Diamond Transmission Partners Galloper Ltd Decommissioning Programme

Document History

Issue	Date	Summary of Changes / Reasons	Author(s)	Approved By (Inc. Job Title)
D.v1	08/06/18	1st Draft	T Gwatinyanya/ J Matthews	G Thornton
D.v2	08/03/19	2nd Draft for submission to BEIS	T Gwatinyanya/ J Matthews	G Thornton
D.v3	01/09/19	Updated to refer to BEIS March 2019 guidance. Other minor grammatical changes.	T Gwatinyanya/ J Matthews	G Thornton
v4	14/08/19	Sections 8 and 10 updated.	T Gwatinyanya	G Thornton

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1 Introduction

This document presents the proposed OFTO decommissioning programme for the Diamond Transmission Partners Galloper Limited ("**DTPG**") assets and is based upon previous decommissioning programmes submitted by Diamond Transmission Partners and the decommissioning programme[1] proposed by Galloper Wind Farm Limited ("**GWFL**"). The decommissioning programme proposed by DTPG is informed and supported by the Environmental Statement ("**ES**") for the project which presents the findings of the Environmental Impact Assessment ("**EIA**") process, document 2.4.11 Environmental Statement October 2011 Document Reference – 5.2.1.

The project is a 336MW wind farm developed by GWFL.

The Galloper project 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: Galloper 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: SI 2013/1203 (amended: SI 2015/1460)	Permission to operate onshore and offshore generating stations with a generating capacity above 50MW	Secretary of State for BEIS/ PINS
Marine Management Organisation ("**MMO**")	Marine and Coastal Access Act 2009: Part 4 – Marine Licensing	Generator Assets Marine Licence (DCO/2013/00003) awarded on 30th June 2016 (construction only). OFTO Assets Marine Licence (L/2018/00049/1) awarded on 29th January 2018 (construction only).	MMO

In accordance with Section 105(02) of the Energy Act 2004, GWFL was required to prepare a draft decommissioning programme for the Galloper Offshore Wind Farm ("**GWF**") 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 draft decommissioning programme outlines the methods for decommissioning, and is consistent with the relevant requirements outlined in BEIS's guidance note on decommissioning of offshore renewable energy installations.

GWFL's decommissioning plan has been submitted to BEIS and DTPG has requested evidence of approval. GWFL in its Decommissioning Programme document states that the OFTO assets will be decommissioned by the appointed OFTO. This will remove any obligations it has under the licence and pass this onto the OFTO.

If possible the generator assets will be decommissioned at the same time as the DTPG assets.

[1] 2.7.3.1 GWF Decommissioning Programme_V5, Doc. no. 002082438-05, 11 February 2016

The 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.

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

Stage 1: DTPG discusses draft decommissioning programme with BEIS (including proposed financial security measures), developer and other consultation parties including any additional EIA activities;

Stage 2: DTPG formal submission of the decommissioning programme and approval under the Energy Act;

Stage 3: Reviews and modifications of decommissioning programme (and any financial security);

Stage 4: Responsible person ensures decommissioning is carried out in accordance with the programme; and

Stage 5: Responsible person adopts decommissioning monitoring, maintenance and management as specified in the programme.

2 Executive Summary

GWFL obtained consents and licences necessary for the construction of the wind farm in May 2013. At the end of the operational life 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, GWFL submitted its decommissioning plan for the Galloper project to BEIS (formerly DECC). DTPG has requested evidence of approval by BEIS of the GWFL decommissioning programme.

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 DTPG assets. DTPG 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 for the offshore components of the DTPG assets can be summarised as:

- complete removal of the offshore substation;
- offshore substation foundations cut off below seabed and removed;
- offshore export cables cut, weighted down and left in situ; and
- sections of the export cables which are not buried or will not remain buried post decommissioning will be cut and lifted off the sea-bed for recycling.

In accordance with the Polluter Pays Principle, DTPG in conjunction with GWFL proposes to clear the seabed in accordance with the provisions made in this decommissioning plan

[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.

and in the Marine and Coastal Access Act 2009 (Marine Licence), and to collect and provide evidence to reflect this.

DTPG in conjunction with GWFL 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 are adequately buried.

DTPG in conjunction with GWFL proposes that, following decommissioning, a full geophysical survey (swath, side scan sonar and magnetometer) is carried out. The survey will be commissioned by DTPG and carried out by an independent survey contractor and all results issued to BEIS and DTPG in parallel for review and comment. In addition further geophysical surveys will be undertaken 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 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, at Year 18, 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, DTPG 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 wind farm owner, and the schedule of works will be determined in agreement with the statutory authorities.

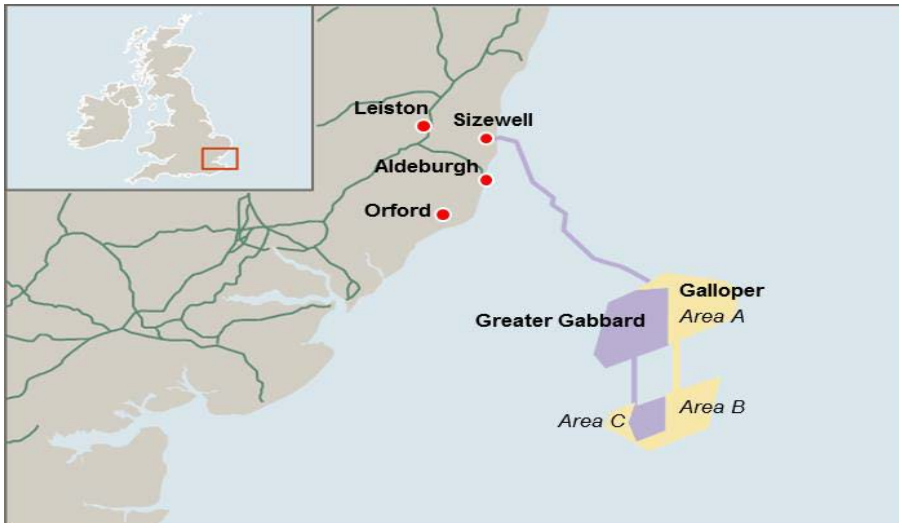
3 Background Information

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

3.1 Location

The project is located in the Outer Thames Estuary approximately 27km off the Essex and Suffolk coasts. The landfall is located at Leiston, Sizewell. In total, the offshore site occupies an area of 180km².

Figure 3.1: Galloper Offshore Wind Farm



3.2 Design and Background

GWF will have an installed capacity of 336MW (a Transmission Entry Capacity of 348MW) fed from 56 turbines rated at 6MW each. Power generated by the turbines will be transmitted through a network of inter array cables.

The array cables will transmit power to an offshore substation.

Using two export cables utilising a combination of subsea and land cable with an approximate length of 46km (45km offshore and 1km onshore), power will be transmitted to an onshore substation at Leiston called Leiston Substation for connection onto the National Grid, see Figure 3.1.

DTPG will operate and maintain the Offshore Transmission Assets associated with the GWF.

3.3 As Built Information

The Construction Design and Management ("**CDM**") Regulations 2015 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. GWFL is responsible at the time of purchase for providing the purchaser with this information. DTPG will expect that such information is supplied and will include as a minimum:

i. as-built position for all structures;

ii. details of the construction of all structures; and

iii. 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 live status of 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 Seabed Features.

Geology

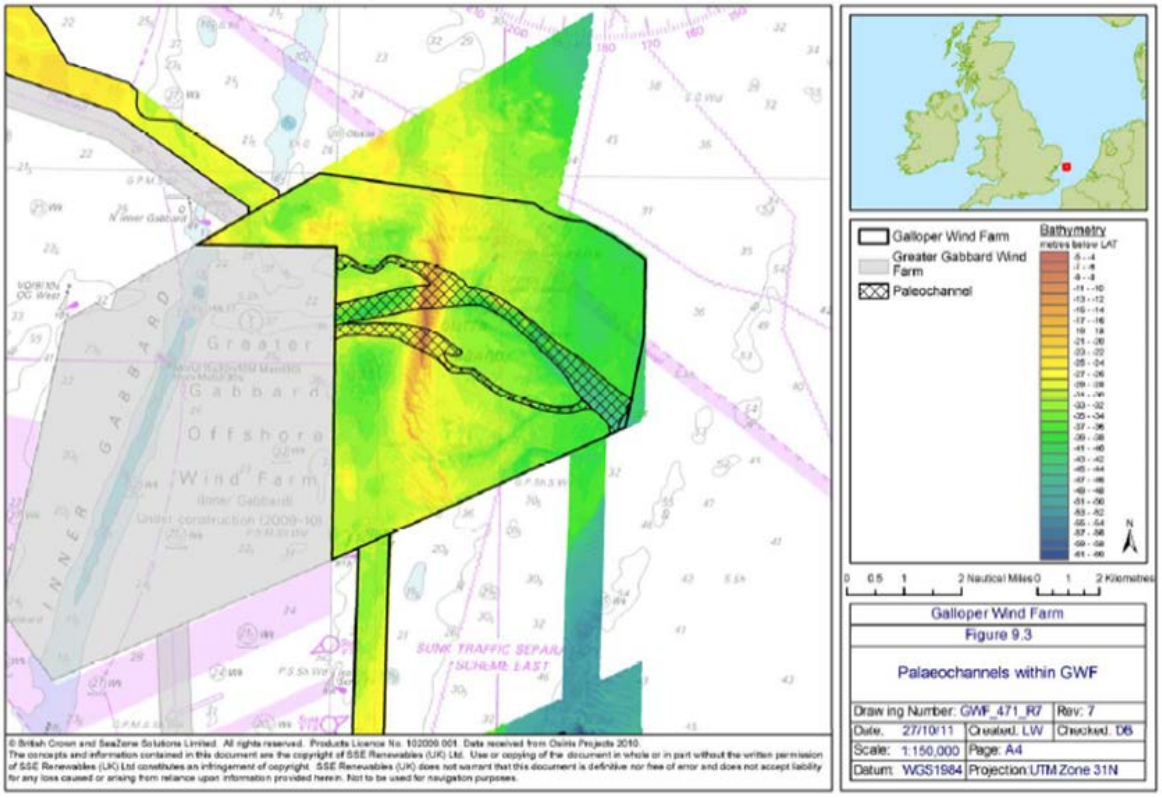
The main geological formation across the wind farm site and the export cable route corridor is the Eocene London Clay Formation which comprises and overlies the Harwich Member throughout the proposed wind farm site (Osiris, 2010a and 2010b).

