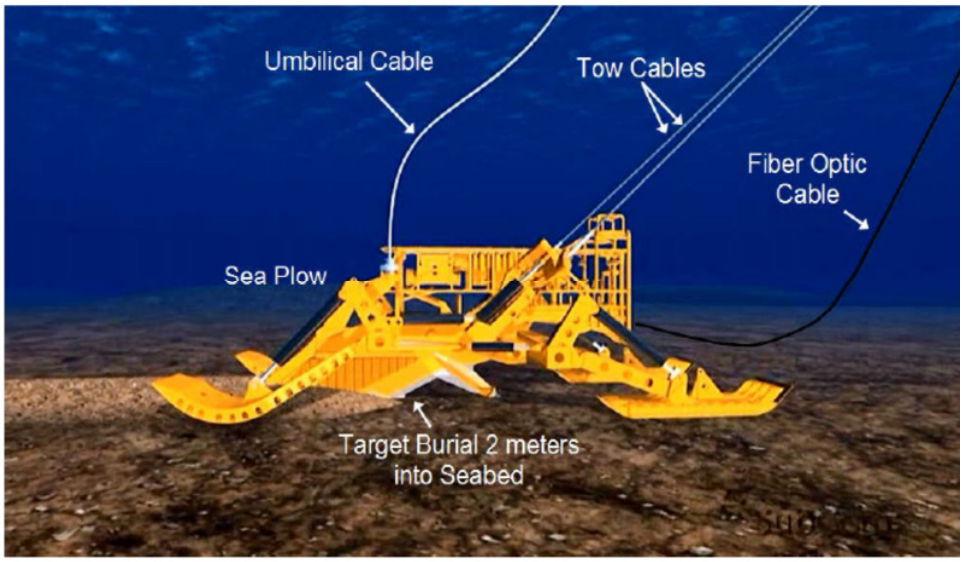
Where possible, the cable will be buried to a target depth of 2 m below the sea floor, up to 1,500 m water depth. This includes burial of the cable for the full length of the cable route through Scottish TS. Through soft-bottom areas, the main lay vessel ('cable ship') would install and bury the cable simultaneously using a sea plough (Figure 2.2). The plough is a burial tool resembling a large sled attached to the cable ship with a tow wire (Figure 2.3). The sea plough 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 natural 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. In hard bottom areas and areas below 1,500 m depth, the cable would be surface laid on the ocean floor. Surface lay is not planned for Scottish TS.

FIGURE 2.2 CABLE INSTALLATION BY SEA PLOUGH



(Source: TE SubCom)

FIGURE 2.3 SEA PLOUGH SCHEMATIC



(Source: TE SubCom)

Computerised modelling and tracking from the cable ship is 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, the 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. This is owed to the installation methods that manage slack at the cage, the weight of the cable itself, and burial.

2.4.4 *Post-Lay Inspection and Burial*

Where burial is planned but not possible as part of the main lay cable installation (e.g. crossings of other in-service cables) or where the cable plough could not achieve the target depth due to bottom conditions, the subsea cable would be inspected and subsequently buried through the PLIB program where seabed conditions allow. PLIB is not currently planned for the section of the Havfrue cable through Scottish TS, but would be added if necessary.

The PLIB is undertaken by an ROV. The ROV would be deployed and operated from the cable ship or suitable support vessel via a control umbilical. The ROV typically uses a jetting tool to bury the cable to the target depth. The jets are directed into the seabed by the burial tool. The seabed is emulsified in the region of the burial and a trench is formed. The ROV jetting system slowly moves along the seabed on along the cable track forming this trench into which the cable is placed. The ROV uses the surrounding seawater for the jetting system, and no seabed materials are introduced or removed from the area.

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

2.5 *OPERATION, MAINTENANCE AND REPAIR*

No routine maintenance is required or planned for the marine elements of the Project. Routine maintenance for the marine segments of the network is unnecessary due to the stability of the ocean-bottom environment. Should the cable be damaged by anchors or fishing gear, the location of the interruption can typically be pinpointed electronically by the 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 whether or not it is buried at that location.

2.6 *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), the Applicant would advise Marine Scotland and the Crown Estate Scotland, of the status and disposal of the inactive cable.

The method of abandonment and/or removal would be determined as part of the licensing process of the Project, but final disposal is to be evaluated by Marine Scotland and the Crown Estate Scotland at the end of the Project's life expectancy.

2.7 *PROPOSED INSTALLATION SCHEDULE*

The anticipated construction schedule for the proposed work is shown in *Table 2.2*. Combined, activities associated with the cable installation operation within Scottish TS are expected to require approximately 6 days.

Offshore installation activities are proposed to occur 24 hours per day, 7 days per week.

TABLE 2.1 PROPOSED INSTALLATION SCHEDULE

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

2.8 *MITIGATION MEASURES INCORPORATED INTO THE PROJECT*

The following key mitigation measures have been incorporated into the project design to reduce or avoid Project effects, along with compliance with all applicable regulatory requirements.

