Diamond Transmission Partners

# Diamond Transmission Partners
# Hornsea One Ltd
# Decommissioning Programme

**Document History**

| Issue | Date | Summary of Changes / Reasons | Author(s) | Approved By (Inc. Job Title) |
|---|---|---|---|---|
| 1 | 23/04/20 | First issue. | J Matthews | G Thornton |
| 2 | 29/09/20 | Updated in line with BEIS comments dated 10/08/20. | J Matthews | G Thornton |
| 3 | 17/12/20 | Sections 7, 8, 10 and 14 updated following comments from Frazer Nash. | J Matthews | G Thornton |

## TABLE OF CONTENTS

### Contents

# 1 Introduction

This document presents the proposed OFTO Decommissioning Programme for the Diamond Transmission Partners Hornsea One Limited ("**DTPH**") assets and is based upon the Decommissioning Programme[1] proposed by Orsted Wind Power A/S Limited (the **"Developer**"). The Decommissioning Programme proposed by DTPH is informed and supported by the Environmental Impact Assessment ("**EIA**").

The project is a 1200MW wind farm developed by the Developer.

The Hornsea Offshore Wind Farm Project One ("**HOW01**") has been awarded a number of primary consents necessary for its construction and operation. Those consents with provisions relating to decommissioning of the offshore wind farm are shown in Table 1.1.

**Table 1.1: Hornsea Offshore Wind Farm Project One Consents**

| Regulation | Legislative Context | Achieved Consents | Authority |
|---|---|---|---|
| Secretary of State for the Department for Business, Energy and Industrial Strategy ("**BEIS**") / Planning Inspectorate ("**PINS**") | Section 36 consent granted 10/12/2014 | Permission to operate onshore and offshore generating stations with a generating capacity above 50MW | Secretary of State for BEIS/ PINS |
| Secretary of State for BEIS / PINS | Development Consent Order ("**DCO**") Consent granted 10/12/2014 | DCO grants overall consent for the entire scheme, containing the maximum and minimum design parameters that the project must comply with. | Secretary of State for BEIS/ PINS |
| Secretary of State for BEIS / PINS | DCO (Correction) Consent granted 30/04/2015 | DCO grants overall consent for the entire scheme, containing the maximum and minimum design parameters that the project must comply with. | Secretary of State for BEIS/ PINS |
| Secretary of State for BEIS / PINS | DCO (Amendment) Consent granted 31/03/2016 | DCO grants overall consent for the entire scheme, containing the maximum and minimum design parameters that the project must comply with. | Secretary of State for BEIS/ PINS |
| Secretary of State for BEIS / PINS | DCO (Amendment) Consent granted 23/03/2017 | DCO grants overall consent for the entire scheme, containing the maximum and minimum design parameters that the project must comply with. | Secretary of State for BEIS/ PINS |

[1] 2.7.2.3.10 HOW01 Decommissioning Programme VE (00064353_A)

| Regulation | Legislative Context | Achieved Consents | Authority |
|---|---|---|---|
| Marine Management Organisation | Marine and Coastal Access Act 2009: Part 4 – Marine Licensing<br><br>Issued 10/12/14 | Deemed marine licence granted as part of the DCO. | Marine Management Organisation |

In accordance with Section 105(02) of the Energy Act 2004, the Developer was required to prepare a draft Decommissioning Programme for the HOW01 and to submit the document to DECC (now Department for Business & Industrial Strategy ("**BEIS**")) for approval prior to the construction of the wind farm.

The Developer's Decommissioning Programme was submitted to BEIS and was approved on 07 March 2018. The Developer in their financial security document state that the OFTO assets will be decommissioned by the appointed OFTO. This will remove any obligations they have under the licence which pass to the OFTO.

If possible the generator assets will be decommissioned at the same time as the DTPH assets after the expected operational life time of 25 years. At the end of its lifetime, the transmission assets will be decommissioned in order to restore the site as far back to its original conditions as possible.

The Decommissioning Programme will be continuously reviewed and revised throughout the life of the project. These reviews will take into account any changes in legislation, circumstances, technological advancements and regulatory requirements.

DTPH will adopt the principles of the BEIS programme process stages and will follow the process as set out below.

**Table 1.2: BEIS Programme Process Stages**

| Stage | Description |
|---|---|
| **Stage 1** | Preliminary discussion between BEIS and the Developer |
| **Stage 2** | Issue of Section 105 Notice by Secretary of State requiring a decommissioning programme be submitted within a specified timescale |
| **Stage 3** | Detailed discussions; submission and consideration of a draft programme (including proposed financial security measures) |
| **Stage 4** | Consultation with interested parties |
| **Stage 5** | Formal submission of a decommissioning programme and approval under section 106 of the Act |
| **Stage 6** | In operation updates:<br>• Reviews and modifications of the approved decommissioning programme (and any financial security) leading up to Secretary of State accepting/requiring any relevant modifications to the final pre-decommissioning version; and<br>• Changes in timeline or ownership |
| **Stage 7** | Execution of the final version of the approved decommissioning programme |
| **Stage 8** | Submission of successful post-decommissioning repot and conclusion of the Energy Act Process |

## 2 Executive Summary

The Developer obtained consents and licences necessary for the construction of the wind farm in 2014. The operational lifetime is approximately 25 years. At the end of this time the objective will be to decommission the asset in accordance with the provisions set out in the various licences obtained.

In accordance with section 105(2) of the Energy Act 2004, the Developer submitted its Decommissioning Programme for HOW01 to BEIS and was approved on 07 March 2018.

The proposed decommissioning measures set out in this Decommissioning Programme aim to adhere to the existing UK and international legislation and guidance notes. In addition, decommissioning industry best practice will be applied, taking into account the legislation applying at the time of decommissioning of the DTPH assets. DTPH will pay full regard to the "waste hierarchy", which suggests that reuse should be considered first, followed by recycling, incineration with energy recovery and, lastly, disposal.

It is difficult to determine the decommissioning schedule, as unforeseen issues can arise during the installation and operation of the assets, which ultimately could affect the decommissioning. At the time of writing, no offshore wind farms (including offshore transmission assets) worldwide have been decommissioned[2], so direct experience of the potential challenges are limited. Once other projects start to be decommissioned, it will provide valuable insight into the timing, costs and operational challenges to be faced.

The proposed decommissioning measures (in line with the Developers approved decommissioning plan) for the offshore components of the DTPH assets can be summarised as:

- Complete removal of the offshore substation;
- Offshore substation foundations cut off below seabed and removed;
- Offshore export cable within the jurisdiction of Associated British Ports ("**ABP**") to be removed;
- All other offshore export and interlink cables cut, weighted down and left in situ; and
- Sections of the export and interlink cables which are not buried and will not remain buried post decommissioning will be cut and lifted off the seabed for recycling.

In accordance with the Polluter Pays Principle, DTPH in conjunction with the Developer proposes to clear the seabed in accordance with the provisions made in this Decommissioning Programme and in the Marine and Coastal Access Act 2009 (Marine Licence), and to collect and provide evidence to reflect this.

DTPH in conjunction with the Developer is committed to restoring the site and cable corridors to the condition it was in prior to construction, as far as it is reasonably practicable. The key restoration work will relate to ensuring that all cut foundations are made safe and adequately covered, and ensuring that cable ends is adequately buried.

DTPH in conjunction with the Developer proposes that, following post decommissioning, a full geophysical survey (swath, side scan sonar and magnetometer) is carried out. The survey will be carried out by an independent

[2] [2] Danish windfarm Vindeby (1.8km from shore 4.95MW) decommissioned in 2017. Swedish windfarm Yttre Stengrund (2km from shore, 10MW) decommissioned in 2016. Both projects are small scale and do not include transmission assets. Though they provide valuable insights, these can't be used to benchmark for large offshore transmission systems.

survey contractor and all results issued to BEIS for review and comment and provided to The Crown Estate. The area covered by the magnetometer and geophysical surveys will be determined prior to decommissioning, but we are aware of oil and gas installation guidance which specifies a 500 metres radius around any installation.

A cost estimate for the plan has been derived, based on the equipment, personnel requirements and the duration of works. Financial security provisions have been carefully considered to ensure that this liability will be met.

In advance of decommissioning, the EIA will be reviewed to assess the potential impacts that may arise and to identify any additional impacts that were not covered in the initial EIA process and subsequent reviews.

Once the assets are nearing the end of their agreed operational life, DTPH will initiate a final review of this document and the proposed programme of works. Once this review is complete, a "Decommissioning Programme of Works" will be developed, in conjunction with the Developer, and the schedule of works will be determined in agreement with the statutory authorities.

# 3 Background Information

This section describes the project and gives a brief overview of the biological, physical and human environment in the area.

## 3.1 Location

The site is located in the Hornsea Development Area, approximately 120km from the Yorkshire coastline. The Wind Farm site covers an area of approximately 407km$^2$. The location is shown in Figure 3.1.

**Figure 3.1a: Hornsea One Offshore Wind Farm**

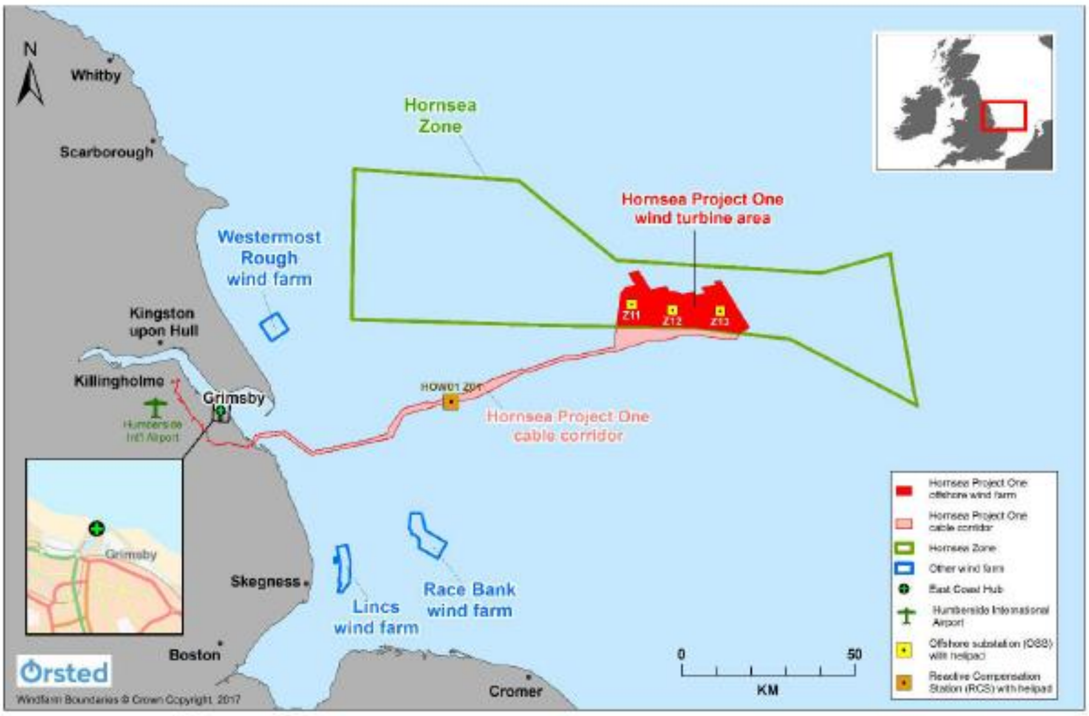
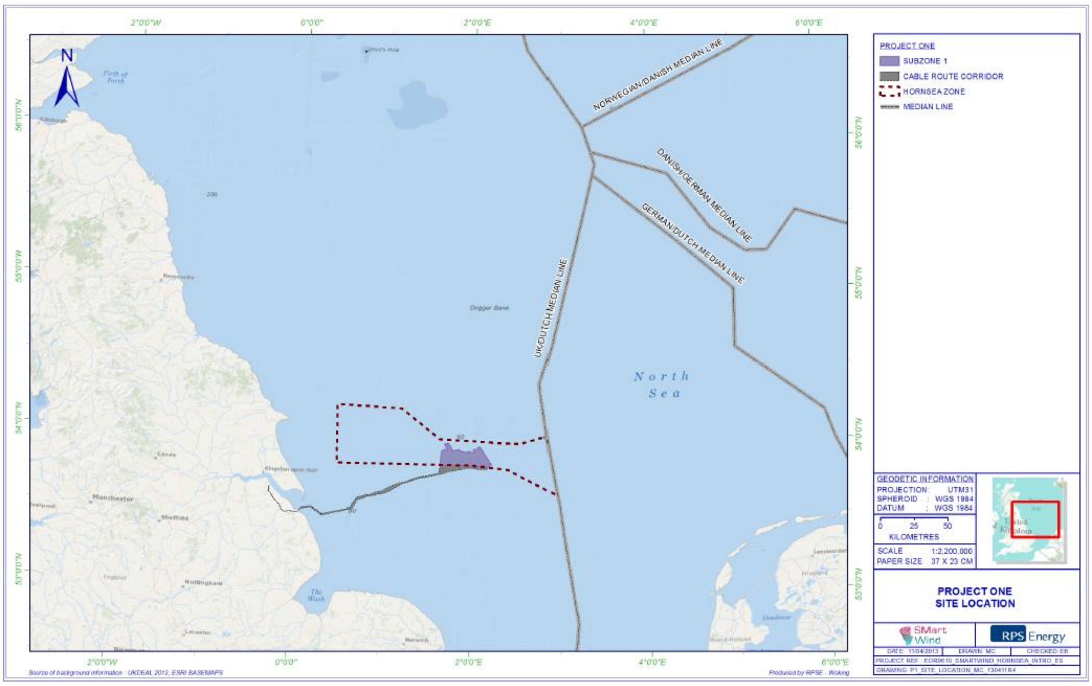


**Figure 3.1b: Hornsea One Offshore Wind Farm**




## 3.2 Design and Background

HOW01 will have a combined Transmission Entry Capacity ("**TEC**") of 1,200MW fed from 174, 7MW turbines. Power generated by the turbines will be transmitted through a network of inter array cables.