The London Clay is composed of firm to stiff silty clay and clayey and sandy silt with subordinate sand. The London Clay may be exposed at the seabed, close to the seabed and overlain by a thin veneer of sands and gravels, or covered by relatively thick Crag (near the coast), Quaternary channel fills or sand units (banks or sand wave fields).

Relatively thick (17m to 33m) sequences of Pleistocene/Pliocene Crag are exposed at the seabed along the inshore portion of the export cable route corridor. Crag is composed of shelly or silty glauconitic sand (Cameron et al., 1992). A cross the proposed wind farm site, Crag is absent apart from several isolated outliers to the north and north-east of Outer Gabbard sand bank.

Osiris (2010a) identified several palaeochannels cut into the London Clay within Area A, which are likely to be infilled with sediments of Quaternary or Holocene age. The channels were originally valleys forming part of a much wider Pleistocene river drainage system across the southern North Sea. The infilled palaeochannels are represented at the seabed as elongate depressions in the bathymetry (Figure 3.2).

Figure 3.2: Palaeochannels within Wind Farm



A filled palaeochannel is located beneath the Outer Gabbard sand bank and at the seabed to the west and east of the bank. It is 750 metres to 850 metres wide and is oriented west south-west to east north-east on the western side of the bank (Figure 3.2). The channel is buried beneath the bank before emerging on its eastern side in a north-west to south-east orientation towards the eastern edge of the wind farm site. The channel is partially filled with up to 16 metres of clayey sandy gravels and sandy gravelly clays (Cameron et al., 1992). Beneath Outer Gabbard sand bank the cumulative thickness of sediment is approximately 33 metres comprised of 13 metres to 14 metres of channel fill overlain by 19 metres to 20 metres of sand.

Along the inshore portions of the export cable route corridor, Osiris (2011b) recognised a series of undifferentiated deposits named the Upper Bedded Deposits. They are composed of silt with some gravelly sand and are variable in thickness up to 16 metres. Other sequences of interbedded gravels, sands, silts and clays are also recorded along the export cable route corridor up to 17 metres thick.

Bathymetry and Seabed Features

Over most of the proposed wind farm site the seabed attains average elevations of between 20 metres below ("**mb**") and 40mb Lowest Astronomical Tide ("**LAT**"), with minimum and maximum depths of 5.5 metres (Outer Gabbard sand bank) and 60mb LAT respectively (Figures 3.3 and 3.4). Seabed elevations are characterised as being highly variable across Area A. The bathymetry of the export cable route corridor ranges from 4mb LAT at the inshore limit to 31mb LAT towards the offshore end.

Figure 3.3: Detailed Bathymetry – Export Cable Corridor

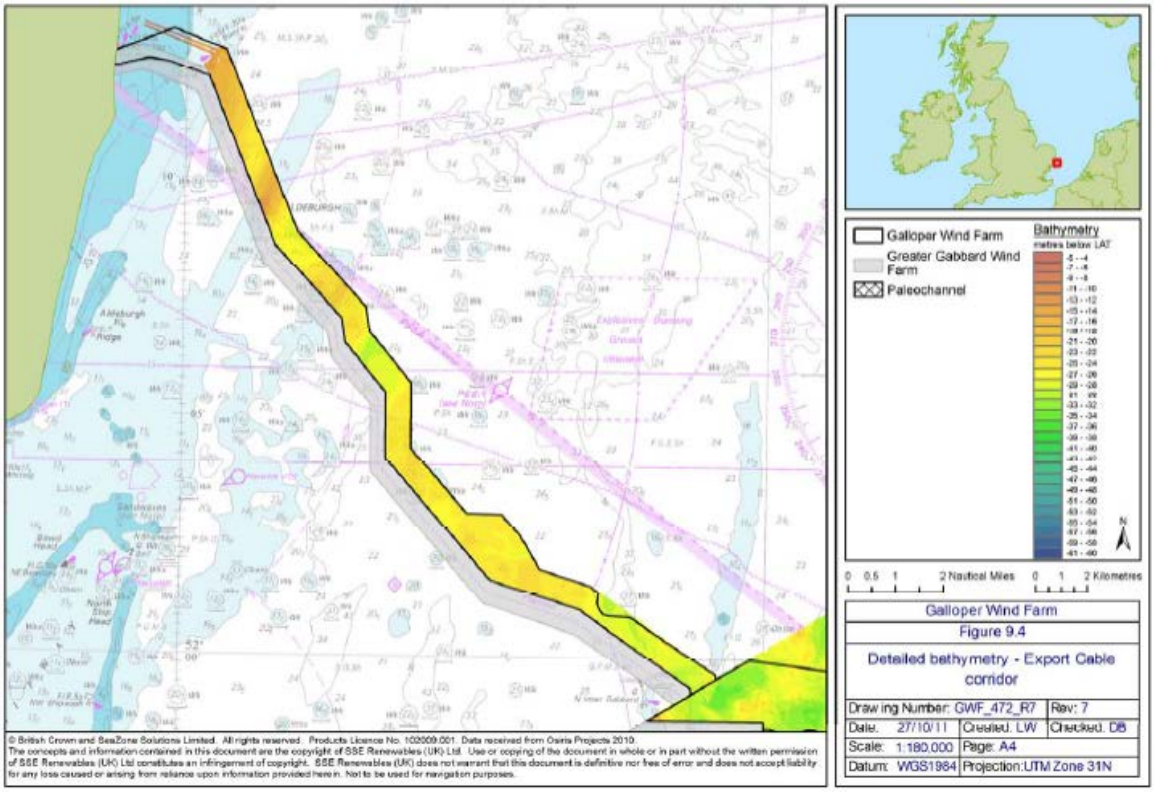
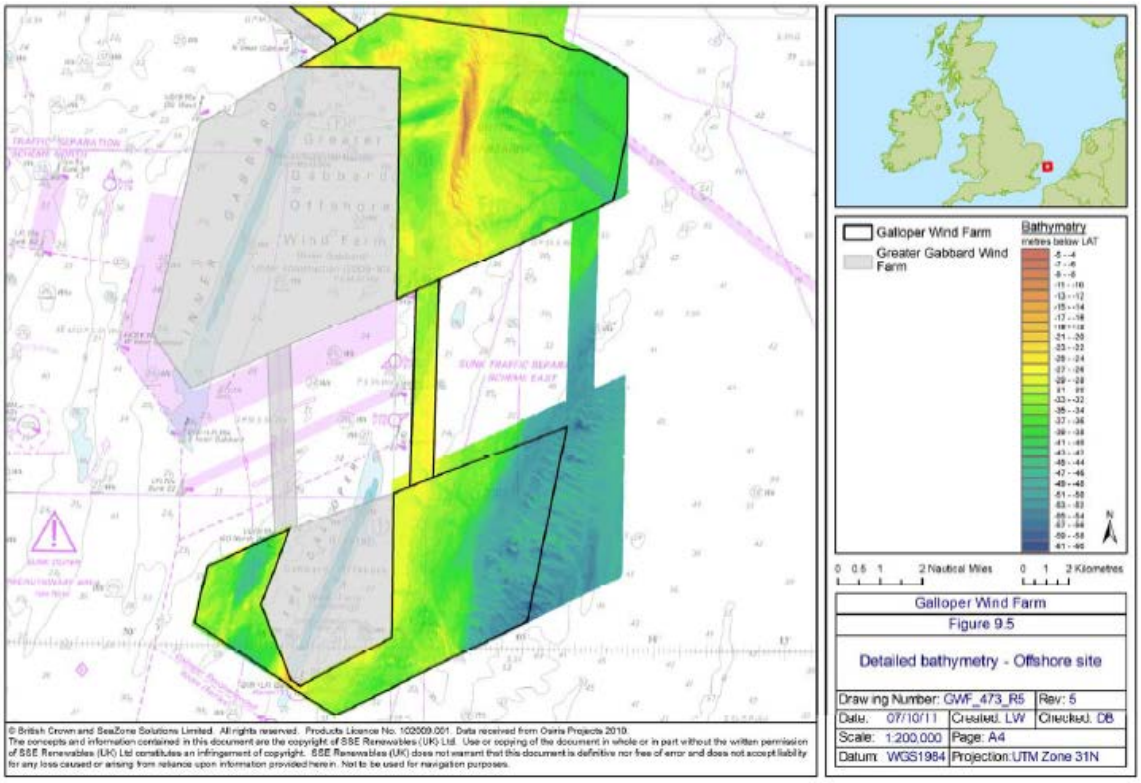


Figure 3.4: Detailed Bathymetry – Offshore Site



The bathymetry of the proposed wind farm site is dominated by the north northeast to south south-west oriented Outer Gabbard sand bank. The crest of the bank attains an elevation of 5.5mb LAT rising rapidly from the seabed (Figure 3.4), though remaining

subtidal at low water. To the east of Outer Gabbard sand bank the surface of the north-west / south-east oriented palaeochannel reaches depths of approximately 47mb LAT.