- Desktop study and marine surveys have been undertaken to identify and avoid constraints, sensitive resources, and hard bottom areas where possible.

- Consultation with Orkney and Shetland fishermen was undertaken during the preplanning and design stage of the Project.

- Cables are planned to be buried where feasible in water depths shallower than 1,500 m to avoid conflicts with fishing gear and disturbance to marine species.

In addition a number of other key mitigation measures will be applied prior to and during installation, including:

- An Oil Spill Contingency Plan (OSCP) will be developed for the Project. The plan will include measures for vessels to avoid and respond to vessel oil spills.

- Notice to Mariners will be provided to advise other sea users on activities and locations during the installation phase.

- Project vessels will not exchange ballast water within the Scottish TS or UK EEZ.

- Coordination with commercial fishermen during installation of the cable.

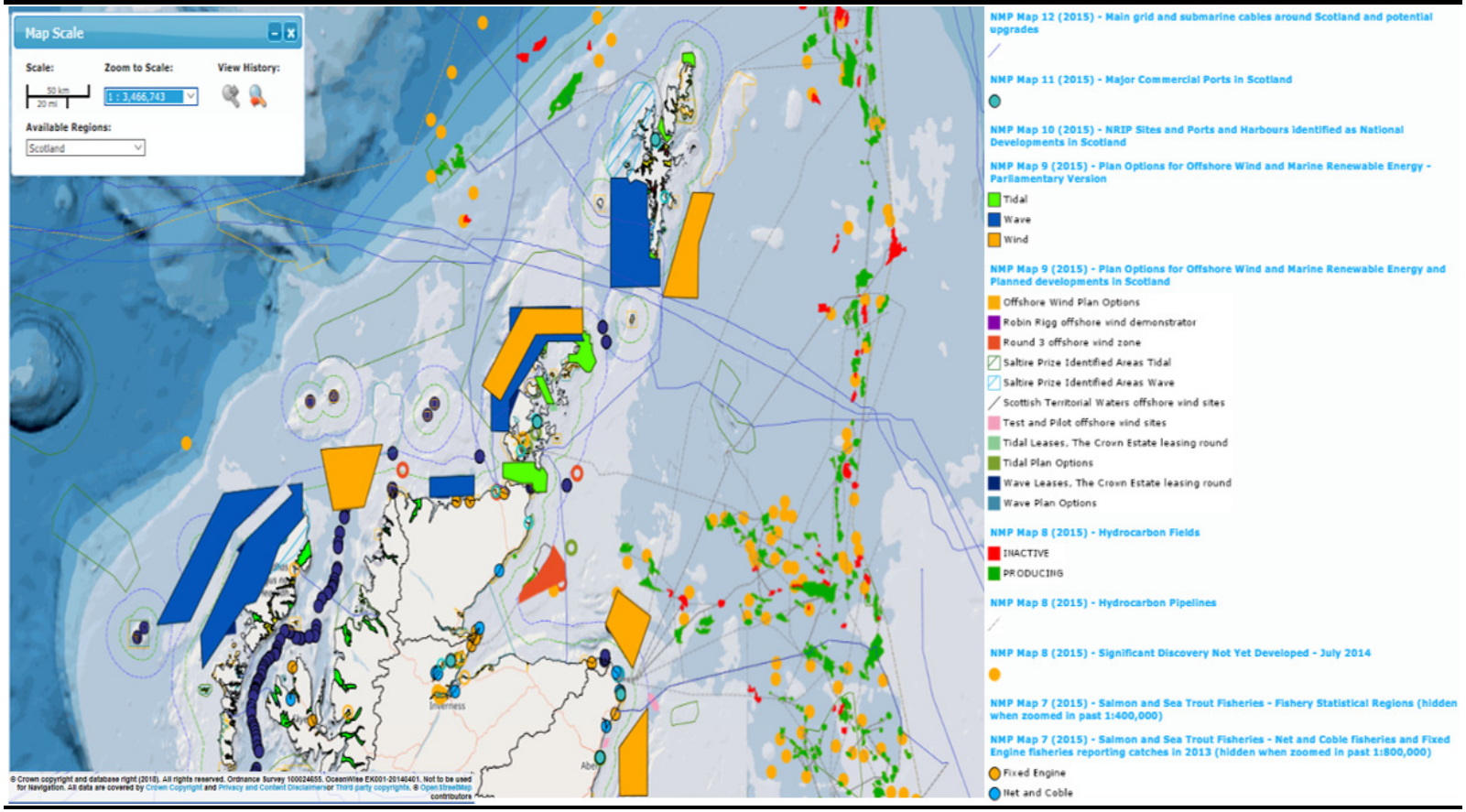
2.9 SIGNIFICANT ADJACENT PROJECTS

There are a number of current and planned developments located near to the proposed cable route. Table 2.3 outlines the key current and planned developments that have been identified in the vicinity of the proposed cable. The locations of the projects are presented on Figure 2.4, along with existing pipelines, cables and oil and gas fields Table 2.3.