The array cables will transmit power to three offshore substation platforms (**"OSP"**).

The three OSPs have two interlink cables connecting them with an approximate length of 14km and 12km.

The three OSPs connect to a reactive compensation station ("**RCS**") via three 220kV subsea cables with approximate lengths of 68km, 74km and 87km.

Using a combination of three subsea and land cable with an approximate length of 106km (approximately 68km offshore and 38km onshore), power will be transmitted from the RCS to the HOW01 onshore substation at Killingholme. The voltage is then stepped up from 220kV to 400kV and transmitted via two 400kV cables to the National Grid Killingholme Substation, where it connects into the National Grid transmission system.

DTPH will operate and maintain the Offshore Transmission Assets associated with HOW01.

## 3.3 As Built Information

The Construction Design and Management ("**CDM**") Regulations 2015 will apply and will require accurate as-built data as amended during the lifetime of the project to be used as a basis for the decommissioning methodologies. The Developer is responsible for providing the purchaser with this information via the projects health and safety file. At the time of writing DTPH has received and reviewed some of the as-built documentation with the remaining to be received and reviewed prior to financial close. As built information will include as a minimum:

1. As-built position for all structures;

2. Details of the construction of all structures; and
3. Position depths of burial and other forms of cable protection for all subsea cables (both export cables and inter-array cables).

If at any time during the lifetime of the project the as-built details change, for example, after a repair to a subsea cable, amended details will be prepared for the on-going site health and safety file containing the as-built data.

## 3.4 Site Characteristics

The site characteristics are described by a comprehensive data set and information collated for the EIA.

### 3.4.1 Physical Characteristics: Geology, Bathymetry and Morphology.

A brief summary of the key physical characteristics for the offshore locations of the HOW01 site is provided below. Further information about the sub-topics is available in the EIA and project geotechnical and geophysical reports.

**Geology**

Surficial Sediments

The entire route, from the beach landfall to the substation, passes over a seabed consisting predominantly of sand and gravelly sand with large areas of sandy gravel. Additionally, areas of coarser gravel and cobble deposits are developed through the shallow sections of the route. Variations in sediments can be observed as the route passes through the deeper water of Silver Pit and Sole Pit, where outcrops of glacial till are developed. The true thickness of the surficial sediments is however unknown as there was no detailed geotechnical investigation undertaken, although surface sediments are not expected to be more than a few tens of centimetres thick along the entire route.

Shallow Soils

The shallow soils comprise predominantly the Upper Pleistocene Glacial Till of the Bolders Bank Formation.

Three main sediment types have been identified along the survey route, these include the Bolders Bank Formation which is present for most of the route from 1-5m in thickness, but sometimes is intermittent or absent. It comprises calcareous, gravelly, sandy CLAY with chalk, sandstone and mudstone erratics. The Lodgement/Ablation Till boundary of the Bolders Bank Formation is delineated in the early part of the route at KP3-16. The base of the Bolders Bank is identified for much of the route although it is not possible to identify the underlying sediment in some sections due to lack of penetration.

The Egmond Ground Formation comprises fine to medium grained sands and gravels and is first identified at KP30.7. The base of the Bolders Bank Formation is evident at 2-3m below seabed with a reflector at 5m below seabed believed to be an internal reflector of the Egmond Ground Formation. Although not always discernable this continues up to the Silver Pit channel.

The Silver Pit channel is where the first evidence of the Yarmouth Roads Formation emerges which comprises fine to medium grained sands. The flanks of the first channel as seen on the geophysical profile between KP50.4 - 51.5, have a good sequence of Bolders Bank Formation and Egmond Ground Formation. In the second channel between KP51.9 - 54.1, delineation is possible of Bolders Bank Formation, Egmond Ground Formation and possibly Yarmouth Roads Formation, which are all exposed with possible undivided Mesozoic Bedrock at the base of the Silver Pit channel. The same sequence is also well delineated on the opposing flank of the channel. The third channel, between KP55.0 – 58.5, has a well defined structure with all formations clearly delineated. On the eastern flank at 30-50m below sea level between the Egmond Ground and Yarmouth Roads Formation is a Sand Hole Formation deposit on the side of the Silver Pit channel. The Sand Hole Formation comprises laminated clays with silty intrusions.

After exiting the Silver Pit channel the Bolders Bank Formation thins to 1m in thickness and the Egmond Ground Formation is replaced by the Yarmouth Roads Formation at KP63. The inclined parallel reflectors here indicate classic delta front facies of the Yarmouth Roads Formation. This continues up to KP72 where the addition of the Yarmouth Roads basal reflector gives depth to Mesozoic Bedrock of 6-8m below seabed up to KP87. Deposits of Bolders Bank Formation thicken to 5-7m overlaying Yarmouth Roads Formation and continue up to the Sole Pit channel at KP98.5. The Egmond Ground Formation re-emerges at KP99 on the eastern side of the Sole Pit channel with a 5m thick Bolders Bank Formation at the seabed. This remains the case for the remainder of the route with occasional Swart Bank Formation channels clearly seen.

**Bathymetry and Morphology**

The survey area extends generally east northeast, with an inshore diversion to the south to avoid shipping channels. The seabed undulates gently as it deepens eastwards. The survey area of 83.7km$^2$ includes several channels and bedforms with significant side slope gradient of up to 15° at Silver Pit. The bathymetry ranges between 3m LAT and 60.8m LAT.

<u>KP0 to KP42</u>

No data was acquired shoreward of KP4.193.

From KP4.193, the route deepens gradually from 4.6m LAT to 25.9m LAT at KP42 with seabed gradients less than 1°. Sand waves up to 0.5m high occur between KP34 and KP35.

The shallow soils predominantly comprise Bolders Bank Formation sediments that are greater than 3m thick. However, four Botney Cut Formation channels in excess of 5m deep cross the route between KP17.41-KP18.32, KP30.82-KP31.77, KP36.09-KP37.00 and KP39.48-KP40.01. Bolders Bank Formation is overlain by Holocene sands up to 2m thick from KP31.41 to KP31.98.

<u>KP42 to KP50.9 – Silver Pit</u>

Silver Pit is the first of the two regional valley systems the proposed route crosses. Silver Pit comprises one major and two minor channels. The major channel extends from KP47.7-KP50.7 with the minor channels occurring nominally between KP43-KP44 and KP44.55-KP46.9.

Outside Silver Pit, water depth is approximately 28m LAT increasing to a maximum depth in the major channel of 60.8m LAT at KP48.83 and 40.2m LAT in the deeper of the minor channels at KP43.65. The steepest gradients, reaching 8°, occur along the flanks of the major channel. The route exits Silver Pit at KP50.8.

Shallow soils in this section are more complex, due to the presence of the Silver Pit channel systems, with a number of Quaternary formations sub-cropping seabed, particularly along the flanks of the various channels. Within the major Silver Pit channel, Cretaceous chalk is interpreted to outcrop between KP48.75-KP50.32.

From KP42 to KP43.70, along the western flank of the first minor Silver Pit channel, the shallow soils comprise Botney Cut Formation with a small subcrop of Bolders Bank Formation present between KP43.17 and KP43.26. Within the base of the first Silver Pit channel, the Botney Cut Formation is underlain by Egmond

Ground Formation, the latter sediments sub-cropping seabed between KP43.70 and KP43.83.

From KP43.83, over the eastern flank of the first Silver Pit channel and throughout the majority of the second Silver Pit channel, Bolders Bank Formation is the predominant sedimentary sequence except for a small area between KP45.83 and KP45.94.

Bolders Bank Formation continues to sub-crop the seabed as far as KP47.62, the western flank of the major Silver Pit channel. Into this channel, the soils are particular complex with Botney Cut Formation overlying Bolders Bank Formation, Egmond Ground Formation, Sand Hole Formation and Cretaceous Chalk.

From KP48.75 to KP50.32, Cretaceous chalk is interpreted to outcrop at seabed. As the route exits Silver Pit, the soils are less complex with Egmond Ground Formation subcropping between KP50.32-KP50.39 and Bolders Bank Formation thereafter.

<u>KP50.9 to KP88.5</u>

From KP50.9, the seabed gently undulates with seabed gradients less than 1°. Sand waves are present, locally up to 4.5m high over which seabed gradients of up to 4° occur. A localised minimum water depth of 18.1m LAT occurs on the crest of a sand wave at KP58.995 with a localised maximum of 30.1m LAT at KP83.256.

Shallow soils comprise Bolders Bank Formation in excess of 5m thick throughout, being intermittently overlain by a variable cover of Holocene sand between KP52.33-KP64.2, KP67.51- KP75.6 and KP87.54-KP88.5. Channel infill sediments of the Botney Cut Formation occur between KP51.98-KP52.43, KP55.27-KP55.87, KP67.29-KP67.51 and from KP88.34, where it underlies the Holocene sand.

<u>KP88.5 to KP95.1 - Sole Pit</u>

Sole Pit is the second of the two regional valley systems the proposed route crosses. Sole Pit comprises one major and one minor channel. The major channel extends from KP89-KP91.95 with the minor channel occurring between KP94.6-KP95.1.

Outside Sole Pit, water depth is approximately 28m LAT increasing to a maximum depth in the major channel of 50.8m LAT at KP91.09 and 36.6m LAT in the minor channel at KP94.72. The steepest gradients, reaching 6°, occur along the flanks of the minor channel. The route exits Sole Pit at KP95.5. Megaripples occur along the flanks of the major channel only. Shallow soils in this section are more complex, due to the presence of the Sole Pit channel systems.

Away from the two valleys, the shallow soils comprise in excess of 5m of Bolders Bank Formation whilst within the two valleys, sediments comprise Botney Cut Formation, occurring between KP88.5-KP91.6 and KP94.6-KP94.86. However along the flanks of both the major and minor channels, both formations occur close to seabed as the Botney Cut Formation thins up the flanks of the channels, leaving Bolders Bank Formation sub-cropping seabed. No outcrops of Cretaceous chalk occur within the Sole Pit.

<u>KP95.5 to KP115.991</u>

From KP95.5 to the end of route, the seabed gently undulates around 30m LAT with seabed gradients less than 1°. Sand waves are sporadically present, locally up to 2m high over which seabed gradients of up to 2° occur.

Shallow soils comprise Bolders Bank Formation in excess of 5m thick throughout, being overlain by up to 3m of Holocene sand from KP110.34 to KP115.30. However, between KP108.59-KP109.03 and KP114.306-KP114.93, two Botney Cut Formation channels cross the route.

### 3.4.2 Marine Processes

#### Coastal Processes

Current speeds and water levels vary across the southern North Sea. Across HOW01 modelled current speeds vary from approximately 0.6m/s (at High Water (HW)) to 1m/s (at Low Water) for peak mean spring tides. While the principal tidal streams run parallel to the shore and current velocities are linear, a more complex pattern of tidal flow exists in the nearshore zone. For example, at the mouth of the Humber Estuary there is a series of interlinked sandbanks and channels, and both ebb and flood tide dominant sediment transport pathways are observed at the estuary mouth.

Water flows across the HOW01 site and the cable route corridor vary temporally (as a function of the tide and tidal range) and spatially. In addition, non-tidal effects may alter tidal currents, for example wind or lateral density currents.