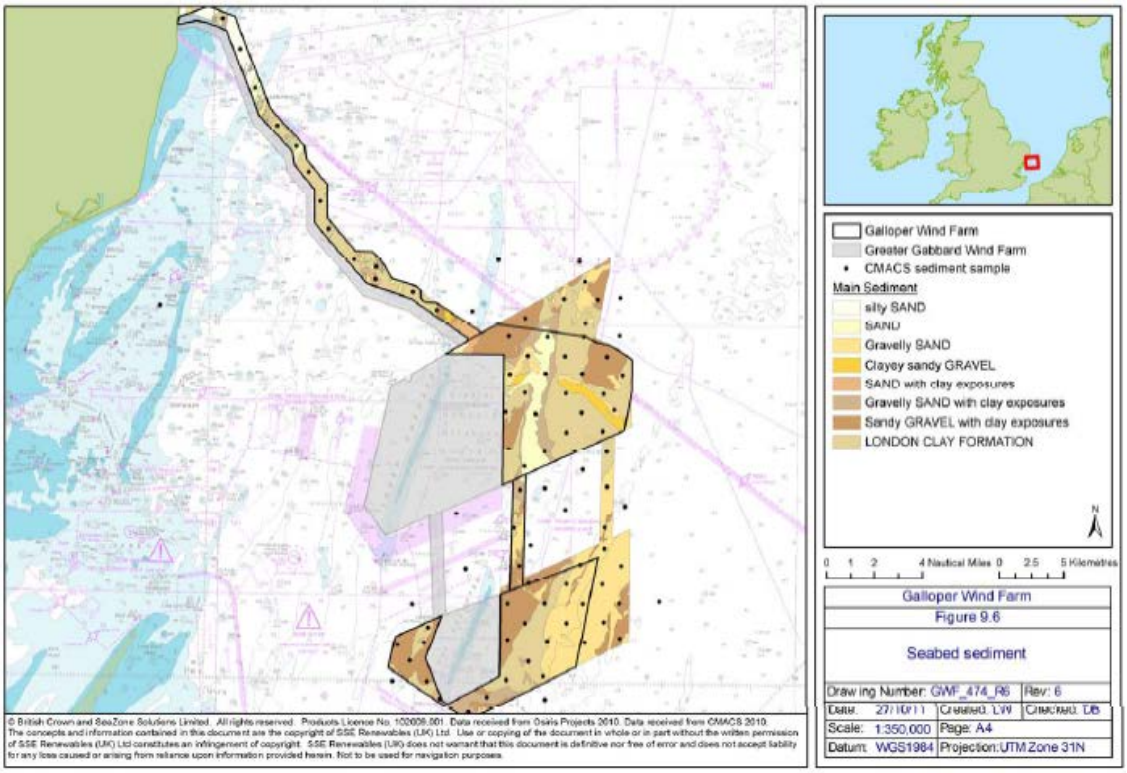
The deepest part of the proposed wind farm site is in the south-east where water depths reach approximately 60mb LAT in a broad north-east / south-west oriented depression (Figure 3.4). The channel is occupied by bedforms with crests oriented normal to the channel axis.

For the export cable corridor, water depths range from 4mb to 31mb LAT and generally deepen gradually out from shore with a uniform gradient out to around 3km. At this point seabed levels fall erratically to depths greater than 15mb LAT across a series of pronounced narrow north north-east to southsouth-west oriented ridges and associated troughs. This trend continues to approximately 11km from shore at which point water depths of approximately 27mb LAT are attained. In this region the corridor passes across an irregular seabed characterised with large sediment bedforms. These irregular features are oriented roughly west north-west to east south-east and reach up to 5 metre high. Only one of these features crosses the cable route centre line.

Approximately 15km from shore the seabed elevation is 25mb LAT, at which point the corridor enters an area of numerous sand wave bedforms. These features are oriented approximately east to west and attain an elevation of 2 metres from the surrounding seabed. Seabed levels shallow from 25mb LAT to 23mb LAT across this area of sand waves (Osiris, 2010b). From here the seabed continues to undulate in depth between 23 metres and 30 metres. Further sand wave features are encountered around 27km to 28km from shore and again around 34km to 35km from shore. The latter features (sand waves and associated megaripples) attain an elevation of up to 7 metres from the surrounding seabed (away from the route centre line) and gradually become more numerous towards at the eastern end of the corridor (Osiris, 2010b).

Within the export cable corridor, seabed sediments are generally characterised by sands and gravels, with patchy sandy silts (Osiris, 2010b) wand occasional outcrops of the underlying Pleistocene Crag or London Clay (Figure 3.5).

Figure 3.5: Seabed Sediment



3.4.2 MetOcean and Coastal Processes

The wave climate at the proposed wind farm is characterised by a combination of locally-generated wind waves and swells waves that move into the area from a remote source, typically the southern North Sea. The longest fetches for generation of swell waves are towards the north and north-east.

The wave roses formed from data collected between 2004 and March 2005 shows that most waves approach the site from the north-east with a smaller proportion from the south-west. The largest waves approach from the north, although they rarely exceed 4m in height. The most common wave heights are between 0.5 metres and 1.5 metres approaching along the dominant northeast / south-west axis. Wave periods are small, with most between 4 and 5.5 seconds. The highest waves generally have the longest periods.

The mean high water spring and mean low water spring elevations at Felixstowe, from Admiralty Tide Tables (2011) are 3.8 metres Chart Datum ("**CD**") and 0.4 metres CD, respectively. The mean spring tide range is therefore 3.4 metres. With seabed elevations between -5.5m CD and -60m CD, the maximum water depths under normal spring tide conditions are between approximately 9.5 metres and 64 metres.

Tidal current velocities across the proposed wind farm site were measured using the six instruments deployed for the GWF. Small variations in velocity occurred across the site related to current interaction with bathymetry. The maximum surface current speeds of 2.1m/s were recorded near Galloper Bank, whilst the minimum current recorded at each site was less than 0.01m/s.

3.4.3 Biological Environment: Subtidal and Intertidal Benthic Ecology

Benthic Fauna

The benthic habitats of the southern North Sea are defined by the substrata of the seabed (Jones et al, 2004). Mobile sand dominated habitats are generally considered to be species poor and are characterised by robust species such as annelid worms and fast burrowing bivalves (Barne et al, 1998, Jones et al, 2004). Epibenthic flora and fauna normally occur on mixed substrata with significant coarse components, where a range of microhabitats allow colonisation by a wide array of species (Jones et al, 2004).

The epifaunal survey results indicate that echinoderms (particularly brittle star species) were the dominant group around the wind farm site, cable route corridor and control area, followed by crustacea (primarily dominated by shrimp). The dominance of echinoderms was most pronounced along the cable route (95% of all species). It is also worth noting that the highest numbers of epifauna individuals on the cable route survey were recorded at the site closest to the shore.

The only benthic species of conservation concern identified within the wind farm area is the Ross worm S. spinulosa. Where the species forms reefs, these are an OSPAR habitat which is in decline in the Greater North Sea area and is therefore protected under Annex V of the OPSPAR Convention. This species is also included in the UK BAP and is a sub-feature of the Habitats Directive Annex I feature 'reefs'.

Fish and Shellfish Ecology

A total of 51 separate fish species were identified from both the otter and beam trawls during the spring and autumn survey, of which nine species were elasmobranchs. Approximately 45 separate species were recorded from within the wind farm site, 40 from the control and 30 from the export cable corridor. The most abundant species caught during the surveys were whiting, cod, lesser spotted dogfish, dab, bib, plaice, thornback ray and starry smoothound.

The most abundant shellfish species found during the otter trawl surveys were velvet crab Necora puber, squid Loligo spp., European lobster and Edible crab.

The baseline characterisation has identified that the Outer Thames Estuary and GWF are potentially important for a number of commercially important species. The GWF overlaps or is in close proximity to a number of finfish species spawning grounds including; herring, cod, whiting, sprat, sandeel, sole, lemon sole and plaice. The wider Thames estuary also supports populations of elasmobranchs including thornback ray which are of national significance. A number of migratory fish species such as salmon, sea-trout, eel, shad, lamprey and smelt may also pass through the GWF site, although only twaite shad were recorded during the site specific surveys. Consultation responses have indicated that key sensitive species are considered to be herring and sole and in particular disturbance to these species during key spawning periods.

3.4.4 Marine Mammals

Harbour porpoise were the most frequently encountered marine mammal within the wind farm study area. Peaks in harbour porpoise activity across the site appear to occur between January and May. Given the low number of sightings, the value of interpreting quantitative or semi-quantitative trends in inter- and intra-annual variation is limited. Most marine mammal sightings were brief encounters with individual animals. For such low numbers of sightings it is difficult to reveal patterns in behavioural activity.

Despite the infrequent and transient sightings of marine mammals within the wind farm development area throughout the year, small groups of animals, in particular harbour porpoise, could be present in the vicinity of the wind farm during construction, operation and decommissioning. This presents a potential risk for the occurrence of an injury and/or disturbance offence under Regulation 39 1(A) of the HR and OMR.

3.4.5 Offshore Ornithology

The abundance and distribution of seabirds in and around the wind farm was characterised through regular site-specific boat-based surveys and regional aerial surveys. Evidence from these surveys combined with scientific literature and observations at other regional wind farms indicate that the southern North Sea is an important area for seabirds. The avifauna of the shallow sea areas of the Outer Thames Estuary and along the east coast of the UK is typically comprised of a mixture of 'true seabirds' (for example: gannet, gulls and auk species), other species that spend part of their life cycle at sea (for example, divers and seaducks) and a wide range of species, such as waterfowl, waders and terrestrial passerines on seasonal migration, both to and from the UK and Continental Europe. The offshore ornithological assemblage present within and adjacent to the wind farm site suggests that these regional waters are used at different times by seabirds (i) overwintering in the area; (ii) foraging from nearby breeding coastal colonies; and (iii) on migration during post-breeding dispersal and pre-breeding return.