TABLE 2.2 CURRENT AND PLANNED DEVELOPMENTS

Development / Project	Description	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. South of the Shetlands, 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.	Proposed
Marine Renewable Energy - Wind	There are several zones planned for offshore wind operations to the north and south of the proposed cable route located near Orkney (8 km) and the Shetland (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.	Proposed

FIGURE 2.4 CURRENT AND PLANNED DEVELOPMENTS



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

3 SCOPING ANALYSIS

3.1 INTRODUCTION

The sections below present an overview of the physical, biological and human environment along the proposed cable route in the licensable area, together with key sources of information that will be used for the EA. Unless otherwise indicated, information within this section is from the Offshore Energy Strategic Environmental Assessment (SEA) documentation (DTI 2001; DTI 2003; DTI 2004; DTI 2007). While the SEAs are intended to provide information to support offshore oil and gas exploration and production and the renewables sector they provide baseline suitable for the purposes of this Scoping Report. The cable will traverse multiple SEA areas and as such this scoping report includes information from SEA 2, SEA 4, SEA 5 and SEA 7 as necessary.

3.2 PHYSICAL ENVIRONMENT

3.2.1 Metocean Conditions

Baseline

The offshore region to the north of Scotland is generally considered to have a mild, maritime climate resulting from prevailing south-westerly winds and the warming influence of the Atlantic Continental Slope Current. Offshore west Scotland, however, is fully exposed to North Atlantic winds and waves and the North Sea, to the east, is characterised by large variations in wind direction and speed, a high level of cloud cover, and relatively high precipitation. Gales are frequent during the winter months.

The hydrography of the area is complex and water currents (from tides, storms and internal waves) are typically moderate to strong, even in the deeper water parts of the Faroe-Shetland Channel. The offshore area is characterised as having relatively high energy in terms of near-bed current velocities and wave climate. However, tidal flows around the Shetland Islands range from 0.5 to 1.25 m/s and move southwards on the flood tide, and northwards on the ebb. The east coast of Shetland and Orkney is more sheltered and less frequently exposed to large, powerful waves than the west coast, however, North Sea storms and swells can result in relatively large waves reaching these coasts. Water depths along the proposed cable route within the Scottish TS vary from 97 m to 126 m.

Potential Effects

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.

Alteration of the bathymetry through cable burial or placement of the cable on the seabed may affect tidal currents in the immediate vicinity of the cable; however, given the very small size of the cable and the burial technique, any change is unlikely to be noticeable against background variation in such a dynamic environment. The potential effects are not considered to be significant due the small magnitude of effect and the low sensitivity of the area and therefore are scoped out of the EA.

3.2.2 Geology, Geomorphology and Sedimentary Processes

Baseline

The bathymetry to the west of Scotland is characterised by glacial relict features, including the fjordic coastline of the mainland, drumlins, enclosed deeps, bedrock grooves, moraines and slide scars. Sediments are predominantly muddy, although the banks and shoals to the west of Scotland are typically surrounded by coarser sediments such as mixed sands and gravels. The area of TS between Fair Isle and the Shetland Islands is characterised by coarse sand and gravel, with sands and muds to the east if the islands. In coastal areas, seabed sediments are highly varied and range from exposed bedrock to mud. Strong bottom currents play an important role in distributing sediments and forming bedforms such as sandwaves. In the northern North Sea the main sediment transport path lies between Orkney and Shetland, with an overall sediment movement to the southeast.

Potential Effects

The cable will be buried in sediment such as muds, sands and gravels, which may temporarily alter the local sediment structure. Bottom currents will rework the surface sediment over time, returning the seabed sediments to near baseline conditions. Where the cable cannot be buried, such as over hard substrate the cable will be laid across the surface, leaving the feature in place. As such, the potential for effects on geological features of interest or sedimentary processes along the cable route is minimal. The potential effects on geology, geomorphology and sedimentary processes are not considered to be significant due the small magnitude of effect and the low sensitivity of the area, and therefore are scoped out of the EA.

3.2.3 Water Quality

Baseline

In general, coastal and offshore waters around Scotland do not show significant anthropogenic contamination, especially the offshore area near the Shetland and Orkney Islands, as they have been subject to lower historical and current inputs of

hydrocarbons than the mature oilfield areas in the east. Other contaminants including heavy metals and persistent compounds such as PCBs are also found in general low levels, although particular areas may display localised elevations associated with historical inputs.

Potential Effects

The vessels will release routine discharges such as black and grey water, galley water, bilge and ballast water in line with national and international requirements, such as MARPOL. As such no significant effects on water quality are expected from routine discharges and this potential effect is scoped out. Ballast water is discussed further in *Section 4.2*.

During cable burial, localised sediment plumes may be created through the action of the plough moving through the seabed and through water jets on the ROV (during OOS cable removal and if PLIB is required). However, much of the sediment is immediately backfilled into the trench over the cable by the action of the plough moving along the seabed. The full extent of the dispersion will be determined by the action of the tidal flows, and the characteristics of the sediment, however, the sediment plume is usually localised in nature and of short-term, with the seabed usually returning to its original state (BERR, 2008). When compared with the area affected by other activities, the spatial extent of cable installation is very small. As such the potential effects of plumes have been scoped out of the EA.