A review of the metocean data collected in relation to tidal currents is presented in Technical Annex 5.1.3: Metocean Data of the EIA. In summary, the total current speed was seen to reduce from the west to the east of HOW01, with tidally dominated currents at Off Ground being approximately 30% faster than those at Windermere Field. The currents are tidally dominated with most of the energy apportioned to the semi-diurnal harmonics. However, high residual currents (often in excess of the tidal component) were experienced during storm events, indicating the considerable influence of meteorological forcing on current speed.

Table 3.1 summarises the tidal elevations within HOW01.

**Table 3.1- Tidal Elevations**

| Level | Spurn Head (m CD) | Subzone 1 (m CD) |
|---|---|---|
| Highest Astronomical Tide | +7.7 | +3.7 |
| MHWS Tides | +6.9 | +3.3 |
| MHWN Tides | +5.5 | +2.6 |
| MSL | +4.1 | +1.9 |
| OD | +3.9 | - |
| Mean Low Water Neap Tides | +2.7 | +1.3 |
| Mean Low Water Spring Tides | +0.7 | +0.6 |
| Lowest Astronomical Tide | 0.0 | 0.0 |

#### Wave Regime

On the east coast, as in many other parts of the UK, westerly and south westerly winds are the most frequent. However, during the winter and spring, winds from the northeast and east sectors are common. Winds blow from the quadrant north around to east only about 20% of the time and it is from this direction that the wind farm is capable of exerting an influence upon the nearshore wind-wave climate. The dominant wind regime interacts with the wind farm, from directions that can affect the inshore wave climate, relatively infrequently. Approximately 80% of the time, the winds are directed away from, or parallel to, the coastline.

The dominant winds blow from sector 202.5ºN to 270ºN (south-southwest through to west), whereas the dominant wave sector is from 315ºN to 0ºN (northeast to north). Waves associated with this latter sector represent long period swell waves.

Since wind-waves originate from meteorological forcing, the wave regime is highly episodic and exhibits strong seasonal variation. In deep water, waves will move across the sea surface without major modification, but as they move into shallower water, refraction, shoaling (wave steepening) and eventually wave breaking will occur. Across the many shallow banks of the southern North Sea, maximum wave heights are also likely to become 'depth limited' with shoaling and wave breaking occurring, especially around low tide.

### 3.4.3 Biological Environment: Subtidal and Intertidal Benthic Ecology

#### Designated Areas

A Habitats Regulations Assessment ("**HRA**") was undertaken as part of the DCO application. The HRA considers the potential impacts upon European protected sites, primarily these include Special Areas of Conservation ("**SAC**") and Special Protection Areas ("**SPA**"). Included within the assessment are the sites / features listed in Table 3.2.

**Table 3.2 – Likely Significantly Effected Areas**

| Species | Site Name | Potential Impact |
|---|---|---|
| Annex I Habitats | Humber Estuary SAC and Ramsar (UK) | Temporary reduction in extent of a number of SAC habitat features.<br>Effects on water quality, including resuspension of contaminated sediments and increases in suspended sediment concentrations. |
| Annex II Species – River and Sea Lamprey | Humber Estuary SAC and Ramsar (UK) | Disruption of lamprey migration during cable installation. Indirect effects on water quality. |
| Annex II Species – Grey seal | Humber Estuary SAC and Ramsar (UK)<br>Berwickshire and North Northumberland Coast SAC (UK)<br>Doggersbank pSCI (Netherlands)<br>Klaverbank pSCI (Netherlands) | Physical injury and/or behavioural disturbance from underwater noise impacts during construction piling of foundations and other construction activities.<br>Behavioural disturbance from underwater noise from vessel noise and other activities.<br>Physical injury from increased risk of collision with vessels. Change in prey availability distribution / abundance. |
| Annex II Species – Harbour seal | The Wash and North Norfolk Coast SAC (UK)<br>Doggerbank SCI (Germany)<br>Doggersbank pSCI (Netherlands)<br>Klaverbank pSCI (Netherlands) | |
| Annex II Species – Harbour porpoise | Vlakte van de Raan pSCI (Belgium)<br>NTP S-H Wattenmeer und angrenzende Küstengebiete SCI (Germany)<br>Doggerbank SCI (Germany)<br>Östliche Deutsche SCI (Germany)<br>Sylter Außenriff SCI (Germany) | |

| Species | Site Name | Potential Impact |
|---|---|---|
| | Steingrund SCI (Germany)<br>Helgoland mit Helgoländer Felssockel SCI (Germany)<br>Hamburgisches Wattenmeer SCI (Germany)<br>Unterelbe SCI (Germany)<br>Borkum-Riffgrund SAC (Germany)<br>Nationalpark Niedersächsisches Wattenmeer SCI (Germany)<br>Gule Rev SAC (Denmark)<br>Sydlige Nordsø SAC (Denmark)<br>Falaises du Cran aux oeufs et du cap gris-nez, dunes du chatelet, marais de tardinghen et dunes de wissant pSCI (France)<br>Bancs des Flandres pSCI (France)<br>Recifs Gris-nez Blanc-nez pSCI (France)<br>Ridens et dunes hydrauliques du detroit du pas-de-calais pSCI (France)<br>Baie de canche et couloir des trois estuaries pSCI (France)<br>Doggersbank pSCI (Netherlands)<br>Klaverbank pSCI (Netherlands)<br>Vlakte van de Raan SAC (Netherlands)<br>Noordzeekustzone SAC (Netherlands)<br>Noordzeekustzone II pSCI (Netherlands) | |
| SPA Qualifying Features - Bar-tailed godwit, Golden plover, Dunlin, Knot, | Humber Estuary SPA and Ramsar (UK) | Temporary habitat loss due to cable laying operations. |

| Species | Site Name | Potential Impact |
| --- | --- | --- |
| Redshank, Dark-bellied brent goose, Sanderling, Ringed plover, Oystercatcher and Grey plover. | | Disturbance and displacement from noise, vibration and visual disturbance due to activities associated with cable laying.<br>Indirect effects due to temporary reduction or redistribution of prey species due to disturbance during cable installation, or changes in water quality. |
| SPA qualifying features – Common tern | Farne Islands SPA (UK)<br>Coquet Island SPA (UK) | Temporary habitat loss due to cable laying operations.<br>Disturbance and displacement from noise, vibration and visual disturbance due to activities associated with cable laying.<br>Indirect effects due to temporary reduction or redistribution of prey species due to disturbance during cable installation, or changes in water quality. |
| SPA qualifying features – Gannet, Kittiwake | Flamborough Head and Bempton Cliffs SPA (UK) | Additional mortality due to collisions with operational turbines. |
| SPA qualifying features – Gannet, Kittiwake, Fulmar, Herring gull, Guillemot, Razorbill, Puffin | Flamborough Head and Bempton Cliffs SPA (UK) | Displacement from foraging and loafing areas due to operational turbines and other infrastructure. |
| SPA qualifying features – Gannet | Firth of Forth Islands SPA (UK) | Additional mortality due to collisions with operational turbines.<br>Displacement from foraging and loafing areas due to operational turbines and other infrastructure. |

**Benthic Fauna**

Sandy sediment communities dominated much of the HOW01 benthic ecology study area, and were generally found to have more impoverished infaunal communities than the coarse and mixed sediment communities, with lower abundances and diversity of polychaetes and bivalve molluscs. The habitats identified were typical of exposed or tide swept coasts and the dominance of species such as the bivalve mollusc C. gibba, which in large abundances may be indicative of unstable substrates (Crema et al., 1991) suggest that these areas may be subject to seasonal or occasional environmental disturbances (Hrs-Brenko, 2006). This would correlate with the observation that these habitats are found in association with the sand dune fields in these areas. Epifaunal communities in these areas were generally absent but, where present, were species poor and characterised by a predominantly mobile species such as echinoderms. The occasional cobble or pebble in these areas were colonised by cnidarians and bryozoans, but these were typically rare in these sediments. The results of the site specific surveys are supported by the Humber REC which identified the EUNIS habitat A5.25(4) Infaunal polychaetes with burrowing bivalves and amphipods in circalittoral fine sand as the dominant habitat over the areas coinciding with the Project One benthic ecology study area.

The areas of deeper water to the north of the HOW01 benthic ecology study area, although still predominantly sand, had a higher proportion of mud in the sediment and supported communities dominated by infaunal and epifaunal brittlestars and high abundances of burrowing bivalves. Muddier areas to the northeast of the HOW01 benthic ecology study area also supported high abundances of the Norway lobster Nephrops.

The coarse sediments which dominated the central and eastern parts of the HOW01 benthic ecology study area, on the whole, had diverse infaunal communities, similar in many places to those found within mixed sediments, with a range of polychaete species present together with bivalve molluscs, echinoderms and crustaceans. The epifaunal communities were, for the most part, as sparse as those observed in the sandy sediments characterised by mobile species, including echinoderms with rare occurrences of sessile epifauna in areas where attachment to hard substrate could be made (i.e., on cobbles, pebbles or gravel). The epifaunal communities in the coarse sediment habitats along the export cable route corridor however, were more diverse than those found in the rest of the HOW01 benthic ecology study area with more frequent occurrences of hydroids and bryozoans on due to the greater availability of hard substrate. The two occurrences of A. islandica, which is listed by OSPAR as a threatened and/or declining species for the Greater North Sea (OSPAR Region II), were in coarse sediments in the eastern end of the export cable route corridor and the north eastern part of Subzone 1. As one of these specimens was a spat rather than a juvenile of this species, and given the low occurrence in the grab samples, it is unlikely that the HOW01 benthic ecology study area is of particular importance for this species within the OSPAR Region II.

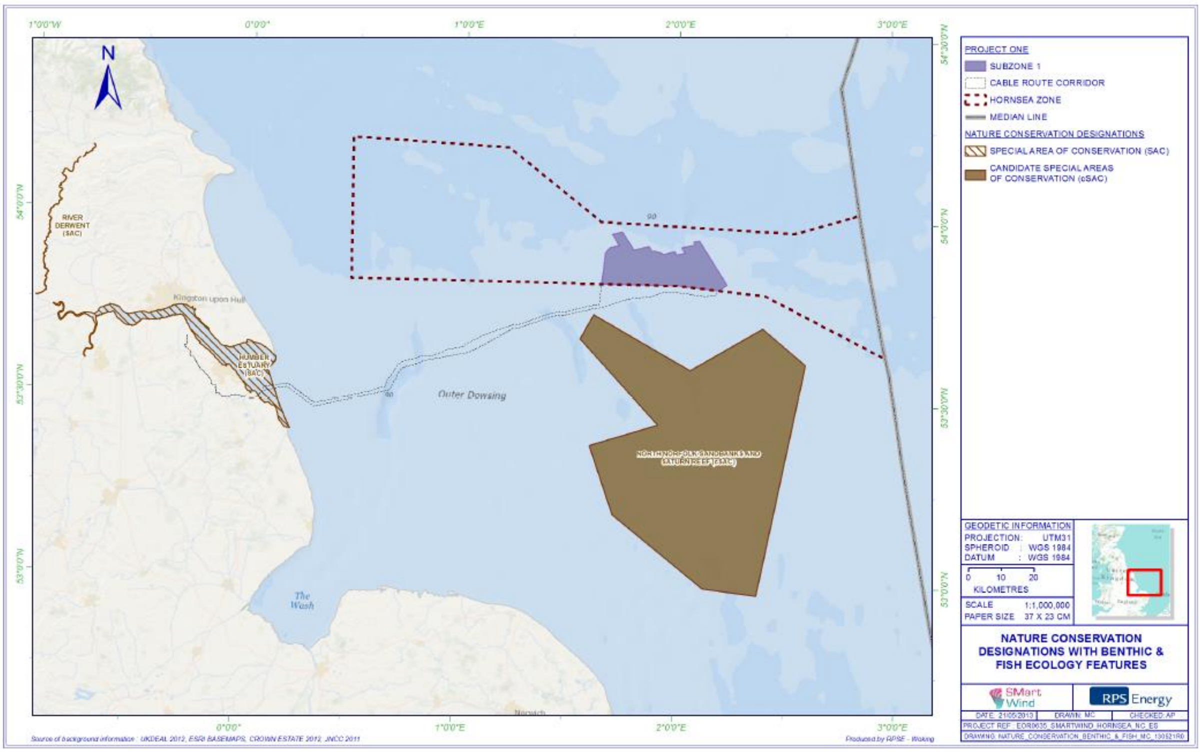
The mixed sediment substrate communities found within the Subzone 1 and the wider HOW01 benthic ecology study area were largely similar to the coarse sediment communities, and there was a high degree of overlap in the species present. The mixed sediment communities on the export cable route corridor differed by being dominated by non-reef forming S. spinulosa. The infaunal communities associated with this tube-building polychaete were the most diverse and numerically abundant communities observed throughout the HOW01 benthic ecology study area, rich in polychaetes, crustaceans, molluscs and echinoderms. The epifaunal components of these communities were also highly diverse with rich communities of bryozoans, ascidians, anemones, shrimps and crabs.