During decommissioning, impacts in the offshore environment could be associated with direct disturbance (e.g. increase in vessel activity, machinery operation, human presence) or indirect disturbance effects through changes to prey supply and habitats. Those species identified in the ES as potentially being impacted (minor adverse to moderate effects) were Red-throated diver; Gannet; Fulmar; Great skua; Common gull; Lesser black-backed gull; Herring gull; Great blackbacked gull; Kittiwake; Common guillemot; and Razorbill.

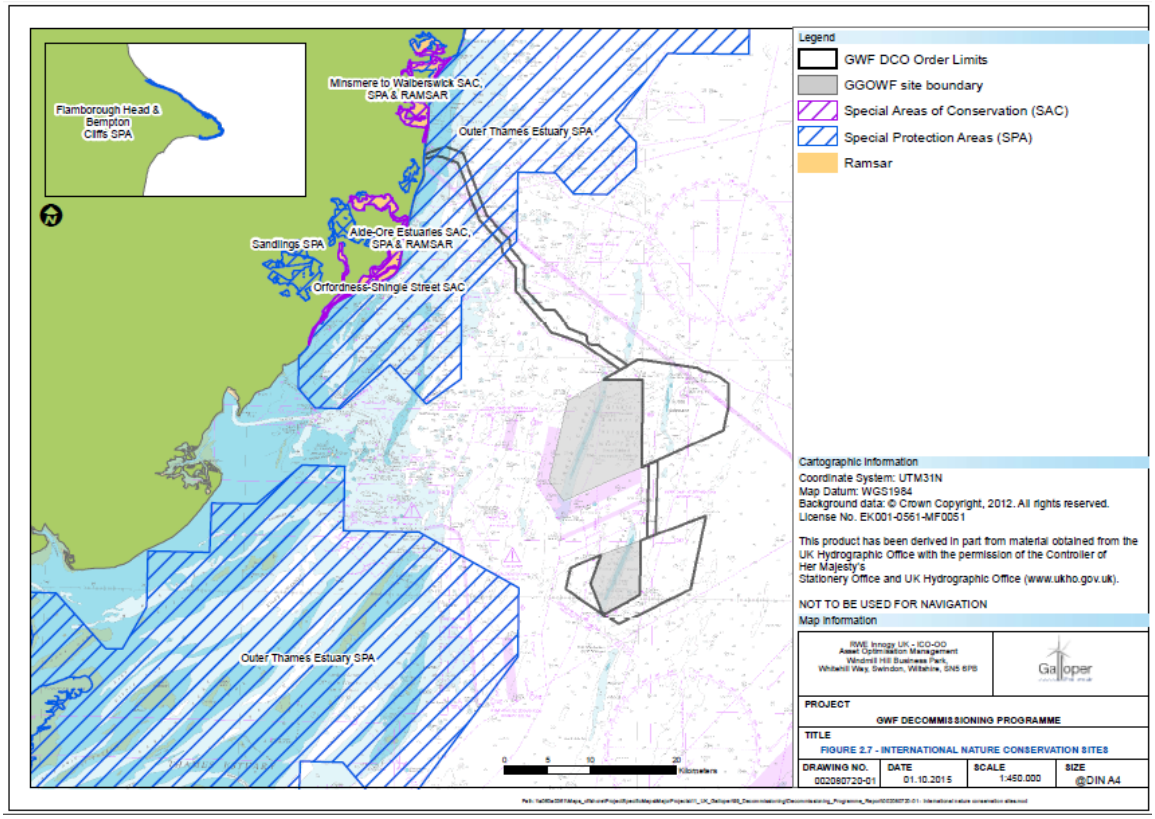
Mitigation identified in the ES was through the adoption of best practice through an Environmental Management and Monitoring Plan ("**EMMP**") to minimise disturbance impacts on birds and their prey.

3.4.6 International nature conservation sites

The Outer Thames Estuary and surrounding area is known to be important for both breeding and overwintering shore and seabirds and large areas of the coast are designated as SPA and Ramsar sites. The export cable route for the GWF passes

through The Outer Thames Estuary SPA and this site supports 38% of the GB population of red-throated diver. The cliffs also support a large number of following species during the breading period: Kittiwake (Rissa tridactyla), Common guillemot (Uria aalge), Razorbill (Alca torda), Puffin (Fratercula arctica), Herring gull (Larus argentatus) and Gannet. Internationally protected sites in the vicinity of GWF are shown in Figure 3.6.

Figure 3.6: International Nature Conservation Sites



3.4.7 Offshore Anthropogenic Environment

Shipping Activity

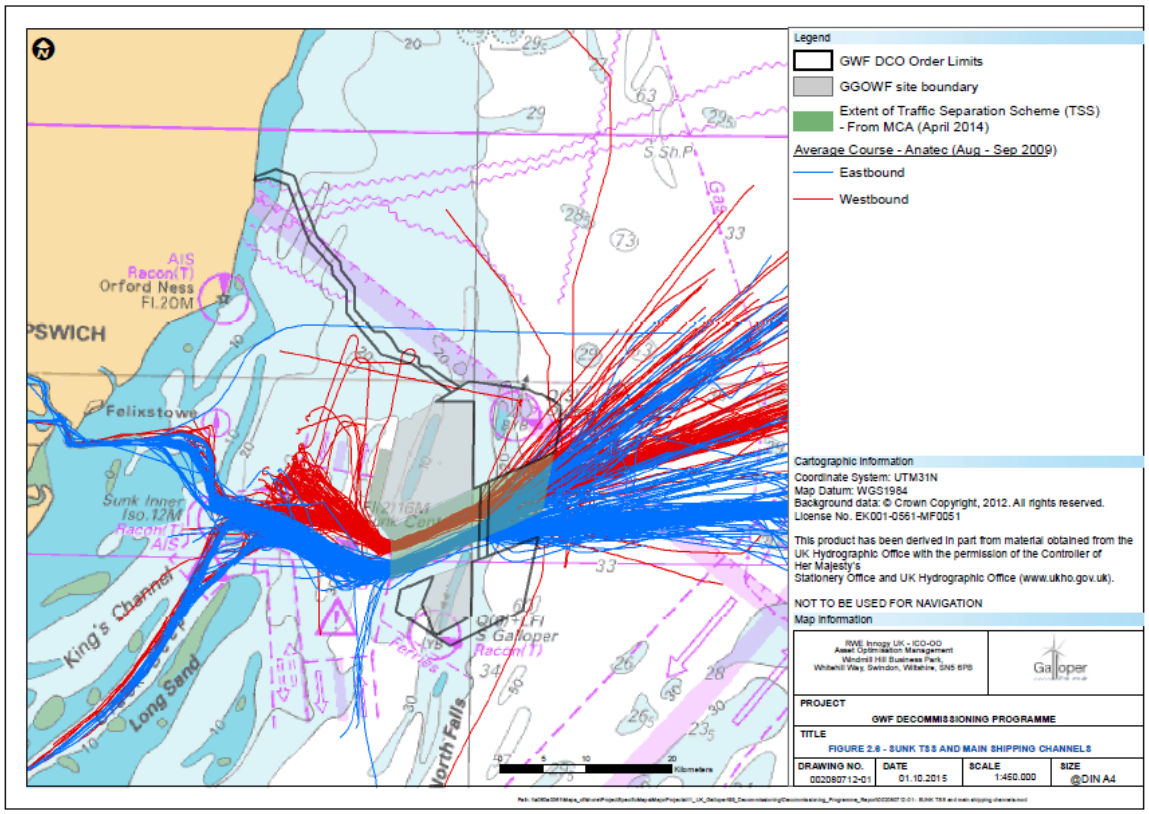
The main navigational feature in the vicinity of the wind farm site is the Sunk Traffic Separation Scheme ("**TSS**") which is located between the northern and southern arrays of GWF and Greater Gabbard wind farm (see Figure 3.7) to the port operations at Harwich Haven Authority and Port of London Authority. The main destinations of the vessels recorded in a survey conducted for the ES were Harwich Haven, the Netherlands and ports in the Thames and Medway. The Sunk TSS is in operation and will tend to move shipping away from the wind farm arrays and offshore substation. Further information on shipping and navigation activities in the vicinity of the wind farm can be found in the ES Chapter 16.

Commercial Fisheries

The activity within the proposed wind farm site comprises mainly trawling by non-UK vessels (in particular Belgian and Dutch beam trawling) which target the sole and plaice fishery. More than 50 Belgian beam trawlers and over 15 Dutch vessels have been identified as using the site. Static potting and long lining with significant netting activity is also recorded around the offshore sand bank known as the 'Outer Gabbard' located inside the wind farm site and also around a cluster of wrecks in the southern part of the site. Potting and netting for sole and bass generally take place from spring to autumn with lining for species such as cod taking place during winter and spring. The main activities occurring along the export cable corridor relate to drift netting for species such as sole and bass. Approximately 50 small inshore vessels are involved in long lining,

potting and netting from locations along the coast between Lowestoft and Harwich. Two vessels from Sizewell and Aldeburgh are known to spend a significant proportion of their time potting within the inshore cable corridor during the summer months. Whilst there is evidence of significant UK demersal activity within the cable corridor, some of this has been attributed to guard vessels associated with the construction of the Greater Gabbard offshore wind farm.

Figure 3.7: Sunk TSS and Main Shipping Channels



3.4.8 Marine Archaeology and Cultural Heritage

Much of the offshore area is considered to be highly sensitive in terms of offshore archaeology. The archaeology of the project site and export cable route includes both wrecks and buried landscapes. Both desk study and analysis of geophysical data have been used to identify potential areas of archaeological importance.