Unplanned fuel spills from events such as collisions or releases from equipment on deck could affect water quality, including within protected areas. The residual effects of an accidental fuel spill could be significant should a spill occur. As such unplanned events will be considered in further detail in the EA.

Information Sources

Information sources for the baseline will include the SEA documentation and other publicly available literature, including a search of the data held by Marine Scotland and accessible online.

3.2.4 Noise

Baseline

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.

Potential Effects

The key noise sources are expected to include vessel propellers and thrusters with a contribution from the hull (e.g. originating from machinery on deck) and equipment in water (for example the plough as it is pulled through the seabed). However, the vessels and plough (a passive towed device) are not considered to be noisy activities according to the JNCC and Defra Marine Noise Registry (JNCC 2016) and the noise generated by the Project will be similar to normal vessel movements and fishing trawlers operating in the area. As such, no significant effects from noise are expected and this effect on biological receptors has been scoped out of the assessment.

3.3 BIOLOGICAL ENVIRONMENT

3.3.1 Benthic Ecology

Baseline

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.

Potential Effects

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

- direct seabed disturbance from ploughing/cable burial activities; 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 along the length of the cable route to an approximate width of 0.75 m. In areas where removal of OOS cables is required and in the event PLIB is required, the use of water jets from an ROV will lead to a higher level of suspended sediment concentrations and sediment settlement than ploughing. These impacts will be temporary since once the cable has been laid the area will recover through recolonisation of benthic species. 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 that the species characteristics of the broad scale habitat along the route (i.e. polychaetes and some bivalves) are not considered sensitive to sedimentation.

Proposed Information Sources

Information sources for the benthic ecology baseline will include the publicly available data from Marine Scotland, Centre for Environment, Fisheries and Aquaculture Science (CEFAS), and previous environmental studies completed within the area. Additional information on the sediment types and bathymetry of the seabed crossed by the marine cable are outputs of the marine route survey, and will be available at the time the EA is undertaken.

3.3.2 Fish and Shellfish Ecology

Baseline

Several commercially targeted fish species are present in Scottish TS. These include whiting (*Merlangius merlangus*), cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), saithe (*Pollachius virens*), Norway pout (*Trisopterus esmarkii*), plaice (*Pleuronectes platessa*), lemon sole (*Microstomus kitt*), monkfish (*Lophius piscatorius*, *L. budegassa*), herring (*Clupea harengus*), sandeel (various species) and mackerel (*Scomber scombrus*) (Coull et al 1998).

The Project area supports spawning of several of these 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 Scottish TS and some also spawn there. The peak spawning period for the majority of fish species that have spawning grounds is between February and June, with sandeels and herring spawning outside of this period (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 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 (CEFAS 2001, IUCN 2014).

Potential Effects

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

- direct habitat disturbance;
- smothering from suspended sediments;
- loss of benthic prey species; and

- loss of fish spawning habitat

Fish and many shellfish are mobile and will be able to avoid the direct effects of ploughing and significant concentrations of suspended sediments. The scale of the temporary impacts on the seabed habitats along the cable route are not considered likely to have a significant effect on fish prey availability or spawning/nursery habitats. For these reasons, an assessment of impacts on fish and shellfish species has been scoped out of the EA.

3.3.3 Marine Mammals

Baseline

Cetacean species known to occur in the Project area, including the Scottish TS (Reid et al 2003, NIMR 2013) include:

- harbour porpoise (*Phocoena phocoena*) (IUCN Red List Least Concern, LC);
- humpback whale (*Megaptera novaeangliae*) (LC);
- minke whale (*Balaenoptera acutorostrata*) (LC);
- sei whale (*Balaenoptera borealis*) (Endangered, EN);
- fin whale (*Balaenoptera p*hysalus) (EN);
- sperm whale (*Physeter macrocephalus*) (Vulnerable, VU);
- long finned pilot whale (*Globicephala melas*) (Data Deficient, DD);
- killer whale (*Orcinus orca*) (DD);
- Atlantic bottlenose dolphin (*Tursiops truncatus*) (LC);
- short-beaked common dolphin (*Delphinus delphis*) (LC);
- white-beaked dolphin (*Lagenorhynchus albirostris*) (LC);
- Atlantic white-sided dolphin (*Lagenorhynchus acutus*) (LC); and
- Risso's dolphin (*Grampus griseus*) (LC).

Harbour porpoises are the most abundant cetacean species in UK EEZ (DECC 2009) and the most frequently recorded; this includes Scottish TS. However, the results of the SCANS and SCANS II surveys suggest that the main concentration of harbour porpoise shifted further southward in 2005 (Hammond et al 2013).

All cetacean species that may be present in the area are listed within Annex II of the EC Habitats Directive, and therefore deliberate killing or disturbance of these species is prohibited. All cetaceans are also protected under the *Wildlife and Countryside Act (1981).*

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% of the population occurring in Scottish TS. Both seal species are listed within Annex II of the EC Habitats Directive, and therefore deliberate killing or disturbance of these species is prohibited.