**Fish and Shellfish Ecology**

The fish and shellfish communities recorded within HOW01 are typical of the southern North Sea. Some of the key species recorded in abundance in the offshore parts of HOW01 included whiting, dab, plaice, gurnard and solenette. At the landfall site, the communities were dominated by juvenile fish, and in particular sandeels.

Spawning and nursery habitats were identified for a range of species including herring, plaice, lemon sole, dab, common sole, cod, whiting, sandeel, sprat, brown crab, European lobster and Nephrops. The Humber Estuary represents a particularly important nursery habitat for many of these species. The Humber Estuary was also identified as being important for migratory fish species including sea and river lamprey, Atlantic salmon, sea trout, allis and twaite shad, European smelt and European eel.

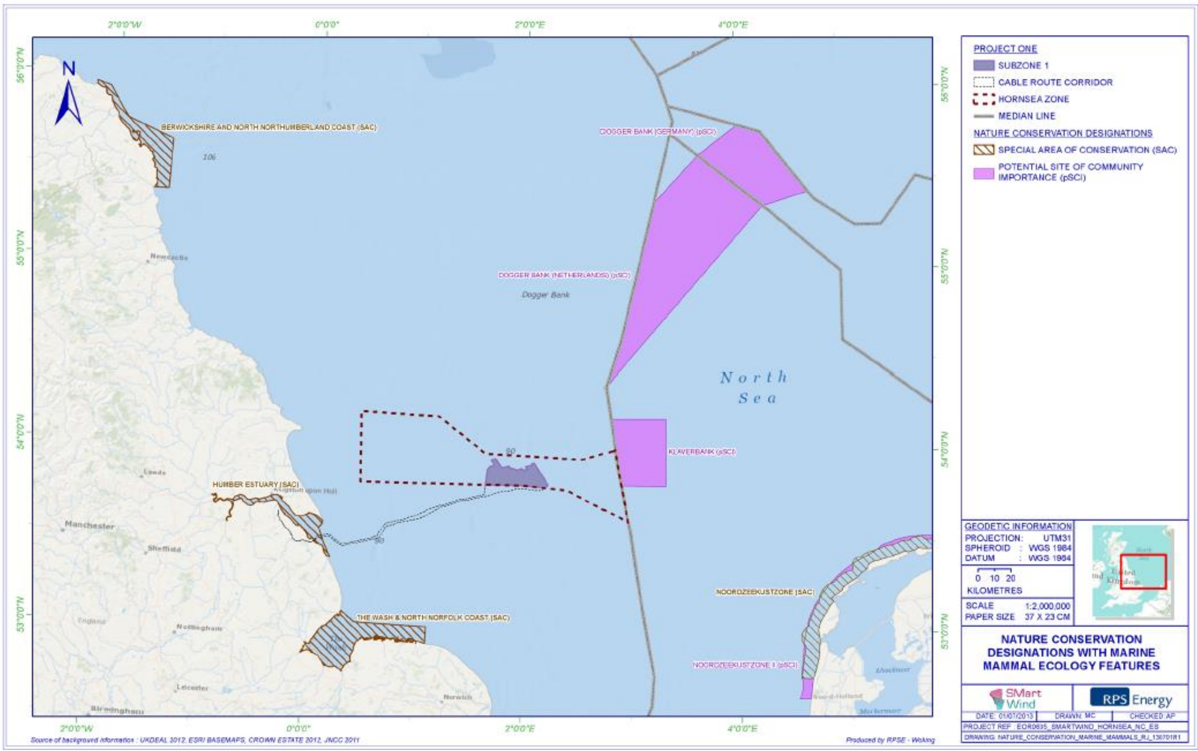
**Figure 3.2: Nature Conservation Designations with Benthic and Fish Ecology Features**




**Marine Mammals**

HOW01 lies within an important area for marine mammals. Harbour porpoise are the most frequently occurring species of marine mammals in Project One, with minke whale, white-beaked dolphin, grey seal and harbour seal also being common. All other species of cetacean were considered rare or occasional visitors and were not taken forward in the EIA.

**Figure 3.3: Nature Conservation Designations with Marine Mammal Ecology Features**




## Offshore Ornithology (Birds)

Offshore ornithology describes the abundance, spatial and temporal distribution, and behaviour of the bird assemblage present within the HOW01 ornithology study area (including Subzone 1 and the offshore export cable route corridor up to the near-shore environment). The offshore bird assemblage was characterised via a series of site-specific boat-based surveys, and contextualised through studies of the wider area published in the scientific literature.

Results from boat-based baseline surveys indicate that the bird assemblage present is typical of that in the offshore environment of the central/eastern North Sea. 'True' seabird species dominate. Also present are some species which spend part of their annual life cycle at sea (e.g., divers and seaducks), and in small numbers a range of other species on migration both to and from the UK and continental Europe, such as waterfowl, waders and passerines. In both survey years; guillemot, kittiwake and razorbill were the three most frequently encountered species, accounting for around 75% of all records. These species were recorded in nationally-important numbers.

Abundances of the most frequently recorded species tended to peak during late summer and the post-breeding dispersal period (roughly August to November), which is likely to be reflective of birds from a wide variety of breeding locations moving through the site towards wintering areas. This seasonal peak also pertained to species breeding within the Flamborough Head and Bempton Cliffs Special Protection Area (SPA), including gannet, fulmar, kittiwake, and auk species (guillemot, razorbill and puffin). Migratory species (skuas, terns and little gull) peaked during autumn, with the latter recorded in potentially internationally important numbers.

## 3.5 Offshore Human Environment

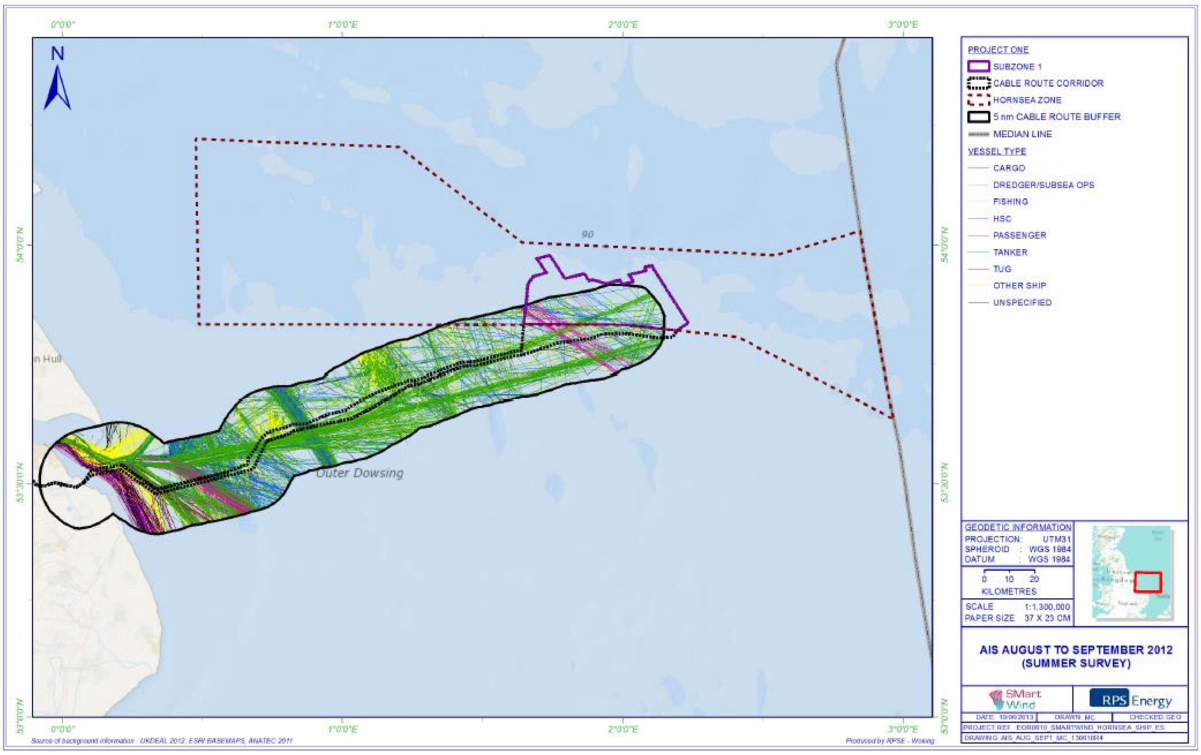
### Shipping and Navigation

A navigational risk assessment ("**NRA**") was undertaken, informed by information on shipping movements around the Offshore Site. The most common types of vessel recorded were cargo vessels followed by tankers.

The 56 days of site-specific data indicated that there were an average of up to 30 unique vessels per day passing within 10NM of Subzone 1, with an average of 13 per day actually intersecting Subzone 1. The majority of these vessels were cargo vessels, followed by tankers.

The baseline review identified that there were no International Maritime Organisation ("**IMO**") routing measures in close proximity to Subzone 1 although the proposed offshore cable route corridor does enter the Humber near the Humber Traffic Separation Scheme ("**TSS**"). The cable route corridor passes through the MOD exercise area, Donna Nook and decommissioning works, if required in the area, will be coordinated with the MOD in this area. There are no Marine Environment High Risk Areas ("**MEHRA**") within Subzone 1 or the cable route corridor.

**Figure 3.4: AIS August to September 2012 (Summer Survey)**




### Commercial Fisheries

Within Subzone 1, UK and Dutch beam trawl vessels dominate the fishery, targeting plaice and sole. There is also a distinct sandeel ground, which is historically important to Danish trawlers. A small number of UK potting vessels also target Subzone 1 as part of an offshore brown crab fishery. Other nationalities that fish across Subzone 1 to a lesser extent include Belgian, French, German and Norwegian vessels trawling for various species of fish. Fishing grounds north of Subzone 1 are fished by UK trawlers that target Nephrops. Fishing operations within Subzone 1 occur throughout the year.

Across the offshore export cable route corridor, UK potting vessels dominate in a brown crab and lobster targeted fishery. The export cable avoids the inner Silver Pit area, which is targeted by a range of fleets from other countries.