On the basis of the archaeological and geophysical assessments conducted to date, a total of 62 wrecks have been identified with a further 281 geophysical anomalies noted.

Direct impacts during decommissioning could comprise damage, disturbance, or destruction of submerged prehistoric archaeology, shipwrecks, and crashed aircraft. The avoidance of features, by use of exclusion zones, as well a range of other mitigation measures, will prevent potentially significant impacts arising. Without mitigation it is anticipated that there would be a major adverse impact in terms of direct and indirect disturbance upon offshore archaeological interests. It is expected that with mitigation measures in place, the residual impacts of the development on features of archaeological interest during decommissioning will be of negligible significance. Further information on the effects of decommissioning on archaeology is set out in Chapter 19 of the ES.

3.4.9 Existing Infrastructure

Along the export cable route, there is existing infrastructure that will need to be taken into account during decommissioning. These are as follows:

- Crossing of the Concerto 1N telecommunications cable at approx. KP 7.2
- Crossing of the Concerto 1S telecommunications cable at approx.KP 8.3
- Crossing of BT Farland Telecommunications cable at approx. KP 20.0

Figure 3.8: Cable Crossings along The Export Routes

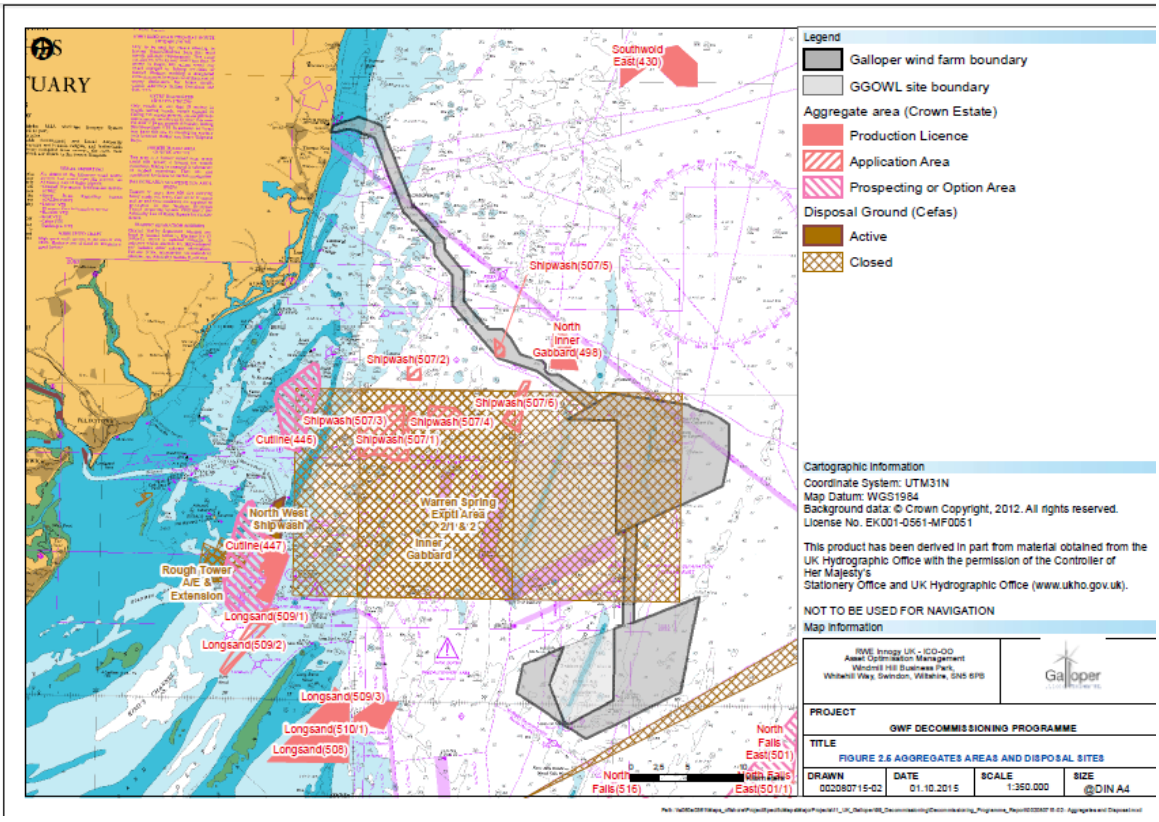
Additional crossings were also identified during the design phase as shown on the chart below in Figure 3.8, however these are out of service. Removal was planned for each of these assets, however only the Hermes cable at KP 9.4 was located during the installation works.

At the time of writing the ES there were no known offshore or onshore oil and gas activities within 10km of the wind farm site and the export cable corridor did not cross any existing oil or gas pipelines. To DTPG's knowledge no new onshore oil and gas infrastructure has been constructed in the vicinity of GWF.

3.4.10 Marine Aggregate Extraction

The locations of aggregate extraction areas in the vicinity of the wind farm site are shown in Figure 3.9.

Figure 3.9: Aggregates Areas and Disposal Sites



3.4.11 Dredging Disposal Sites

There are no known active marine disposal sites within the wind farm site boundary. One active disposal site (Inner Gabbard) is located 12.5km to the west of the proposed wind farm site. Another is located 30km to the west (North West Shipwash). There is one closed disposal site, which lies across most of the northern wind farm offshore area and another which runs parallel to the south western boundary of the wind farm site. All other active or disused sites are located over 15km from the wind farm site. Disposal sites are included in Figure 3.9.

3.4.12 Nuclear Power Stations

The export cables make landfall at Sizewell near the existing Sizewell A and B nuclear power stations and the proposed Sizewell C nuclear power station. The installation and decommissioning of the export cables will be of interest to the nuclear power station owners as there are various existing and proposed intake and outfall structures associated with them in the vicinity of the export cable route.

4 Decommissioning Techniques

As part of the windfarm construction the OFTO assets are also constructed in a way that it is possible to decommission them at the end of its operational life (approximately 23 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, DECC, January 2011;
- 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 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
- it would involve an unacceptable risk to the environment.

In addition, DTPG 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.

[3] Note Ofgem OFTO regime requires OFTOs to be prepared to decommission the transmission asset after 20 years.

Guiding Principles	Comments
Maximise reuse of materials	DTPG will aim to maximise the reuse of waste material from the decommissioning phase and will pay full regard to the 'waste hierarchy', see Table 4.2.
Consideration of the rights and needs of legitimate users of the sea	The rights and needs of other users are respected by DTPG. Decommissioning activities will seek to minimise the impact on stakeholders and emphasis will be placed on clear and open communication.
Follow Polluter Pays Principle	DTPG 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 DTPG are:

- one Offshore Platform Substation ("**OSP**") (including jacket and ALL components on the platform); and
- two Offshore export cables.

The following locations have mattresses installed for cable protection:

- Cable crossings;
- Where the export cables are routed from the OSP J Tubes to the burial depth with a cable protection system installed between the J-tube exit and the point at which the cable reaches target burial depth. Mattresses are installed at this location to protection the cable protection system;
- At the following locations on export cable 1 route:
  - KP9.706 and KP9.796;
  - KP13.703 and KP13.746; and
  - KP13.885 and KP13.997.

  The purpose of these mattresses is to provide protection to the cable in areas where the burial depth was not considered acceptable and remedial burial was not expected to be effective.

5.1 Offshore Substation

The OSP is located to the north west of the project site in the northern array area in approximately -30 m depth LAT. It consists of a jacket substructure secured with skirt piles to the sea-bed, and a topside housing the mechanical and electrical equipment. The OSP will have multiple decks with the roof deck at +37.5 m LAT and the cellar/cable deck at +17.5 m LAT.

The foundation legs are 20m x 16m at the top of the jacket and 26.5m x 22.5m at the seabed. The piles increase the seabed footprint of the OSP to 28m x 24m. The height of the jacket is 49.85m from the seabed to in the jacket/topside connection. The jacket foundations were installed by placing them on mud-mats on the seabed, then piling and grouting the piles through the sleeves outside each leg.

The purpose of the OSP is to transform the voltages of the electricity generated by the turbines from 33kV up to 132kV for transmission of generated power to the onshore transmission grid system.

The dimension of the Galloper OSP is as follows:

- topside weight: approximately 2,154 tonnes (lift weight);
- foundation and support structure weight (excl. piles): 1,997 tonnes (lift weight); and
- area of topside: 30.7m x 34m x 17.6m.

Located on the platform is:

- 2 x 180MVA 132/33/33kV export transformers;
- medium voltage ("**MV**") switchgear bays;
- 132kV Gas Insulated Switchgear ("**GIS**");
- Two auxiliary transformers and two earthing transformers;
- Control and communication ("**SCADA**");
- Diesel power room;
- LV & utility room;
- Public room Accommodation (emergency)Laydown areas;
- Cable deck; and
- Crane.