Potential Effects

Cable operations have the potential to impact marine mammals through:

- collision with the installation vessel or support vessels;
- contact with fuels or chemicals that may be accidentally released; and
- interactions or entanglement with the cable or other lines, during installation operation, between the installation vessel and plough.

Given the short term and transient nature of installation, it is unlikely to have a significant effect on marine mammals, either in terms of collision or entanglement with installation equipment. In addition, marine mammals present in the installation area will be familiarised to vessel movements given the level of existing activity (see *Section 3.4*). Therefore effects on marine mammals are scoped out of the EA.

3.3.4 Seabirds

Baseline

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).

The most common species of seabird within the Scottish TS include Northern fulmar (*Fulmarus glacialis*), Northern Gannet (*Morus bassanus*), guillemot (*Uria aalge*), black-legged kittiwake (*Rissa tridactyla*), razorbill (*Alca torda*), Atlantic puffin (*Fratercula arctica*) and little auk (*Alle alle*), as well as numerous species of gull, tern and skua (Stone et al 1995).

Potential Effects

Potential significant effects of cable installation on birds are limited. The main issues would be the disturbance of normal behaviour either at sea by installation activities. Given the short term nature of the installation activities, significant effects are not expected and will not be considered further in the EA.

3.3.5 Designated Sites

Baseline

There are no designated sites crossed by the cable within the Scottish TS.

Appendix A describes the portions of the route in the UK EEZ that pass through designated areas.

3.4 HUMAN ENVIRONMENT

3.4.1 Commercial Fisheries

Baseline

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, using purse seines and trawls, and mackerel, using trawlers. The pelagic fisheries are much more international than those for demersal species and they tend to be prosecuted by larger vessels using purse seine and both single and paired boat midwater trawling. Both fisheries are active throughout the year, with peak landings in the summer and early autumn (CEFAS 2001). The pelagic fishing effort north of Scotland is high. The pelagic fishing effort is high throughout the continental shelf area north of Scotland.

Potential Effects

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

- restricted access to fishing grounds;
- temporary fish stock displacement; and
- snagging of fishing gear.

Cable installation is not expected to significantly affect fish and shellfish ecology (see *Section 3.3.2*) so impacts on existing fish stocks are not expected. Restriction of fishing access will be temporary and short term for cable installation only and not expected to significantly affect commercial fisheries. These effects are scoped out of the EA.

The cable will be buried up to 2 m below the seabed for protection from fishing gear in water depths less than 1,500 m, including the entire length of the Scottish TS. As such no impacts to fishing gear are predicted and this effect is scoped out of the EA.

3.4.2 Shipping and Navigation

Baseline

The Project area supports a moderate level of shipping traffic, largely comprised of 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 impact associated with installation activities is the increased risk of collision by existing navigational users along the cable route. However, this is not considered to be a potential significant impact given the installation will likely be undertaken from a single vessel, be transient and short term at any one location. The cable ship would maintain a nominal speed of 800 m/h during cable installation along Scottish TS, and would require all vessels to maintain a 1 nm buffer distance from the ship and towed equipment. Notice to Mariners will also be provided.

3.4.3 Infrastructure and other users

Baseline

There are a number of current and planned significant other developments and infrastructure located within or in close proximity to the proposed cable route; however, for the most part these are located outside of Scottish TS.

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

The proposed cable route follows a similar route to previously installed main grid and submarine cables around Scotland. There are several hydrocarbon pipelines connecting producing and inactive hydrocarbon fields to shore. Existing cables also have the potential to be upgraded. The proposed cable route does not cross any pipelines or existing subsea cables within the boundaries of Scottish TS.

There are significant planned options for marine renewable energy operations in the form of tidal and wind energy to the north and south of the proposed cable route located at two sites near the Northern Isles. South of Shetland, the proposed cable route also travels through an area that has the potential to be developed.

The area supports a low coverage of recreational use.

Potential Effects

Cable installation is not expected to significantly impact existing or planned infrastructure and other sea users. The biggest interaction will be with other linear infrastructure installed on the seabed. However, no infrastructure crossings have been identified within Scottish TS. Crossings will be designed and, where required, crossing agreements put in place before installation is undertaken. Crossings and crossing agreements will be dealt with outside of the EA process and will not be considered further in the EA.

3.4.4 Marine Archaeology and Cultural Heritage

Baseline

There is potential for prehistoric submarine archaeological remains to occur throughout the region, including within Scottish TS. Archaeological remains are more likely to have remained intact in sheltered submerged caves and gullies within sea lochs and enclosed bays, while in the offshore area the strong currents, thin sediment cover and exposure to storms makes the survival of prehistoric remains and deposits less likely. There are a large number of ship and aircraft wrecks in the region, including both charted and uncharted sites, as well as approximately 200 maritime national monuments.