**Figure 3.5: Fishing Vessel and Gear Type Tracks Relative to HOW01 Site**

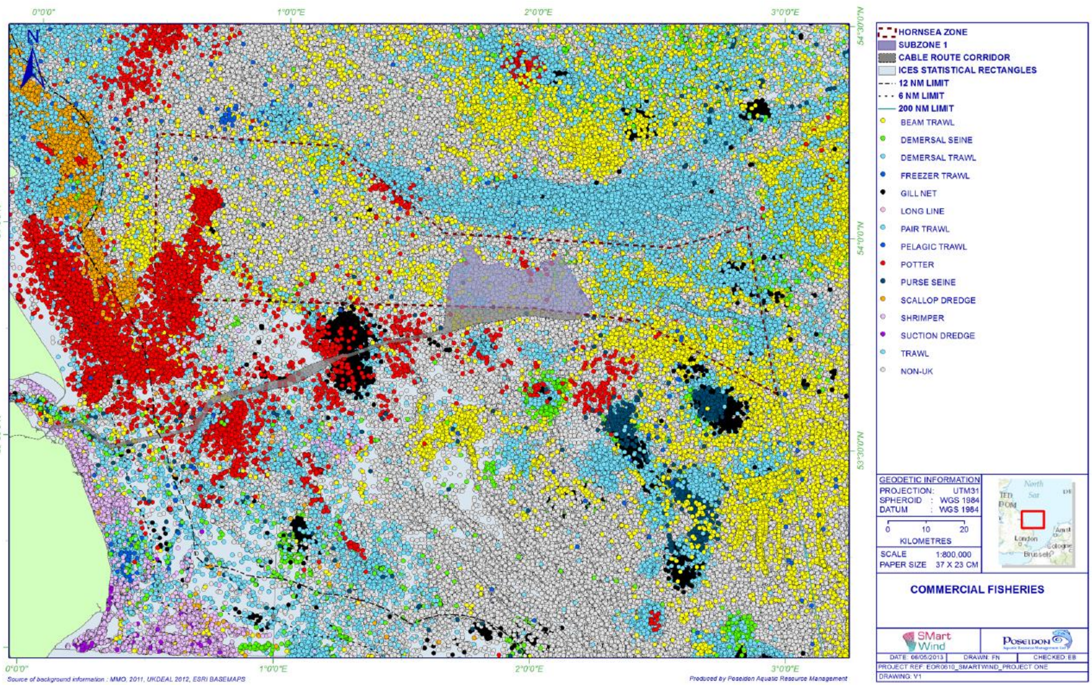
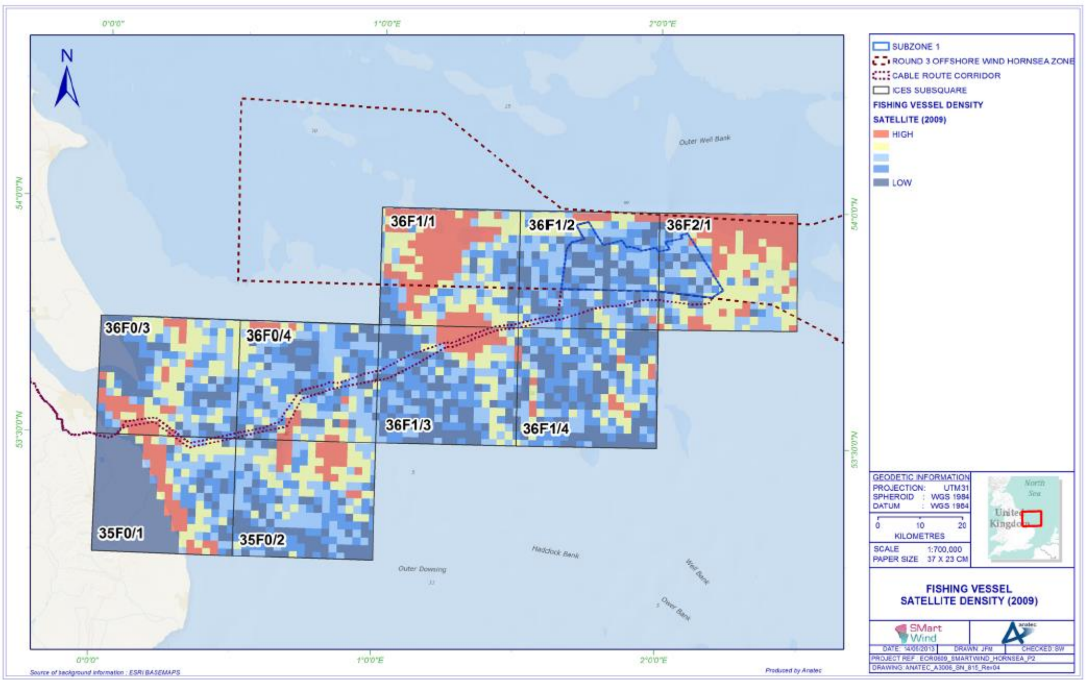



**Figure 3.6: Fishing Vessel Satellite Density (2009)**




## Marine Archaeology and Cultural Heritage

With regards to the geoarchaeology of seafloor sediments, a number of palaeochannels (historic river channels) were identified within Subzone 1. An extensive system of Early Holocene channels, already documented in the Southern North Sea by recent research, was identified in many parts of the development area, particularly Subzone 1, where a series of large former river valleys drain northwards into the depression now known as Outer Silver Pit.

These channels vary from 50m to 2km wide and are up to 50m deep. The palaeochannels are likely to contain preserved ancient land surfaces, covered and protected by fluvial alluvium deposited in the Early Holocene period. Fewer of these channels were identified within the cable route corridor, although a second group were identified draining into Inner Sliver Pit from the west and east. Finally, a large geoarchaeological feature was identified extending 5km seawards from the landfall at Horseshoe Point. This is believed to be the remains of later Mesolithic/Neolithic wetland associated with the prehistoric course of the Humber.

In terms of maritime and aviation wrecks, records suggest that these become much more common within 60km of the coast. Particularly high numbers of World War I and II wrecks are recorded in this area, many of which had been sunk by mines. Substantial numbers of aircraft, mostly Beaufighters, are recorded as having being lost during World War II close to the strategically important World War II airfield at North Cotes, beside the cable landfall, and it is possible that some of these may lie within the offshore export cable route corridor. In total, 32 confirmed anomalies, 17 recorded but unconfirmed anomalies and 975 unconfirmed anomalies were identified within Subzone 1 and the offshore export cable route corridor.

**Aviation, Military and Communications**

There are a number of aviation, military and communications related interests in the vicinity of Subzone 1 and offshore cable route corridor. This includes Ministry of Defence ("**MOD**") Managed Danger Areas ("**MDAs**"), Military Low Flying Areas, and the Donna Nook Danger Area (D307). In addition, two Helicopter Main Routes ("**HMRs**") cross Subzone 1 and its boundary extends into the 9nm consultation zones surrounding the Mimas, Saturn and Schooner A offshore gas platforms.

Subzone 1 is located within the operational range of the NATS Claxby and Cromer Primary Surveillance Radars ("**PSRs**"), and is also within the operational range of the MOD's Air Surveillance and Control Systems ("**ASACS**") Air Defence PSRs located at Staxton Wold and Trimingham. There are networks of microwave links in the vicinity of Subzone 1; however, no permanent structures from Hornsea Project One will obscure the line of sight of any existing links.

**Existing Infrastructure and Other Users**

Infrastructure and other users considers the impact of HOW01 on the following receptors: recreational sailing and motor cruising, kite surfing, surfing, windsurfing, sea/surf kayaking and canoeing, diving, recreational fishing, other offshore wind farms, offshore telecommunications cables, Carbon Capture and Storage ("**CCS**"), Underground Coal Gasification ("**UCG**"), disposal sites, aggregate extraction and oil and gas operations (including pipelines).

A number of potential impacts on infrastructure and other users, associated with the construction, operation and decommissioning of HOW01, were identified. These included displacement of recreational vessels, disturbance to cables and pipelines and aggregate areas, disruption to oil and gas operations including the interference with Radar Early Warning Systems ("**REWS**") on gas platforms, and an increase in airborne noise. With the proposed mitigation measures in place, these impacts identified, with the exception of the potential disruption to oil and gas seismic surveys, result in effects of negligible to minor adverse significance (not significant in EIA terms).

**Seascape and Visual Resources**

The seascape and visual resources assessment considers the effects of HOW01 on present day seascape character and on the Historic Seascape Character ("**HSC**").

The present day seascape and HSC were characterised by site-specific surveys from viewpoint locations, as well as a desktop study.

The visual characteristics of Subzone 1 and the offshore export cable route corridor are relatively homogenous, with a lack of visibility to coastal areas, due to the distance from the shore. The offshore area is generally open, with occasional views of offshore structures such as gas platforms, and regular patterns of use by sea-going vessels for a variety of purposes (e.g., recreational cruising, commercial ferry routes, commercial fishing activity etc.). Air combat training takes place over the majority of the study area. There are no national or regional seascape designations within the seascape and visual resources study area.

Subzone 1 lies within two broad HSC types; Navigation and Offshore Industry. Similarly, the offshore export cable route corridor passes largely through areas with Navigation or Offshore Industry broad character designations. The only exceptions to this, is close to the shore, which is identified as Military and Coastal Industry.

# 4 Description of Items to be Decommissioned

As part of the windfarm construction the OFTO assets were constructed in a way that it is possible to decommission them at the end of its operational life (approximately 25 years[3]), in order to fulfil regulatory requirements at construction consenting stage.

The following decommissioning measures are based on today's known techniques and have been proposed with regard to:

- Decommissioning of Offshore Renewable Energy Installations Under the Energy Act 2004 - Guidance notes for industry (England and Wales) – March 2019;
- The Best Practicable Environmental Option ("**BPEO**");
- OSPAR guidance documents on offshore wind farms;
- IMO 'Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and in the Exclusive Economic Zone';
- Government guidance notes for decommissioning offshore oil and gas installations in compliance with OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic Decision 98/3;
- UNCLOS and OSPAR obligations;
- Safety of surface and subsurface navigation;
- Other users of the sea, and
- Health and safety considerations.

Components left in situ following decommissioning will be aligned with standards set out by the IMO that specify that, an installation or structure need not be entirely removed if:

- It would not involve extreme cost;
- It is not technically feasible (however, the design and construction should be such that entire removal would be feasible);
- It would involve an unacceptable risk to personnel; and

[3] Note Ofgem OFTO regime requires OFTOs to be prepared to decommission the transmission asset after 25 years.

- It would involve an unacceptable risk to the environment.

In addition, DTPH will also apply the following principles:

**Table 4.1: Guiding Principles**

| Guiding Principles | Comments |
|---|---|
| Minimise environmental impact | In considering decommissioning measures, the BPEO will be chosen in order to minimise impact on the environment at an acceptable cost. |
| Safety at all times for all | The highest levels of health and safety will be followed throughout the project lifecycle. Safe practices will be followed in implementing decommissioning solutions. |
| Maximise reuse of materials | DTPH will aim to maximise the reuse of waste material from the decommissioning phase and will pay full regard to the 'waste hierarchy', see Table 6.3. |
| Consideration of the rights and needs of legitimate users of the sea | The rights and needs of other users are respected by DTPH. Decommissioning activities will seek to minimise the impact on stakeholders and emphasis will be placed on clear and open communication. |
| Follow Polluter Pays Principle | DTPH decommissioning and waste management provisions acknowledge our responsibility to incur the costs associated with our impact on the environment. |

## 5 Description of Items to be Decommissioned

The items covered in this section for decommissioning by DTPH are:

- Three Offshore Substation Platforms ("**OSP**") (including jacket and ALL components on the platform);
- One Reactive Compensation Station ("**RCS**") (including jacket and ALL components on the platform);
- Three offshore export cables; and
- Interlink cable.

### 5.1 Offshore Substation Platforms (OSP)

The project has an installed TEC of 1,200MW. The offshore element of the project consists of three 34/220kV OSPs and one 220kV RCS. The purpose of the OSP's are to transform the voltages of the electricity generated by the turbines from 34kV up to 220kV for transmission of generated power to the onshore transmission grid system.

The dimensions of the HOW01 OSPs are as follows:

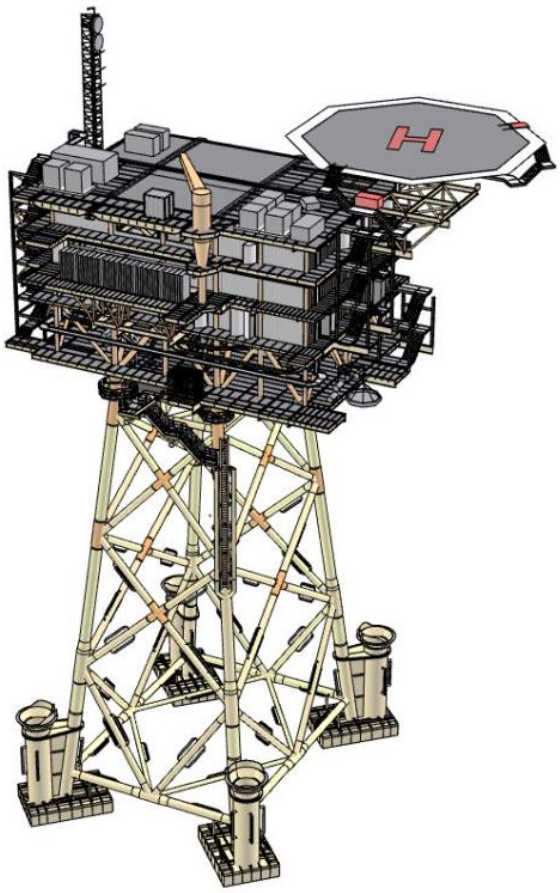
- Topside lift weight is approximately 2,690 metric tonnes ("**Mt**") for Z11, 2,700Mt for Z12 and 2,720Mt for Z13;
- Foundation and support structure lift weight (excl. piles) is approximately, 1,740Mt for Z11, 1,600Mt for Z12 and 1,630Mt for Z13
- Piles: diameter 2.2m, pile length of approximately 48m; and

- Area of topside is approximately: 52m long x 36m wide x 52m high.

Located on each OSP is:

- Two main transformer including coolers;
- One Shunt Reactor;
- Medium voltage ("**MV**") switchgear bays;
- 220kV Gas Insulated Switchgear ("**GIS**") bays;
- Auxiliary transformers and two earthing resistors;
- Control and communication room ("**SCADA**")
- LV & utility room;
- Public room Accommodation (emergency)Laydown areas; and
- Cable deck.