Figure 5.1a: Galloper Topside

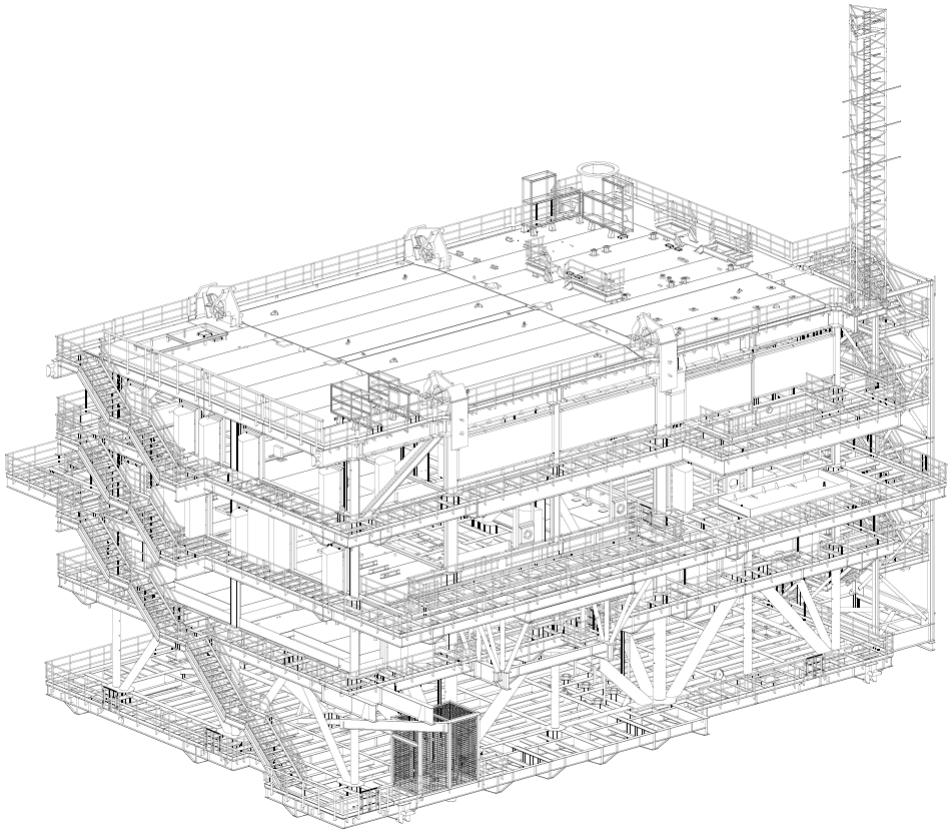


Figure 5.1b: Galloper Topside

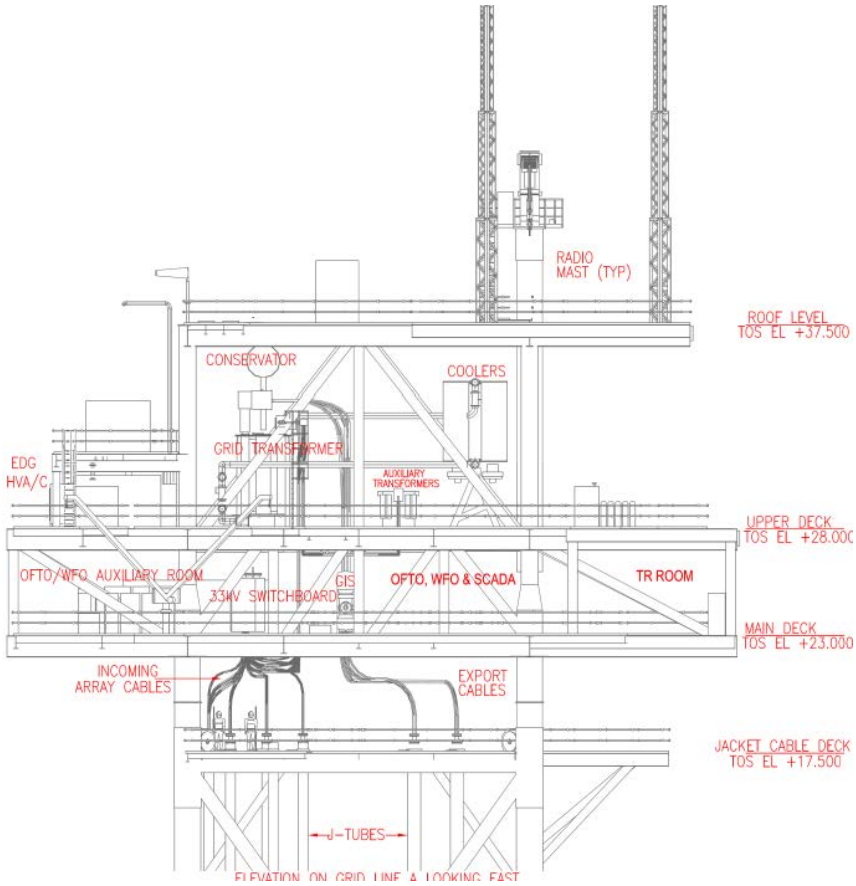
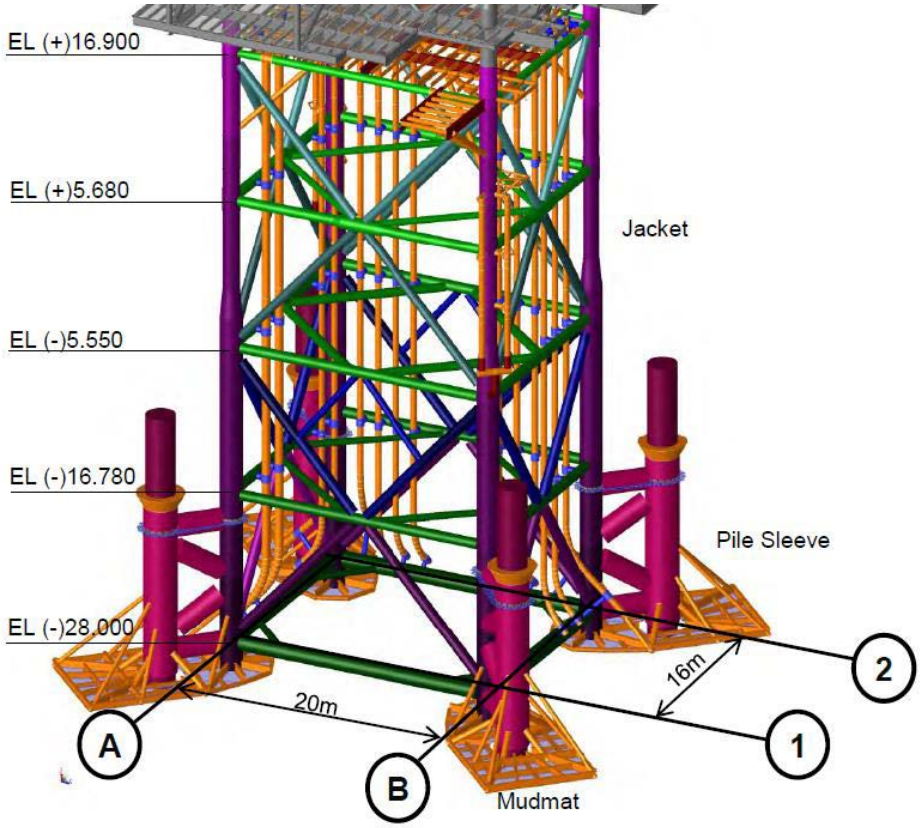


Figure 4.2: Galloper Jacket and Foundation



5.2 Offshore Export Cable

The two subsea export cables are 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 two 132kV export cables each run 45km from the OSP to landfall close to Sizewell where the offshore cables are connected to the onshore cables in the transition joint bay behind the beach. The export cables are be 3-core aluminium of 1000mm^2 cross section with polymer insulation and aluminium wire armour with incorporated optic fibres.

The export cable corridor runs parallel to the Greater Gabbard offshore wind farm export cables but does not cross it offshore. The export cables will make crossings with three live and three non-live telecoms cables. At a future date the export cables may be crossed by export cables from the proposed East Anglia Offshore Wind projects.

The subsea export cable is buried to a depth of 1.5m to 2.5m, with short sections below 1.5m, with the shallowest burial being 1.05m. It should be noted that predominantly the cables are buried in clay. Where the cable is buried in the clay layer the seabed is not expected to fall below the top of the clay, resulting in long term burial of the cable. In addition where the cable is not buried in clay, additional burial depth was added to the target burial depths to account for seabed mobility.

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 OSP and the export cables.

At the time of writing this document, the decommissioning phase is not expected to commence before a timeframe of at least 20 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. DTPG will also review the plan upon request by BEIS.

However as mentioned in Section 3, certain principles are projected to be followed:

- health and safety considerations;
- 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, DECC, January 2011;
- 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), 19th 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

In line with The Decommissioning of Offshore Renewable Energy Installations Under the Energy Act 2004 - Guidance notes for industry (England and Wales) – consultation draft 07 February 2018, Section 7.18, it is proposed that the EIA is “reviewed (and, if necessary, more detailed assessment undertaken) towards the end of the life of the installation, when a final review of the decommissioning programme is undertaken to finalise the decommissioning measures proposed” i.e. at year 18. This, allows sufficient time to implement any measures arising from the updated EIA to be incorporated into the final decommissioning programme. The process supporting the EIA will include pre-decommissioning surveys. The plan of work will include a detailed method statement together with project specific hazard and risk assessments. DTPG will also liaise with other developers and OFTOs in the region to ensure potential synergies for decommissioning facilities are investigated.

6.4 Decommissioning of Offshore Substation

It is planned that the structure for the offshore substation will be removed in its entirety including part of the foundations. There however 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 place.

The items to be decommissioned are:

- all of the topside equipment and transformers;

  (As the transformers 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;
- 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 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. The cut sections will be removed with minimal disruption to the seabed.

It is expected that the offshore substations 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 are braced for sea transportation, transformer 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. A special agreement will be made with the GIS supplier to ensure the safe removal of the SF_6 Gas; 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 OSP 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
- 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.

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 at such a depth below the surface of the seabed that the remaining parts do not pose a danger for shipping or fishing vessels, though this is likely to be varied due to individual localised factors such as ground condition etc. at each site. 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 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 classification.

6.5 Decommissioning of Export Cables

Offshore cables where buried to a safe depth below the sea-bed, such that they do not pose a risk to other maritime users will remain in situ. However the final 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.

Any cables left in-situ, will have the ends 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 lengths of export 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.