Potential Effects

Archaeological resource that may be impacted by cable installation includes submerged palaeo-landscapes, wrecks and related maritime remains and terrestrial archaeology, including in situ sites. The potential significant effects include:

- direct loss or disturbance; and
- indirect disturbance via changes in sedimentation.

A desktop routing analysis was undertaken during the first stage of route planning, and took into consideration publicly available information on archaeological and cultural resources. A cable route survey will also be conducted that will include geophysical data acquisition of the route and a corridor of approximately 350 m either side. Interpretation of this data will identify any archaeological features that need to be avoided by cable installation, and the route will be adjusted if necessary to avoid obstructions identified during the survey. At a burial depth of up to 2 m, installation is not expected to significantly impact any paleoarchaeology that may be present along the route. The effects on marine archaeology and cultural heritage will therefore not be considered further in the EA.

4.1 APPROACH TO ENVIRONMENTAL APPRAISAL AND MITIGATION

The overall EA will comprise three main parts:

- A non-technical summary.
- The main text of the EA including an assessment of likely impacts.
- Supporting annexes, if required.

The introductory chapters will contain background information on the Project, set out the EA methodology and any relevant policy. The remaining chapters will contain technical assessments of the potential environmental effects and mitigation measures proposed and/or adopted during the Project design to avoid or reduce such effects. The proposed structure of the EA is presented in *Section 5*.

Table 4.1 presents the topics to be assessed in further detail in the EA based on the findings of this Scoping Report.

TABLE 4.1 BASELINE TOPICS AND ASSESSMENT APPROACH

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 overtime and hard substrates will have the cable laid over rather than removed. As such the potential for any direct effects on geological features of interest or sedimentary processes along the cable route are minimal. Effects on geology, geomorphology and sedimentary processes have been scoped out.
Water quality	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. Sediment plumes from cable burial will be localised and short term and have been scoped out of the EA. 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 in the EA.
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. As such no significant effects from noise are expected and this effect has been scoped out.

Topic	Scoping Decision	Assessment Comments
Benthic Ecology	Scoped in	The impact on the benthic ecology will be limited and temporary along the route of the cable. 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 in the EA.
Fish and shellfish ecology, marine mammals, seabirds	Scoped out	The impact on the water column and seabed installation activities will be limited. Biota in the area will be accustomed to vessel movements and the short term interaction is not expected to cause significant effects.
Designated areas	Scoped out	No designated areas in the licensable area.
Commercial Fisheries	Scoped out	Impacts on fish stocks are not expected and displacement from fishing grounds will be short term for installation. No impacts on fishing gear are predicted due to cable burial in the Scottish TS.
Shipping and Navigation	Scoped out	Cable installation will likely be undertaken from a single vessel and will therefore have very limited interaction with shipping and navigation in the area.
Infrastructure	Scoped out	There will be limited interaction between cable installation and other infrastructure and sea users. Crossing consultation will be undertaken outside of 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 features of potential archaeological interest.

4.2 MARINE NON-NATIVE SPECIES RISK AND BIO-SECURITY MEASURES

Non-native species can be introduced through ballast water exchange, infected equipment and hull fouling and can cause effects at the ecosystem level, which includes all habitats and species. As part of normal ship operations, ballast water can be taken onboard at one location and discharged in another distinct bioregion. Ballast water is one of the most important vectors for the transfer of marine species throughout the world. Marine organisms may also attach themselves to the hulls of ships or equipment, which is commonly referred to as biofouling. The attached organisms are then carried by the vessel or on equipment to new bioregions. Under the right conditions, non-native species may establish themselves in the new bioregion.

Vessels for the Project will operate across the whole cable route (i.e. from the USA to Norway), however, ballast water exchange is unlikely to be required in UK waters and will not be undertaken in Scottish TS. In addition, as part of the Project design the IMO Guidelines for the Control and Management of Ships' Ballast Water to Minimise the Transfer of Harmful Aquatic Organisms and Pathogens and the IMO International Convention on the Control of Anti-fouling systems on ships (AFS) will be applied. All equipment will be inspected prior to use in the water

and cleaned as required. While the risk of introducing non-native species will still be present it is considered low risk given the controls in place. Given the low risk and that mitigation will be applied non-native species will not be considered further in the EA.

Table 5.1 provides an overview of the proposed environmental appraisal structure.

TABLE 5.1 ENVIRONMENTAL APPRAISAL STRUCTURE

Section	Contents
Non-technical Summary	Non-technical summary of the EA and its findings, including the conclusions of the assessment.
Introduction	Description of the development context and the outline of the EA structure.
Project Description	A description of the proposed installation and protection of the cable, and operation.
Project Alternatives	An overview of alternatives including route selection will be provided.
Regulatory Context	Legislative and policy framework relevant to the project, with reference to international standards and guidelines that will apply to the project.
EA Methodology	Methodology that will be used for the EA.
Environmental Appraisal	Overview of the existing environment and potential effects for those receptors identified in this report as requiring additional assessment. The EA will focus on receptors in the Scottish TS. Unplanned events will also be considered and the outcome of the transboundary and cumulative effects assessment will be included. Any necessary mitigation and monitoring, including measures that are embedded into the project design, will be described.
Summary	Presents a summary of any significant effects from the project.
Annexes	Supporting Annexes as required

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Appendix A

APPENDIX A

This appendix provides supplemental information on the designated areas crossed by the Havfrue cable route outside of the licensable area, but within the UK EEZ. An overview of the designated features in the two MPAs crossed by the route is provided in Table A.1, followed by a description of the re-routing effort undertaken to reduce the cable footprint across these areas.