**Figure 5.1: HOW01 OSP**



## 5.2 Reactive Compensation Substation (RSC)

The offshore element of the project consists of one RCS. The purpose of the RCS is to house mid-point reactors used for absorption of reactive power from the export cables that would otherwise have to be absorbed by the offshore reactor/WTGs or be exported to the onshore system.

The dimensions of the HOW01 RCS is as follows:

- Topside lift weight is approximately 2,500Mt;

- Foundation and support structure lift weight (excl. piles) is approximately 1500Mt;
- Piles: diameter 2.2m, pile length of approximately 48m; and
- Area of topside: 45m long x 49.5m wide x 20m high:

Located on the RCS is:

- Three Shunt Reactors including coolers;
- 220kV Gas Insulated Switchgear ("**GIS**") bays;
- Auxiliary transformers;
- Control and communication room ("**SCADA**")
- LV & utility room;
- Public room Accommodation (emergency)Laydown areas; and
- Cable deck.

**Figure 5.2: HOW01 RSC**

## 5.3 Offshore Export Cable

The total length of each offshore export cable is approximately 104km, 108km and 124km from the OSP to landfall and 12km and 14km for the interlink cables. The subsea cable is required to connect the wind farm to the onshore electricity transmission system. As part of their design the cable will also have an internal fibre optic for data transfer and control purposes.

The subsea export cable is buried to a nominal depth of 0.46m to 4.39m. The range is due to the seabed mobility and differences in anthropogenic risk across the route, see Section 6.8 for further details.

Removing the cables from the seabed is expected to have a far greater negative environmental impact than leaving them in the seabed. In order to minimise any such negative impacts as far as possible, the array and export cable ends will be cut off prior to foundation removal and the remaining lengths buried, and thus allowed to stay in situ.

Whilst it is considered that cables that have remained buried for the life of the wind farm prior to decommissioning will be at low risk of subsequent exposure, contingency plans will be put in place to ensure that appropriate actions are carried out in the event that any cables do become exposed e.g. notification to mariners etc. prior to removal.

Due to the requirements of the ABP Landowner's Consent to the laying of Cables and Options for Lease agreement (KP0.2 - KP7.3) these are to be removed from the seabed.

The cables are designed for a long service life in marine conditions and will degrade very slowly with no material impact on the surrounding environment. Since any exposed sections of cable will be removed during decommissioning, as will any sections which are deemed likely to become exposed, the cable sections left in situ are considered to be stable and unlikely to become exposed or subject to movement. This will be verified by post-decommissioning surveys and seabed mobility prognosis for the 50 year period beyond decommissioning, see Section 14 for details on timing of post-decommissioning surveys.

Any changes in the available approaches to decommissioning, the appropriate set of principles, or knowledge concerning the application of these principles will be applied when the Decommissioning Programme is updated. Such an update will be undertaken in the event of a major change in input data and, in any event, in line with the required permitting processes.

# 6 Description of Proposed Decommissioning Measures

This section gives an overview of legislation and guidance relevant to decommissioning activities and further outlines in more detail how decommissioning of individual parts of the development will be carried out i.e. the OSPs, RCS and the export cables.

At the time of writing this document, the decommissioning phase is expected to commence after 25 years. Therefore, it is not possible to describe the precise technology and methods of decommissioning works. These will develop over the operational lifetime of the wind farm, and should therefore be reviewed and a detailed decommissioning works schedule finalised before the decommissioning phase starts. DTPH will also review the plan upon request by BEIS.

However as mentioned in Section 4, certain principles are projected to be followed:

- Health and safety considerations;
- Best Practicable Environmental Option ("**BPEO**");
- Safety of surface and subsurface navigation; and
- Other uses of the sea.

## 6.1 Adherence to relevant legislation and guidance

The decommissioning measures are based on known techniques of today and have been proposed taking into consideration the following key UK and international legislation and guidance notes:

- Decommissioning of offshore renewable energy installations under the Energy Act 2004: Guidance notes for industry (England and Wales) March 2019;
- Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and in the Exclusive Economic Zone, International Maritime Organisation (IMO), 19 October 1989;
- Guidance Notes for Industry: Decommissioning of Offshore Installations and Pipelines under the Petroleum Act 1998, DECC;
- OSPAR guidance documents on offshore wind farms;
- Guidelines for Environmental Risk Assessment and Management, Defra, September 2002; and
- United Nations Convention on the Law of the Sea (UNCLOS), 1982.

Other relevant legislation includes:

- Hazardous Waste Regulations 2005;
- Marine and Coastal Access Act 2009;
- The Water Resources Act 1991;
- The Conservation of Habitats and Species Regulations 2010;
- The disposal or recovery of waste on land, principally under Part II of the Environmental Protection Act 1990, other legislation relating to the carriage and transfer of waste and, where appropriate, the Hazardous Waste Regulations 2005; and relevant health and safety legislation;
- London Convention 1972 and the 1996 Protocol, relating to the prevention of marine pollution by dumping of wastes;
- Construction (Design and Management) Regulations (CDM) 2015; and
- Appropriate H&S Regulations.

## 6.2 Phasing and Co-ordination of Decommissioning

The phasing and detailed programme for decommissioning will be defined and submitted to BEIS in advance of decommissioning.

## 6.3 Plan of Works and Integration

A detailed final Decommissioning Programme will be prepared two years ahead of the proposed decommissioning date and will incorporate the results of a detailed recent EIA, thus allowing sufficient time to implement any measures arising into the final Decommissioning Programme. The process supporting the EIA will include pre-decommissioning surveys. The plan of work will include detailed method statement together with project specific hazard and risk assessments. DTPH will also liaise with other developers in the region to ensure potential synergies for decommissioning facilities are investigated.

## 6.4 Decommissioning of Offshore Substation Platforms and Reactive Compensation Stations

It is planned that the structure for the OSP and RCS will be removed in its entirety including the foundations. There are some structures that may be left under the seabed i.e. cables and foundation bottom pieces whereby removal may result in greater impact on the environment than leaving them in situ.

The items to be decommissioned are:

- All of the topside equipment, transformers and reactor;

  (As the transformers and reactor are oil filled, they and the various other components including generators and fuel storage, will be transported to an onshore facility for dismantling, with constituent parts processed for reuse, recycling and disposal. This will be performed in conjunction with the generator);
- The topside's support structure;
- The jacket structure, including all appurtenances such as J-Tubes and boat access system;
- The piles will be cut at such a depth below the surface of the seabed that the remaining parts do not pose a danger for shipping or fishing vessels, even if sediment should become relocated. Following the cutting operation the foundations and the jacket structure may be removed as a single structure after the removal of the topside; and
- The interlink cable and turbine interconnecting cables adjacent to the substructure will be cut at a point below the surface of the seabed to allow the cable to remain buried (cut sections will be removed with minimal disruption to the seabed).

It is expected that the OSPs and RCS will be decommissioned in two main stages, comprising the complete removal, firstly of the topside, followed by removal also of the jacket foundation.

Prior to removal of the topside, a number of preparatory activities will be conducted including:

- De-energise and isolate required electrical control and power cables from National Grid and SCADA system;
- It is proposed that the oil filled transformers and reactor are braced for sea transportation, transformer and reactor oil levels can be reduced in components like the conservator tank and cooler fins to deal with a liquid load;
- Dismantle terminations for export and array cables; removal of all cables back to cable deck, or seabed;
- Removal of all unsecured loose items from the topside;
- Containment and/or removal of potentially hazardous/polluting fluids. An agreement will be made with the Gas Insulated Switchgear ("**GIS**") supplier or another competent contractor to ensure the safe removal of the $SF_6$ Gas;
- Certification of lifting points; and
- Cutting welded stab-in connections between topside and foundation.

A Heavy Lift Barge Vessel ("**HLV**") will be used to dismantle the topside and transport the structure ashore for further dismantling.

The process of decommissioning of the OSPs and RCS is likely to involve the following second stage sequence:

- A HLV lifts the topside module onto an adjacent barge;
- Topside is transported back to port where the topside is transferred to the quayside;

- Topside will be processed for recycling and or disposal as appropriate; and
- Jacket piles will be cut off at such a depth below the surface of the seabed that the remaining parts do not pose a danger for shipping or fishing vessels, even if sediments should become relocated, the method used could be either water cutting or remote thermal cutting.

Complete removal of the pile below the seabed is considered neither practical nor environmentally desirable. The appropriate depth for removal would depend upon the sea-bed conditions and site characteristics at the time of decommissioning. This is in line with the IMO standards as complete removal of the foundations would involve an unacceptable risk to the marine environment and is likely to involve extreme cost. If an obstruction exists above the sea bed or an obstruction appears following decommissioning which is attributable to the wind farm, this obstruction will be marked by the owner so as not to present a hazard to other sea users. The marking will remain in place until such time as the obstruction is removed or is no longer considered to be a hazard to other sea users. The monitoring of this obstruction will be built into the decommissioning monitoring and maintenance programme.

The general target for cutting of the jacket piles will be at such a depth below the surface of the seabed that the remaining parts do not pose a danger for shipping or fishing vessels, even if sediments should become relocated. When assessing the possibility of cutting below the seabed, it is important to consider the need to overcome frictional forces acting on the pile. Considerable excavation will have to take place, approximately two meters in diameter for every meter in depth below the seabed.

Once cut the jacket will then be lifted onto a barge and transported back to port for recycling or sold off as scrap metal.

Items contained within the topside will be processed for recycling accordingly or disposed as appropriate.

All hazardous waste will be handled accordingly and disposed of in accordance with its waste classification.

## 6.5 Decommissioning of Export Cables and Interlink Cables

The decision whether or not to remove the cables will be taken closer to the end of the project's lifetime and will be subject to consultation as part of an application for consent to cover decommissioning activities. If cables are left in-situ, the ends will be weighted down and buried at the current depth to ensure that no navigational risk arises in the sense that fishing gear or anchor would interface with the as left cables. Also, only export cables and interlink cables which are buried to a depth considered to be safe will be left in-situ. Exposed cables will be removed or buried to a secure depth. Due to the requirements of the ABP Landowner's Consent to the laying of Cables and Options for Lease agreement (KP0.2 - KP7.3) these are to be removed from the seabed.

Where a cable is removed on request, the sequence for removal is anticipated to be:

- Identify the location of the cables that need to be removed;
- Seabed material may need to be removed to locate the cable, likely to be carried out using a water jetting tool similar to that used during cable installation e.g. mass flow excavator. Buried cables will be located using a grapnel to lift them from the seabed. Alternatively, or in addition, it may be necessary to use an Remote Operated Vehicle ("**ROV**") to cut and/or attach a lifting attachment to the cable so that it can be recovered to the vessel;

- The recovery vessel will either 'peel out' the cable as it moves backwards along the cable route whilst picking it up on the winch or cable engines, or, if the seabed is very stiff/hard it may first under-run the cable with a suspended sheave block to lift the cable from the seabed. The use of a suspended sheave block could be carried out before by a separate vessel such as a tug prior to the recovery vessel 'peeling out' the cable;
- The recovery vessel will either spool the recovered cable into a carousel or chop it into lengths as it is brought on-board before transport to shore; and
- Parts will be processed for reuse, recycle or disposal.

### 6.6 Rock Berms

The base case assumption for rock berms is that they will be left in situ. DTPH considers that it is best practice to leave rock berms in place to preserve the marine habitat that has established over the operational life of the wind farm, on the assumption that to do so would not have a detrimental impact on the environment, conservation aims, the safety of navigation and other uses of the sea.

### 6.7 Summary of Proposed Decommissioning Measures

A summary of the proposed decommissioning measures for the offshore components of the DTPH are outlined in Table 6.1a and 6.1b.