If the export cables are removed on request, the sequence for removal is anticipated to be:

- Buried cables will be located using massflow excavation or a grapnel to lift them from the seabed. Alternatively, or in addition, it may be necessary to use an ROV to cut and/or attach a lifting attachment to the cable so that it can be recovered to the vessel;
- 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. 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**") or divers 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 removal of the export cable 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
- Cable removed will be processed for reuse, recycle or disposal.

6.6 Mattressing

The base case assumption for mattressing is that it will be left in situ. DTPG considers that it is best practice to leave mattressing 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 DTPG are outlined in Table 6.1.

Table 6.1: Summary of Proposed Decommissioning Measures for DTPG

Component		Proposed decommissioning measures
Offshore substation	Topside	Complete removal
	Jacket	Cut off below seabed level and removed
Offshore export cable		Cut off at the base of the platform, any cable forecast not to remain adequately buried will be removed; the remaining cable will be weighted down and left in situ.
Mattressing		Left in situ.

Table 6.2: Decommissioning Plan Technical and Environmental Summary

Activity	Description	Approach
Dis-connection	Transmission assets disconnected from NGET and wind turbine generators, isolated and earthed.	Undertaken in accordance with the safety rules in place at the time.
Topside structure housing the OSP	Houses transmission assets including oil-filled transformers, gas-insulated switchgear, diesel generators and termination of the OFTO export cables and wind farm array cables. Total lift weight of the substation topside is approximately 2,154 tonnes (lift weight).	Oil filled transformers are braced for sea transportation, transformer oil levels reduced in the conservator tank and cooler fins to deal with a liquid load. Cables will be removed or cut at the hang-off. Any loose items will be removed. The topside is then cut from the jacket and removed in one piece. Parts will be processed for reuse, recycling and disposal.
OSP platform structure and piles	Jacket structure circa 1,997 tonnes (lift weight) and supporting foundations and piles.	Critical joints and members of the structure will be inspected. Foundations will be inspected using ROV. Jacket which is installed using skirt piles will be removed by cutting the

Activity	Description	Approach
		piles below the seabed and removing the 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 platform.
Offshore export cables	OSP is connected to land by a 45 km subsea export cable buried to a target depth of between 1.5-2.5 metres. The subsea export cable consists of two XLPE insulated; three core 1000mm^2 aluminium conductor cables.	As per the current industry standard to minimise environmental disturbance to the seabed, only offshore cables that are exposed at the time of decommissioning will be removed. Cable requiring removal will be cut as close to the platform foundation, or sea bed, as is possible, with the ends weighted down and buried to a secure depth below seabed level. Recovered cable will be stripped and recycled. Contingency plans will be put in place to ensure appropriate actions are in place if the cables become exposed post decommissioning.

6.8 Proposed Waste Management Solutions

DTPG 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.

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 OSP	Steel from topside and Foundations		X	
Main power transformers	Steel, iron laminate, copper, transformer oil	X	X	
Gas insulated switchgear	Copper, electronics	X	X	

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

At the time of decommissioning, where assets have remaining technical asset life and a second hand market exists DTPG will look to sell assets. If this is not possible then DTPG will recycle or disposal as detailed in Table 6.3.

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, mattressing and the embedded piles of the OSP in the seabed. The basis of this decision is that the items in question meet at least one of the four situations in which (based on the IMO standards) non-removal or partial removal may be considered.

The four situations are where:

a. 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);

b. entire removal would involve an unacceptable risk to personnel;

c. entire removal would involve an unacceptable risk to the marine environment; and

d. entire removal would involve extreme costs.

In addition The Decommissioning of Offshore Renewable Energy Installations Under the Energy Act 2004 - Guidance notes for industry (England and Wales) – March 2019, section 7.2.2 and 7.2.3 states BEIS will consider exceptions from full removal in line with IMO guidelines on a case by case basis.

Jacket Piles - complete removal of the pile below the seabed 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.

Mattressing - leaving cable protection on the seabed is associated with certain positive effects (leaving the exposed rock 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 place 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 removal is undesirable owing to the risk of damaging the other cable.

Export Cables - the primary reason for leaving cables buried in the seabed is:

a. marine habitats and ecosystems will have developed over the cables since their installation

b. decommissioning of the buried cables and embedded piles may require the involvement of divers in significant and dangerous operations e.g. in preparation work for cable/embedded pile removal, installation/recovery/snagging works of any under runners used during the cable removal etc.;

c. the complete recovery of all of the buried cable and pile structures would entail a major excavation of the seabed that would be hugely damaging to the environment in the area. An updated EIA will be produced at the decommissioning programme year 18 review to confirm this assumption based on the environmental conditions at the time; and

d. cost to remove the full export cable is estimated to increase the current decommissioning forecast costs by between 160% and 180%. The cost of decommissioning 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.

DTPRB will enter into discussions with BEIS and The Crown Estate ("**TCE**") regarding long term monitoring and residual liability of any infrastructure left in situ.

The export cables are predominantly buried in clay and where the cable is buried in the clay layer the seabed is not expected to fall below the top of the clay, resulting in long term burial of the cable. In addition where the cable is not buried in clay, additional burial depth was added to the target burial depths to account for seabed mobility.

It is also noted from analysis of the geophysical reports that the seabed appears to be relatively stable where sand is present in <35% of the cable route length. Within the areas with the largest mobile bedforms, pre-sweeping was undertaken before installation, which along with additional burial depths applied, should mitigate against the risk of export cable exposure.

As demonstrated in Figure 6.2, the calculated bedform heights for each section are added to the recommended depths of lowering determined by the cable burial risk assessment.

To aid installation via ploughing in areas with steep sand waves/ripples, a number of areas were selected for 'pre-sweeping'. Pre-sweeping involves temporarily reducing the seabed level prior to installation of the cable. The primary purpose of pre-sweeping is to remove steep slopes which cannot be easily traversed by the plough, however an additional advantage is that this allows greater burial depth to be achieved, when referenced from the original seabed level, using the standard installation techniques. The principal of lowering the seabed level by pre-sweeping is demonstrated in Figure 6.1.

Figure 6.1: Principles of Pre-Sweeping

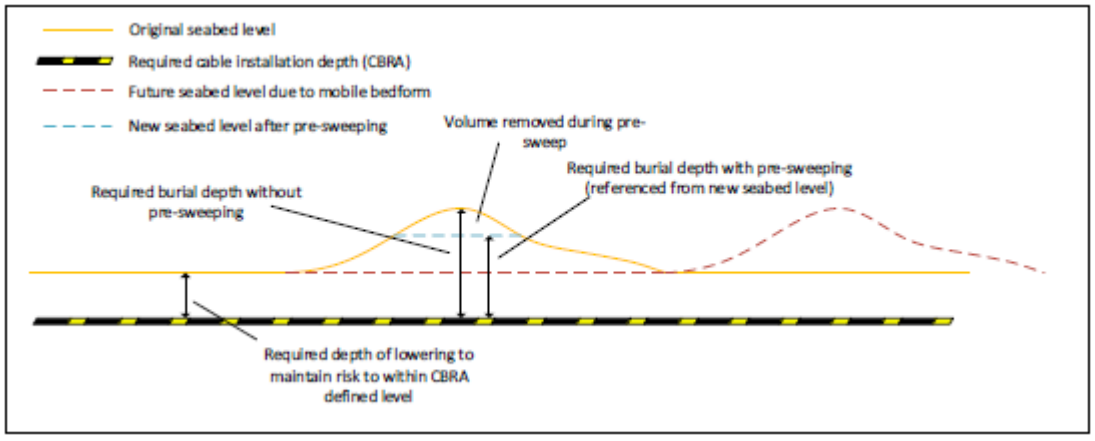
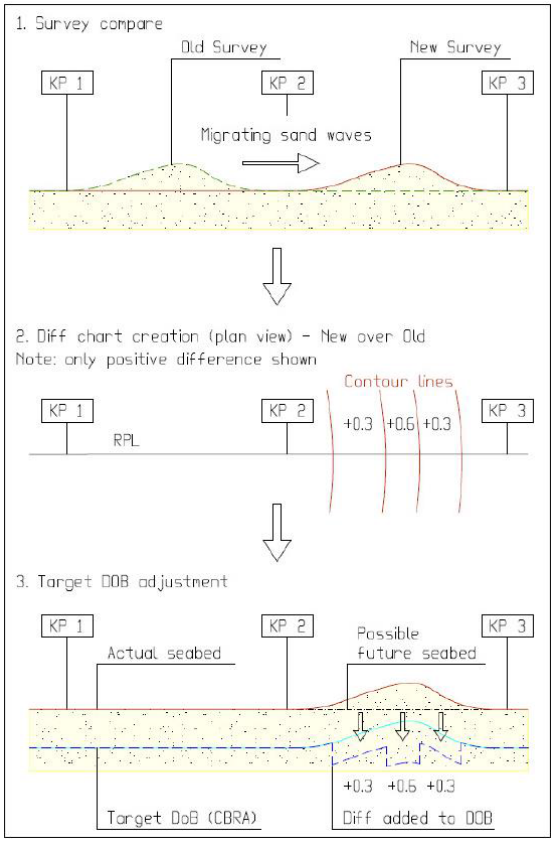


Figure 6.2: Seabed Mobility Methodology



It is therefore expected that the export cables will remain buried to a safe depth. This will be reviewed throughout the project and prior to decommissioning and if new evidence comes to light that will affect the cable burial depths then this will be assessed and taken into account in formulating a new plan for the decommissioning of the export cable.

6.10 Lighting and marking

During the decommissioning of the GWF, appropriate aviation and nautical marking and illumination will be applied.