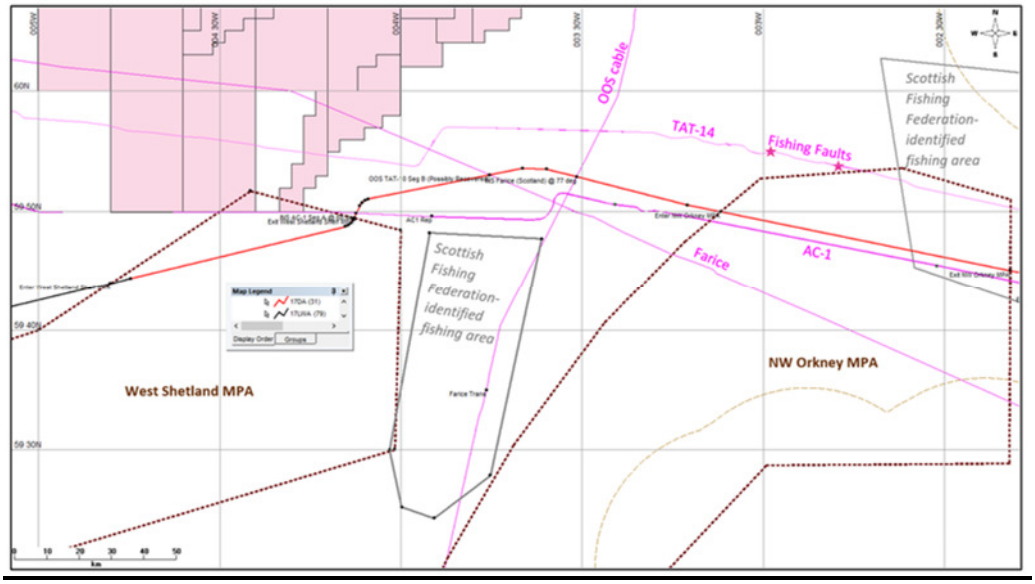
The proposed cable route passes through two nationally designated Marine Protected Areas (MPAs) in the EEZ, namely:

- **West Shetland Shelf Nature Conservation Marine Protected Area** (NCMPA) designated for offshore subtidal sands and gravels; and

- **North-West Orkney** NCMPA designated for sandeels and geomorphological features, including sand banks, sand wave fields and sediment wave fields representative of the Fair Isle Strait Marine Process Bedforms Key Geodiversity Area.

The crossings are illustrated in Figure A.1.

FIGURE A. 1 HAVFRUE CABLE MPA CROSSINGS



(Source: TE SubCom)

Several other MPAs are located close to the proposed cable route but are not traversed by it. These include Central Fladen NCMPA, Fair Isle NCMPA, Darwin Mounds Special Area of Conservation (SAC), Rosemary Bank Seamount NCMPA, Geikie Slide and Hebridean Slope NCMPA and Anton Dobrn Seamount SAC.

Additional detail on the designated features of the North-West Orkney MPA and the West Shetland Shelf MPA is provided in *Table A.2*.

TABLE A.2 DESIGNATED SITES SUPPLEMENTAL INFORMATION

Site Name	Designated Features	Site Overview (taken from JNCC Website, 2018)	Sensitivity (FEAST) (Marine Scotland Website, 2018)
West Shetland Shelf	Offshore subtidal sands and gravels (habitat)	The site has been designated for the protection of the wide variety of sand and gravel habitats (habitats of priority importance) present in the area, providing an important example of the northern extent of their range on the continental shelf in Scottish seas. They are a relatively common habitat in Scottish seas, however, within the MPA they tend to support a particularly rich diversity of wildlife. Small rocks support anemones, cup sponges and crustaceans such as hermit crabs and squat lobster. Cobbles and pebbles support species of bryzoans and encrusting sponges. Sandy sediment support urchins and starfish, while sea snails and bivalves, such as scallops, keel worms and sand mason worms live buried in the sand. The MPA is also important for several species of fish, including the dragonet, red gurnad, cod, plaice, bass, and skate and rays.	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. The degree to which particular examples of the habitat is sensitive to the pressure is dependent on the species present.
North-West Orkney	Sandeels (Mobile species) Sand banks, sand wave fields and sediment wave fields representative of the Fair Isle Strait Marine Process Bedforms Key Geodiversity Area (Geomorphological feature).	The MPA is a shallow area lying to the north and west of the Orkney Isles on the Scottish continental shelf. The area is considered important as an export ground for sandeels - a type of burrowing fish that forms a critical component of many North Sea food webs. The area is characterised by a mixed ground type (areas of rough substrate within the areas of sediment) which make it suitable for sandeel colonisation. This may also account for the patchiness of the larval distribution. The MPA plays an important role in supporting wider populations of sandeels in Scottish waters. Specifically, newly hatched sandeel larvae from this region are exported by currents to sandeel grounds around Shetland and the Moray Firth. The MPA also includes protection for geomorphological features representative of the Fair Isle Strait Marine Process Bedforms Key Geodiversity Area. These shelf tidal bedform features such as the sediment wave fields, sand wave fields and sand banks are active and are maintained under a specific range of tidal current conditions.	FEAST indicates sandeels burrow near the seabed surface. Results from FEAST indicate that the soft unconsolidated sediments of sediment wave fields, sand wave fields and sand banks are formed and actively maintained by the action of tidal currents, and as such they have some ability to recover. They are all considered to have high resilience but medium resistance to disturbance from cable installation.