**Table 6.1a: Summary of Proposed Decommissioning Measures for DTPH**

| Component | | Proposed decommissioning measures |
|---|---|---|
| OSP and RCS | Topside | Complete removal |
| | Jacket | Cut off at such a depth below the surface of the seabed that the remaining parts do not pose a danger for shipping or fishing vessels. |
| Offshore export cable | | Cut off at the base of the platform, the remaining cable will be weighted down and buried at such a depth below the surface of the seabed that the remaining parts do not pose a danger for shipping or fishing vessels.<br>Cable removal from ABP port jurisdiction. |
| Offshore interlink cable | | Cut off at the base of the platform, the remaining cable will be weighted down and buried at such a depth below the surface of the seabed that the remaining parts do not pose a danger for shipping or fishing vessels. |

**Table 6.2: Decommissioning Programme Technical and Environmental Summary**

| Activity | Description | Approach |
|---|---|---|
| Disconnection | Transmission assets disconnected from National Grid Electricity Transmission ("**NGET**") system and wind | Undertaken in accordance with the safety rules in place at the time. |

| Activity | Description | Approach |
|---|---|---|
| | turbine generators, isolated and earthed. | |
| OSP and RCS topside structures | Houses transmission assets: oil-filled transformers, switchgear, and termination of the OFTO export cables and for the OSP wind farm array cables.<br>Gross lift weight OSP topside is circa 2,690Mt, Z11, 2,700Mt Z12 and 2,720Mt Z13.<br>Gross lift weight of the RCS topside is circa 2,500Mt. | Oil filled transformers and reactors are braced for sea transportation, oil levels reduced in the conservator tank and cooler fins to deal with a liquid load.<br>Cables will be removed or cut at the hang-off.<br>The topside is then cut from the jacket and removed in one piece. Parts will be processed for reuse, recycling and disposal in line with the waste hierarchy and Good Industry Practice ("**GIP**"). |
| OSPs and RCS jacket structure and piles | Gross lift weight of the OSP jacket structure is circa 1,740Mt, Z11, 1,600Mt Z12 and 1,630Mt Z13 and supporting foundations and skirt piles.<br>Gross lift weight of the RCS jacket structure circa 1,500Mt and supporting foundations and skirt piles. | Critical joints and members of the structure will be inspected using a ROV.<br>Jacket piles will be cut off at such a depth below the surface of the seabed that the remaining parts do not pose a danger for shipping or fishing vessels, even if sediments should become relocated. Post topside removal and cutting operation, the foundations and jacket structure will be removed as a single structure. |
| Inter array cables | Inter array cables are owned by the Developer and connect the wind turbine generators to equipment on the OSP. | In conjunction with the Developer inter array cables will be cut or dismantled at the hang-off to enable removal of the topsides. |
| Offshore Cables | The three OSPs are connected to the RCS by three export cables of 68km, 74km and 87km length buried to a target Depth of Lowering ("**DoL**") of between 0.58 and 3.38 metres.<br>The RCS is connected to land via three export cables of circa 68km in length buried to a | To minimise environmental disturbance to the seabed, only offshore cables that are exposed at the time of decommissioning with the exception of those within the ABP jurisdiction will be removed.<br>Due to the requirements of the ABP Landowner's Consent to the laying of Cables and Options for |

| Activity | Description | Approach |
|---|---|---|
| | target DoL of between 0.46 and 4.39 metres.<br>The three OSPs are connected via two interlink cables of 12km and 14km in length buried to a target DoL of between 2.03 and 2.61 metres.<br>The subsea export cable consists of three XLPE insulated; three core 1000mm$^2$ (1200 mm$^2$ at central landfall to RCS) copper conductor cables.<br>The subsea interlink cable consists of three XLPE insulated; three core 950mm$^2$ aluminium conductor cables.<br>The two subsea interlink cables consists of an XLPE insulated; three core 950mm$^2$ aluminium conductor cables. | Lease agreement (KP0.2 - KP7.3) these are to be removed from the seabed.<br>Cable requiring removal will be cut as close to the platform foundation, or sea bed, as is possible, with ends weighted down and buried to a secure depth below seabed level such that the remaining parts do not pose a danger for shipping or fishing vessels. Recovered cable will be stripped and recycled.<br>Contingency plans will be in place to ensure appropriate actions are in place if cables become exposed post decommissioning e.g. notification to mariners etc. prior to removal. |

## 6.8 Proposed Waste Management Solutions

DTPH is committed to maximising the reuse of waste materials and pays full regard to the 'waste hierarchy' which suggest that reuse should be considered first, followed by recycling, incineration with energy recovery and lastly, disposal. In any event waste management will be carried out in accordance with all relevant legislation and it would be intended that any disposal takes place on land.

At the time of decommissioning, where assets have remaining technical asset life and a second hand market exists DTPH will look to sell assets. If this is not possible a waste management plan will be drawn up prior to the commencement of decommissioning to ensure that adequate time remains for the proper provisions to be made.

An overview of expected types of wastes and their expected re-use, recycling or disposal is given in Table 6.3. In any event, waste management will be carried out in accordance with all relevant legislation at the time of decommissioning and it is intended that any disposal will take place on land.

**Table 6.3: Re-use, Recycle and Disposal Options**

| Asset | Waste Type | Re-Use | Recycle | Disposal |
|---|---|---|---|---|
| Jacket and foundations from OSPs and RCS | Steel from topside and Foundations | | X | |

| Asset | Waste Type | Re-Use | Recycle | Disposal |
|---|---|---|---|---|
| Main power transformers | Steel, iron laminate, copper, transformer oil | X | X | |
| GIS and air insulated switchgear | Copper, electronics | X | X | |
| OSP and RCS power cables | Copper and aluminium | | X | |
| Diesel generators | Steel, copper and electronics | X | X | |
| Reactors | Steel, iron laminate, copper and reactor oil | X | X | |
| Auxiliary transformers | Steel, iron laminate, copper and transformer oil | X | X | |
| SCADA, protection panels | Steel and electronics | | X | |
| Neutral earthing resistor | Steel and copper | X | X | |
| LV switchboard | Steel and electronics | X | X | |
| Subsea cables | Copper, aluminium, lead, and steel | | X | |
| Onshore cables | Aluminium, lead, copper and steel | | X | |
| Other | Non-recyclable materials and fluids | | | X |

## 6.9 Details of Any Item Left in-situ Offshore Following Decommissioning

As described in the previous sections, it is proposed to leave a major section of offshore cables, interlink cables, embedded piles of the OSPs and RCS, and cable protection (rock berms) in the seabed (the "**Left in-situ Items**").

Cable protection has been installed at four crossing locations and at various locations along each cable route totalling 39km, where additional cable protection was required.

Leaving the Left in-situ Items is in line with the March 2019 Guidance, which states in:

- Section 7.1.2 "Decommissioning programmes……….should include a base case of all infrastructure being removed";
- Section 7.2.3 goes on to state "Exceptions will be considered on a case by case basis prior to decommissioning, taking on board environmental conditions, the balance of risk, cost and technological capabilities at that time"; and finally

- Section 7.2.6 states "Where less than full decommissioning is proposed, developers/owners will need to engage with other regulators (such as the Marine Management Organisation and Natural Resources Wales in respect of Marine Licences and Maritime and Coastguard Agency and the General Lighthouse Authority in connection with navigational risk) and their landlord on the acceptability of the proposals."

In line with the March 2019 Guidance Section 7.2.2 the basis of the Left in-situ Items is that one of the four IMO standards where non-removal or partial removal may be considered is met, being:

1. The installation or structure will serve a new use, whether for renewable energy generation or for another purpose, such as enhancement of a living resource (provided it would not be detrimental to other aims, such as conservation);
2. Entire removal would involve an unacceptable risk to personnel;
3. Entire removal would involve an unacceptable risk to the marine environment; and
4. Entire removal would involve extreme costs.

The primary reasons for leaving the Left in-situ Items in the seabed are:

**IMO Standard 2:**

1. Decommissioning of the Left in-situ Items will require the involvement of divers in significant and dangerous operations e.g. in preparatory work for cable/embedded pile removal, installation/recovery/snagging works of any under runners used during the cable removal etc. and the lift operation required during the removal of cable protection (rock berm removal has never been done to date) etc.

**IMO Standard 3:**

1. **Cable Protection** - leaving cable protection in-situ on the seabed is associated with certain positive effects (leaving the exposed habitat and benthic community that will have likely colonised it in place, and avoiding the increased vessel disturbance/damage and sediment effects associated with removing the material). However, leaving cable protection in-situ is also associated with certain adverse effects (the enduring loss of the original biotopes and potential scouring of surrounding natural seabed sediments). On balance, avoiding impacts arising from removal and the positive impacts of colonisation outweigh the negligible to minor adverse impacts of continued seabed loss and potential scour.

   In addition, cable protection will also trap sand migration on the seabed. It is assumed that some form of localised dredging, or more likely the use of a remotely operated underwater excavator tool as used in cable re-burial would be used to pre-blast or clear the sand away from the cable protection with associated disturbance/damage and sediment effects associated with removing the material.
2. **Jacket Piles** - complete removal of the pile below the seabed with currently proven technology is considered neither practical, nor environmentally desirable due to the considerable excavation that will have to take place, approximately two meters diameter for every meter in depth below the seabed, with piles buried to a depth of approximately 48 metres resulting in disturbance of 96 metres.
3. **Export Cables** – The use of a remotely operated underwater excavator to blast or clear the sand away from the buried cable prior to removal will cause

unnecessary damage and disturbance to the seabed where cables have been proved to have been adequately buried.

The methodology to determine the export cable seabed mobility and minimum depth of lowering of the cable, to ensure the cable is adequately protected is detailed in documents '2.2.4.1.21_HOW01 - Export Cable Route and Interlink Cable Route - Seabed Change Assessment (00045067_C).pdf, and . 2.2.5.1.10 HOW01 Export and Interlink Cable Routes Burial Strategy Report (02126734_B).pdf. The 'Seabed Change Assessment Report' considers a period of 25 years.

In summary, the Reference Seabed Level ("**RSBL**") for every metre point of the route is calculated for the lowest expected elevation of the seabed level over the lifetime of the project (25 years) hence any cable buried lower than the RSBL level is expected to remain adequately buried and protected against seabed mobility.

Based on the installed burial depths, the total length of cable, which has not been buried deeper than the RSBL is 0.103km out of a total route length of 443.554km.

Note that the RSBL is considered achieved where rock protection has been installed regardless of the initial depth of lowering that was achieved.

The sections where the RSBL has not been achieved represent a total of approximately 0.02% of the total installed route length of approximately 444km. The remaining cable, which has been buried deeper than the RSBL, or is protected by rock, is forecast to remain buried for the lifetime of the project being 25 years and is therefore considered stable, however this will be monitored throughout the lifetime of the assets. At the time of decommissioning any cable that has remained adequately buried for a period in excess of 25 years will be expected to remain buried for the foreseeable future and will be evidenced by a final RSBL assessment prior to decommissioning.

For the sections of the export cables buried above the RSBL level and forecast to become exposed over a 25 year period, the Developer states RSBL is overly conservative in these areas as they are close to a boundary between two morphology zones on a slope and that no remedial work is expected here. DTPH analysis confirms this statement.

The cable which has been buried deeper than the RSBL is forecast to remain buried for the lifetime of the assets and is therefore considered stable, however this will be monitored throughout the lifetime of the assets. At the time of decommissioning any cable that has remained adequately buried for a period in excess of 25 years will be expected to remain buried for the foreseeable future and will be evidenced by a final RSBL assessment prior to decommissioning.

Cable which has not been installed deeper than the RSBL will be reviewed by DTPH (as part of the overall cable monitoring) at each update of the Decommissioning Programme. If exposures occur during the life of the project and are not forecast to be naturally reburied by bedform movement, then DTPH will undertake remedial burial works. This additional lowering may result in an overall depth of lowering which ensures long-term stability of the cable and no future exposures.

**IMO Standard 2 and 3:**

4. Cable protection removal at crossing locations is undesirable owing to the risk of damaging the third party infrastructure that the cable protection is protecting, which includes other power cables and pipelines. Damaging third

party assets may lead to a major pollution incident and may involve divers in the significant and dangerous repair work operations.

**IMO Standard 4:**

5. The cost of decommissioning the export cable that is adequately buried, more than doubles the forecast cost of decommissioning the offshore transmission assets, and as such will not present value for money for the UK consumer who would pay these costs through the offshore transmission tender revenue stream.

An updated EIA will be produced at the Decommissioning Programme year 23 to review and confirm assumptions based on the environmental conditions at the time. DTPH will also enter into discussions with BEIS and The Crown Estate regarding long term monitoring and residual liability of any infrastructure left in situ at this time.

## 6.10 Lighting and marking

During the decommissioning of the Hornsea One Offshore Wind Farm, appropriate aviation and nautical marking and illumination will be applied.

In accordance with the Hornsea One consent under Section 36 of the Electricity Act 1989, DTPH is committed to exhibiting the appropriate marks and lights during the decommissioning of the project.

In relation to aviation safety, the shape, colour and character of the lighting will be compliant with the Air Navigation Order 2005, or as otherwise directed by the Civil Aviation Authority or the relevant legislation at the time.

In relation to navigational safety, lights and marks will be agreed with Trinity House, in consultation with the Maritime and Coastguard Agency prior to decommissioning to specify any obstruction marking that may be required during the removal operations. In the event that any obstruction is left on site, which may be considered to present a hazard to navigation, the necessary and specified marking will be provided.

# 7 Environmental Impact Assessment

The Developer for HOW01 completed an EIA in 2013. Table 7.1 summarises the impacts from the decommissioning phase.