In accordance with the Galloper consent under Section 36 of the Electricity Act 1989, DTPG 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

An EIA was completed by GWFL for GWF in 2011, the ES. Table 7.1 summarizes the impacts from the decommissioning phase.

Table 7.1: Summary of Decommissioning Impact Assessment

Topic	Impact Description	Decommissioning Impact
MetOcean	Short term impacts on current and wave patterns from decommissioning vessels.	Negligible
Morphology and coastal processes	During decommissioning, sediment would be disturbed. Most of the suspended sediment would be sand, which would be rapidly re-deposited on the seabed and would not cause a significant increase to the background sediment concentrations. There would be a small fraction of gravel in the sediment but this would not be mobilised. The overall effects would be insignificant.	Negligible
Fish and Shellfish	Nine species of commercial importance are known to use spawning and nursery grounds that overlap or are in close proximity to the study area or, are considered to be sensitive to potential wind farm impacts. Those species include fish such as herring, cod and sole, as well as elasmobranchs (sharks, rays and skates). The only species of conservation importance recorded from surveys in the area was twaite shad, which is listed under Appendix III of the Bern Convention and Annexes II and V of the EC Habitats Directive and is a UKBAP priority species. During installation no significant impacts were assessed, as the level of impact through underwater noise and vibration will be greatly reduced compared to the construction phase, removing the main source of potential impact on fish and shellfish.	Minor to moderate
Birds	During decommissioning, impacts in the offshore environment could be associated with direct disturbance (e.g. increase in vessel activity, machinery operation, human presence) or indirect disturbance effects through changes to prey supply and habitats. Those species identified in the ES as potentially being impacted were Red-throated	Minor to moderate

Topic	Impact Description	Decommissioning Impact
	diver; Gannet; Fulmar; Great skua; Common gull; Lesser black-backed gull; Herring gull; Great blackbacked gull; Kittiwake; Common guillemot; and Razorbill. Mitigation identified in the ES was through the adoption of best practice through an EMMP to minimise disturbance impacts on birds and their prey. Best practice includes minimising disturbance from lit structures by employing best practice measures such that the lighting of turbines will meet minimum legal requirements, namely as set out in the IALA Recommendation O-117. The ES concluded that when mitigation measures are implemented to minimise the risk of potentially significant effects on species' populations, there will be no significant impacts to any species at an international, national or regional scale, nor on any Natura 2000 site.	
Marine mammals	The primary potential impact identified during the decommissioning phase is associated with noise and potential vessel collision. As decommissioning will not involve piling operations there are unlikely to be significant impacts. Potential impacts as a result of injuries on marine mammals due to vessel collisions are anticipated to be of minor adverse significance for pinnipeds and negligible for all cetaceans. Vessels will be made aware of the risk of potential collision and protocols will be developed as part of a Marine Mammal Mitigation Plan for decommissioning.	Minor
Shipping and navigation	During the decommissioning phase, the primary potential impact identified is associated with vessel collisions; either with other vessels or with the wind farm structures themselves. With the application of a range of mitigation measures, including operating procedures, marking / lighting, Emergency Response Cooperation Plan and compliance with the relevant regulations these impacts are as low as reasonably possible.	Minor
Commercial fishery	Key fishing activity taking place in and around the wind farm site and export cable corridor comprises mainly foreign beam trawling for plaice and sole with drift netting along offshore banks for bass by local UK vessels. The inshore areas of the cable corridor are used by passive gear such as drift nets which target sole and bass, along with some	Negligible

Topic	Impact Description	Decommissioning Impact
	localised potting activity for shellfish which occurs in close proximity to the export cable landfall. During decommissioning, there will be a temporary loss of access to fishing grounds within the wind farm site. This will affect different sectors of the fishing community to varying extents. If the export cables need to be removed as part of decommissioning there will be disrupt of a significant proportion of the inshore potting grounds. Mitigation measures can be put in place comprises fisheries liaison and discussions with local fishermen to agree suitable co-existence measures. As a result impacts associated with temporary loss of access during decommissioning are anticipated to be of negligible significance. In addition no significant impacts are likely to occur as a result of displacement of excluded vessels onto other fishing grounds, or increased steaming times for fishing vessels due to the decommissioning works.	
Cultural heritage	Much of the offshore area is considered to be highly sensitive in terms of offshore archaeology. Direct impacts during decommissioning could comprise damage, disturbance, or destruction of submerged prehistoric archaeology, shipwrecks, and crashed aircraft. The avoidance of features, by use of exclusion zones, as well a range of other mitigation measures, will prevent potentially significant impacts arising. Without mitigation it is anticipated that there would be a major adverse impact in terms of direct and indirect disturbance upon offshore archaeological interests. It is expected that with mitigation measures in place, the residual impacts of the development on features of archaeological interest during decommissioning will be of negligible significance.	Negligible
Contamination	The baseline marine water and sediment quality study found that sediment and water quality in the areas surrounding wind farm is generally good. Sediment contaminant conditions for the area around wind farm and the export cable corridor are below levels at which adverse effects on marine fauna are anticipated. The contaminants analysis undertaken indicated that arsenic is the most common metal	Negligible

Topic	Impact Description	Decommissioning Impact
	contaminant in the area. Such a result is to be expected owing to historical arsenic waste disposal and inputs from other estuaries in this region. Potential impacts during decommissioning could arise due to re-suspension of contaminants and accidental spillage of construction materials. However, any re-suspension of material will be minor and localised, and contaminant levels in the sediments are below levels at which adverse effects would occur. Subsequently it is anticipated that the impacts will be of negligible significance.	
Airborne noise	The wind farm considered either on its own or in combination with any other offshore wind farm consented or in planning, should not cause any loss of amenity onshore and therefore the impact is predicted to be not significant.	Negligible
Underwater noise	Refer to 'Marine mammals' above.	Minor
Seascape and visual	The effects arising from the proposed development would be reversible and, after decommissioning, would leave no net residual effect upon either the seascape resource or the visual environment.	Negligible

Consistent with the commitment to undertake reviews of the decommissioning provisions contained within this document, DTPG will review 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. Planned surveys in and around the transmission assets which could inform this process could include:
    - Geophysical surveys (side scan sonar ("**SSS**") and Multibeam Echo Sounder ("**MBES**"));
    - Geotechnical surveys;
    - Benthic grab/camera surveys;
    - Ornithological surveys;
    - Marine mammal monitoring;
    - 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 TSS to the port operations at Harwich Haven Authority and Port of London Authority, 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; and
- 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

DTPG 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 GWFL during the development and construction phase, we will ensure that this is applied during the operational life of the asset through to decommissioning.

3 years prior to decommissioning, DTPG proposes to seek the advice and opinions on the environmental impact assessment that will inform the actual decommissioning plan, form a range of stakeholders, this includes but is not limited to:

- BEIS;
- Historic England;
- Environment Agency;
- MMO;
- Centre for Environment, Fisheries and Aquaculture Science;
- Maritime and Coastguard Agency;
- Natural England;
- TCE;
- Eastern Inshore Fisheries and Conservation Authority;
- GWF Commercial Fisheries Working Group;
- Greater Gabbard Offshore Wind Farm ("**GGOWF**") Owners;
- GGOWF OFTO;
- Concerto 1 South telecoms cable Owner;
- Concerto 1 North telecoms cable Owner;
- BT (Farland) Telecoms cable owner;
- East Anglia One OFTO;
- Sizewell A, B and proposed C Nuclear Power Station (EDF Energy);
- National Federation of Fishermen's Organisations;
- British Marine Aggregate Producers Association;
- Trinity House Lighthouse Service;
- Joint Nature Conservation Committee;
- Licensees of aggregates operations near to the export corridor;
- Royal Yachting Association; and
- Chamber of Shipping.

DTPG will apply for a separate decommissioning marine licence from the MMO at the time of decommissioning.

In accordance with the relevant clauses under Section 36 of the Electricity Act 1989 and relevant conditions of the Marine Licence, DTPG 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 confidential and therefore not included in Decommissioning Programme. Cost and financial security information is provided separately to BEIS.

10 Proposed Decommissioning Schedule

It is proposed that decommissioning commences at the end of life.

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 wind farms start to be decommissioned, it will provide valuable information to DTPG on timings, costs and operational challenges to be faced. Currently we anticipate GWF will be decommissioned in 2040 and will take 24 months to complete.

In line with project management guidelines and DTPG 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, DTPG will carry out regular reviews throughout the project lifecycle.

DTPG intends to undertake internal reviews of the Decommissioning Programme and Financial Security Statement throughout the life of the project with an internal review of the Decommissioning Programme before the commencement of the formal review in year 9 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 months before the first security provision is due; and;
- 18 years following commencement of transmission licence.

During the formal reviews DTPRB 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 the MMO), 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 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 DTPG 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. DTPG 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, DTPG 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 DTPG is aware of the guidance for oil and gas installations which specifies a 500 m 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. DTPG proposes that an independent survey company will be commissioned by DTPG to complete the surveys and that they report in parallel to both DTPG and BEIS for review and comment.

13 Restoration of the Site

Following the successful completion of the decommissioning works, the DTPG site will be restored, as far as reasonably practicable, to the condition it was in pre-construction. This will apply to the area of the platform installation and the export cable corridor.

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 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

DTPG 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.

DTPG 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 we are aware of oil and gas installation guidance which specifies a 500 metres radius around any installation.

Should these surveys identify any residual elements from the project protruding above the sea bed, DTPG 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:

- GWF Decommissioning Programme;
- Decommissioning of offshore renewable installations under the Energy Act 2004: Guidance notes for the industry, DECC, January 2011(revised);
- Marine and Coastal Access Act 2009;
- Marine Licence (Ref: L/2018/00049/1);
- Section 36 Licence (Ref: SI 2013/1203); and
- GWF Environmental Statement (GWFL, 2011).