Avoidance Measures During Route Development

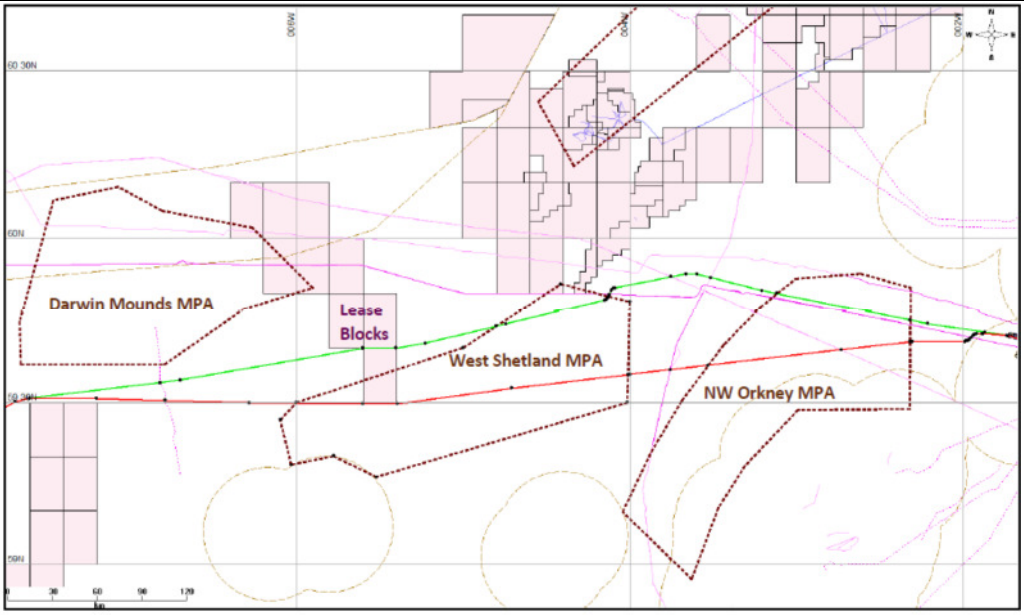
The original Havfrue cable route had more cable length crossing the UK MPAs. Following consultation with fishermen and other interested parties, a re-route was undertaken to avoid a fishing area located between the two MPAs and reduce the route length crossing the MPAs. The results of the re-route are described below. The route assessed in the Scoping Report represents the current route, including the changes made to reduce route length in the MPAs.

The green line in Figure A.2 below shows the current proposed Havfrue Segment 5 route, which moves 53% of the cable outside the West Shetland and NW Orkney MPAs. This is shown in comparison to the previous route, in red.

The re-route moves as much cable as possible outside the MPAs, without moving too far north, where anticipated hard seabed/thin sediment cover may impact burial. The re-route minimises the cable footprint inside the MPAs, while also achieving optimal system protection from fishing risks. The route also minimises Lease Block crossings—skirting the edge of LB UK 166/13—and is optimised for in-service cable crossing angles and separation.

The selected route was reviewed with interested parties, including fishermen and lease block owners, and agreed to be satisfactory.

FIGURE A. 2 SEGMENT 5 ORIGINAL ALIGNMENT AND RE-ROUTE



(Source: TE SubCom)

As shown in Table A.1, the re-route reduced the route length crossing the MPAs by nearly 100 km, and represents a 53% reduction in route length crossing the MPAs.

Table A.1 Cable Re-Route to Minimize MPA Crossings

MPA		Current Issue 6 RPL (Route km)			Re-route for MPAs (Route km)			Change (km)	Change (%)
		From KP	To KP	Distance (km)	From KP	To KP	Distance (km)		
West Shetland		188.39	301.78	**113.39**	258.12	297.61	**39.49**	-73.90	-65.2
NW Orkney		329.06	397.93	**68.87**	357.06	402.87	**45.81**	-23.05	-33.5
	TOTALS			**182.26**			**85.30**	**-96.96**	**-53.2**
	96.95 km of the system would be moved outside the MPA area with this re-route. This is a 53% reduction in route lengths inside the MPAs.								