**Table 7.1: Summary of Decommissioning Impact Assessment**

| Topic | Magnitude of Impact | Significance of effect including designed in measures |
|---|---|---|
| Marine Processes | Negligible | Negligible (Insignificant) |
| Nature Conservation[4] | Minor adverse | Negligible (Insignificant) |
| Benthic Subtidal and Intertidal Ecology | Negligible to low depending on the habitat. | Negligible to minor (insignificant) depending on the habitat |
| Fish and Shellfish Ecology | Negligible to Low | Negligible to minor |
| Ornithology | Negligible to Medium | Negligible to minor. |
| Marine Mammals | Negligible to Low | Negligible to minor (Insignificant). |
| Shipping and Navigation | Negligible to Low | Negligible to minor (Insignificant). |
| Commercial fisheries | Low | Negligible to minor. |
| Aviation, Military and Communications | Negligible | Minor (Insignificant). |
| Marine Archaeology and Ordnance | Negligible to Low | Minor (Insignificant). |
| Infrastructure and Other Users | Low and negligible | Minor and negligible (Insignificant) |
| Seascape and Visual Resources | Negligible to Large | Negligible to moderate (Insignificant) |

Consistent with the commitment to undertake reviews of the decommissioning provisions contained within this document, DTPH will review and update the existing EIA throughout the lifetime of the project. A final review will be undertaken towards the end of the installation when final details of the decommissioning measures are known in order to address the impacts at the time. At this point a decision will be made as to whether a more detailed assessment is required. Key criteria that will inform the decision will include:

- An updated review, identification and assessment of potential impacts on both the physical, biological and human environment (this will include a comparison of the environmental impact of the decommissioning scopes with and without full cable removal). Planned surveys in and around the transmission assets which could inform this process could include:

[4] Not including ornithology

  - Geophysical surveys side scan sonar ("**SSS**") and Multibeam Echo Sounder ("**MBES**"));
  - Geotechnical surveys;
  - Benthic grab/camera surveys;
  - Ornithological surveys;
  - Marine mammal monitoring; and
  - Fish surveys.
- An updated review, identification and assessment of activities of other legitimate users of the sea with the potential to be affected by decommissioning. This is because the nature and/or intensity of human activities taking place on/around the transmission assets, such as navigation in and out of the Mersey Estuary, could have changed over the lifetime of the project.
- An updated review, identification and assessment of the potential impacts of decommissioning on the local community, e.g. potential socio-economic impacts.
- An updated review, identification and assessment of potential impacts on historic environment interests, in particular marine archaeological features.

If upon these additional reviews it is concluded that gaps exist in any of the topics above, a specific EIA covering the decommissioning process will be prepared in consultation with the relevant authorities. The EIA will list measures to avoid or otherwise reduce or remedy adverse impacts where possible.

## 8 Consultation with Key Stakeholders and General Public

DTPH regards open and effective communication and consultation as an essential element of owning and operating the asset. Carrying on with the good work and relationships established by the Developer during the development and construction phase, we will ensure that this is applied during the operational life of the asset through to decommissioning.

DTPH proposes to seek the advice and opinions on the draft Decommissioning Programme from a range of stakeholders including but not limited to:

- The Crown Estate;
- BEIS;
- Local and national government including; East Lindsay District Council; West Lindsay District Council; North East Lincolnshire District Council and North Lincolnshire Council;
- Port Authorities including Associated British Ports ("**ABP**")
- UK Hydrographic Office;
- Ministry of Defence (Donna Nook exercise area)
- Maritime and Coast Guard Agency;
- Marine and Fisheries Agency;
- Centre for Environment;
- Health and Safety Executive ("**HSE**")
- Fisheries and Aquaculture Science;
- North Eastern Inshore Fisheries and Conservation Authority;
- Marine Management Organisation;

- Local businesses;
- National Grid Electricity System Operator ("**NGESO**")
- NGET;
- British Gas;
- National Federation of Fishermen's Organisation;
- Local land and marine community;
- Inshore fisheries and conservation Authority;
- The Chamber of Shipping;
- Joint Nature Conservation Committee;
- National British Marine Aggregate Producers Association ("**BMAPA**");
- Historic England;
- The Royal Yachting Associations; and
- Trinity House.

All advice and opinions received through the consultation will be reviewed and where applicable incorporated into the Draft Decommissioning Programme.

DTPH will apply for a separate decommissioning marine licence from Marine Management Organisation at the time of decommissioning.

In accordance with the relevant clauses under Section 36 of the Energy Act 1989 and relevant conditions of the Marine Licence, DTPH will issue timely and efficient Notice to Mariners and other navigational warnings of the position and nature of the decommissioning activities that will be taking place. Efforts will be made to ensure that this information reaches mariners of the shipping and fishing industry as well as recreational mariners. The UK Hydrographic Office will be notified as appropriate on the progress and completion of works.

## 9 Costs and Financial Security

Cost and financial security information is commercially confidential and therefore not included in this Decommissioning Programme. Cost and financial security information is provided separately to BEIS.

## 10 Proposed Decommissioning Schedule

It is proposed that decommissioning commences after year 25, coinciding with the end of life of the asset based on its design life and the mid-life of The Crown Estate lease.

As no offshore windfarm has been decommissioned to date worldwide, it is difficult to anticipate the operational challenges, costs and precise timings of works. Once other farms start to be decommissioned, it will provide valuable information to DTPH on timings, costs and operational challenges to be faced. Currently we anticipate Hornsea One offshore wind farm will be decommissioned between 2045 and 2049 and will take 24 months to complete.

In line with project management guidelines and DTPH experience, we acknowledge that the most important step in the decommissioning process is advanced planning and having an option of decommissioning methods. Applying the principles mentioned in earlier parts of this document, DTPH will carry out regular reviews throughout the project lifecycle to take account of:

- Information gathered during the course of construction and operation;
- Changes in market conditions, international standards, the regulatory regime;

- Knowledge of environmental impacts, including any sediment shift since construction, or new species entering the area;
- New technology assessed against developmental status (e.g. prototype or proven), efficiency both in terms of time and cost and health and safety and environmental impacts;
- New methods assessed against developmental status (e.g. prototype or proven), efficiency both in terms of time and cost and heath safety and environmental impacts;
- Any relevant changes in nearby infrastructure or navigational routes; and
- The latest cost estimates and the robustness of the financial security arrangements.

DTPH intends to undertake internal reviews of the Decommissioning Programme throughout the life of the project with an internal review of the Decommissioning Programme before the commencement of the formal review in year 12 to ensure the Decommissioning Programme and financial security estimates are up to date. Formal review exercises will be undertaken with BEIS at the following times:

- 12-18 month before the first security provision is due; and
- 23 years following commencement of the transmission licence.

During the formal reviews DTPH will undertake a review of any items proposed to be left in-situ following decommissioning.

In addition a formal review will be undertaken following any major work or when a material change has occurred with the relevant authorities notified.

The final review will provide an opportunity to scrutinise the detail of the decommissioning provisions in consultation with BEIS and key stakeholders (including Marine Management Organisation), ensuring the impacts of the decommissioning works have been adequately assessed and the schedule of works and the costs associated are fully understood and agreed. This final review will include the latest bathymetric survey data to confirm the cable burial depths against the RSBL to demonstrate that any cable intended to be left in-situ is adequately buried. At this stage consideration will also be given as to whether a revised EIA and Appropriate Assessment are deemed necessary.

## 11 Project Management and Verification

The final Decommissioning Programme will provide information on how DTPH will manage the implementation of the decommissioning works and also provide assurance to the BEIS concerning progress and compliance. The final review of this document and the proposed schedule of decommissioning works will be undertaken towards the end of the operational lifetime (depending on repowering taking place or not). This review will produce a Decommissioning Programme of Works, including current knowledge of decommissioning methods, measures and timing. The Decommissioning Programme will be made available to the public for comment.

The project management of the decommissioning works will be undertaken with the right level of rigor expected of such a project. DTPH envisages a single main contractor for the decommissioning work and will also appoint an experienced and highly qualified project management team to ensure the decommissioning work proceeds on schedule and in accordance with the requirements of the Decommissioning Programme.

A Decommissioning Report will be issued for the approval from the appropriate regulatory authorities after the decommissioning phase is finished, in compliance with the BEIS Guidance, summarising how the Programme has been carried out.

As a minimum, this report will include:

- Confirmation that the approved Decommissioning Programme has been adhered to during the decommissioning works; otherwise, an explanation of any major variances from the programme; this includes information of actual costs of the works and an explanation of any major variances from the forecast costs;
- Information on the outcome of the decommissioning phase, including sea-bed clearance;
- Confirmation that relevant authorities have been notified, in case any elements of the development remain protruding from the seabed, of existence of such remains; and
- Information of any appropriate aids to navigation have been installed, where required, to overcome risks posed by such remains.

Upon completion, not more than four months after the decommissioning works, the report will be provided to BEIS.

## 12 Sea-bed Clearance

In accordance with the Polluter Pays Principle ("**PPP**"), DTPH proposes to clear the seabed in accordance with the provisions made in this Decommissioning Programme and to collect and provide evidence of this.

Following the completion of decommissioning works, surveys will be carried out to show that the site has been cleared. These surveys will enable identification and subsequent recovery of any debris located on the sea-bed which may have arisen from activities related to the project and which may pose a risk to navigation, other users of the sea or the marine environment. It is currently intended that side scan sonar will be used to identify debris, with an ROV deployed to investigate and recover any potential identified.

The area to be covered will be determined prior to decommissioning but DTPH is aware of the guidance for oil and gas installations which specifies a 500m radius around any installation.

References will be made to 'Archaeological No Build Areas' in order that these are not inadvertently cleared in the process of removing any debris. Analysis of the survey data will also ensure that items for removal and disposal relate only to the project. The appropriate competent authority will be approached regarding the identification of other anomalies that may be of archaeological interest.

It is important that this process of collecting and presenting evidence that the site is cleared is independent. DTPH proposes that an independent survey company complete the surveys and that they report in parallel to both DTPH and BEIS.

## 13 Restoration of the Site

Following the successful completion of the decommissioning works, the DTPH site will be restored, as far as reasonably practicable, to the condition it was in pre-construction.

The key restoration works will include the following:

- Securing and adequately covering all cut foundations; and
- Ensuring that cable ends are adequately buried.

Active restoration relying on intervention with equipment is not proposed as it is considered that such works present unnecessary and unacceptable risk to personnel. For the export and interlink cables, it should be noted that the currently envisaged option is to leave the cable buried in the seabed. Allowing the seabed to 'self-settle' is considered sufficient and in proportion to the limited environmental impact of the proposed decommissioning. Should post decommissioning surveys indicate that previously buried cables have become exposed such that they pose a navigational risk, the exposed parts of the cable would be cut away and removed from the seabed.

## 14 Post-decommissioning Monitoring, Maintenance and Management of the Site

DTPH proposes to use an independent contractor to carry out surveys post decommissioning. The scope will include identification and mitigation of any unexpected risks to navigation and other users of the sea caused by materials left on the seabed.

DTPH proposes to undertake magnetometer and geophysical surveys at the completion of decommissioning, and subsequently in Year 1 and 2 post-decommissioning with a scope to survey in Year 4 and 6 based on findings from the previous surveys. The area covered by the magnetometer and geophysical surveys will be determined prior to decommissioning, but is expected to be in the order of 500 metres around the offshore platforms and 25 metres either side of each export cable route. We are also aware of oil and gas installation guidance which specifies a 500 metres radius around any installation. The survey interpretation reports will be provided to BEIS.

Should these surveys identify any residual elements from the project protruding above the sea bed, DTPH will ensure that notification is given to the UK Hydrographic Office so that suitable notation of a potential anchoring hazard can be marked on relevant charts and mariners informed accordingly. Appropriate measures will then be taken to remove or re-bury in order to avoid posing a risk to mariners potentially using the area. The removal or reburial technique and machinery will be decided depending on the type, size and location of the elements, but will more likely mirror that used for the initial decommissioning works.

## 15 Supporting Studies

Any supporting studies or investigations which are undertaken in support of future Decommissioning Programmes will be included as annexes to the Decommissioning Programme.

The following documents inform and support the decommissioning provisions contained in this document:

- Hornsea One Offshore Wind Farm Decommissioning Programme;
- Decommissioning of offshore renewable installations under the Energy Act 2004: Guidance notes for the industry, BEIS, March 2019 (revised);
- Marine and Coastal Access Act 2009;
- Deemed marine licence granted as part of the DCO awarded 14 December 2014.
- Section 36 Licence;
- DCO granted December 2014;and
- Hornsea One Offshore Wind Farm Environmental Statement July 2013.