Decommissioning Programme

WoDS Transmission plc

July 2016

Contents

Introduction

This document presents the proposed OFTO decommissioning programme for the WoDS Transmission plc (WoDST) assets and is based upon the decommissioning programme proposed by Scottish Power Renewables (WODS) Limited and DONG Energy West of Duddon Sands (UK) Ltd (jointly JV West of Duddon Sands). The decommissioning programme proposed by JV West of Duddon Sands is informed and supported by the Environmental Statement for the West of Duddon Sands Offshore Wind Farm.

The West of Duddon Sands Offshore Windfarm (WDS) 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 windfarm are shown in Table 1.1 below:

Regulation	Legislative Context	Achieved Consents
Marine & Coastal Access Act 2009	For licensable marine activities, including depositing objects or substances, or carrying out works, in the sea or on or under the sea bed.	Marine Licence: L/2012/00424/4
Electricity Act 1989	Section 36 of the Electricity Act 1989. Wind turbines, inter-array cables, export cables and off-shore substations	Issued by Department for Business, Enterprise and Regulatory Reforms (BERR) on 4th September 2008

Table 1.1: Achieved consents for construction and operation of West of Duddon Sands Offshore Wind Farm.

Upon issue of the Section 36 consent for the WDS project, the Department for Business Enterprise and Regulatory Reform also issued Morecambe Wind Limited (now JV West of Duddon Sands) a notice under Section 105(2) of the Energy Act 2004 regarding the requirement to prepare and approve a decommissioning programme for the project prior to commencing construction.

The programme outlines the methods for decommissioning, using the format outlined by the DTI Guidance Notes for Industry, January 2011, paying particular attention to:

- Considering integration and cooperation with other companies during decommissioning
- Environmental impacts
- Regular reviews to reflect changing circumstances and knowledge over the project lifetime
- Monitoring
- The expected timeframes and costs of removal

This draft Decommissioning Plan is submitted for approval by DECC. It is assumed that the Generator assets will be decommissioned at the same time as the WoDS Transmission assets.

We will adopt the principles of the DECC programme process stages. However, we believe that the process will differ because of the change in circumstances and will be:

STAGE 1	WoDS Transmission plc discusses draft decommissioning programme with DECC, JV West of Duddon Sands and other consultant parties
STAGE 2	WoDS Transmission plc produces decommissioning programme
STAGE 3	Review of decommissioning programme
STAGE 4	Responsible person ensures decommissioning is carried out in accordance with the programme

STAGE 5	Responsible person carries out post decommissioning monitoring, maintenance and management of site and as specified in the programme

1 Executive Summary

The Environmental Statement (ES) for West of Duddon Sands Offshore Wind Farm produced by JV West of Duddon Sands was submitted in March 2006. In May 2009 JV West of Duddon Sands approved the construction and commissioning of the West of Duddon Sands Wind Farm. An environmental monitoring programme defining survey methods for pre-, during and post-construction has been developed by JV West of Duddon Sands and discussed with the authorities.

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 WoDS Transmission plc assets. WoDS Transmission plc 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 prior to construction, as unforeseen issues can arise during the installation and operation of the wind farm, which ultimately could affect the decommissioning. At the time of writing, no offshore wind farms (including OFTO assets) worldwide have been decommissioned, so knowledge of the challenges is limited. Once other wind farms 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 WoDS Transmission plc assets can be summarized as: complete removal of the offshore substations; offshore substation foundations cut off at 1 metre below seabed level and removed; scour protection left *in situ* and export cables mostly left *in situ* (see Section 4.3.3).

In accordance with the Polluter Pays Principle, WoDS Transmission plc in conjunction with JV West of Duddon Sands 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.

WoDS Transmission plc in conjunction with JV West of Duddon Sands is committed to restoring the West of Duddon Sands Offshore Wind Farm 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.

WoDS Transmission plc in conjunction with JV West of Duddon Sands proposes that, following post-decommissioning, a full geophysical survey (swath, sidescan and magnetometer) is carried out. The survey will be carried out by an independent survey contractor and all results issued to the Department of Energy and Climate Change (DECC) for review and comment. It is proposed that geophysical surveys are carried out 1 and 5 years after decommissioning has been completed.

A cost estimate for the programme has been derived, based on the equipment and 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 Environmental Impact Assessment (EIA) will be reviewed to assess the potential impacts that may arise and are not covered in the initial EIA process and subsequent reviews.

Once the assets are nearing the end of their agreed operational life, WoDS Transmission plc 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 JV West of Duddon Sands, and the schedule of works will be determined in agreement with the statutory authorities.

2 Background information

The background information consists of a description of the project, and a brief presentation of the characteristics of the project area.

2.1 WoDS Transmission plc

The West of Duddon Sands Offshore Wind Farm incorporates 108 x 3.6 MW turbines and is shown in Figure 2.1 along with the cable route for the West of Duddon Sands export cable. Turbines transmit power through a network of 33 kV inter-array cables to an offshore substation which is within the turbine array on a jacket foundation. From the offshore substation, two submarine 155 kV export cables are installed in the seabed between the offshore substation and landfall near Heysham in Lancashire. Once onshore, cables are laid subsurface until reaching the onshore substation, which transmit power to the national grid. A plan of the wind farm and associated cabling is included as Figure 2.1 below:

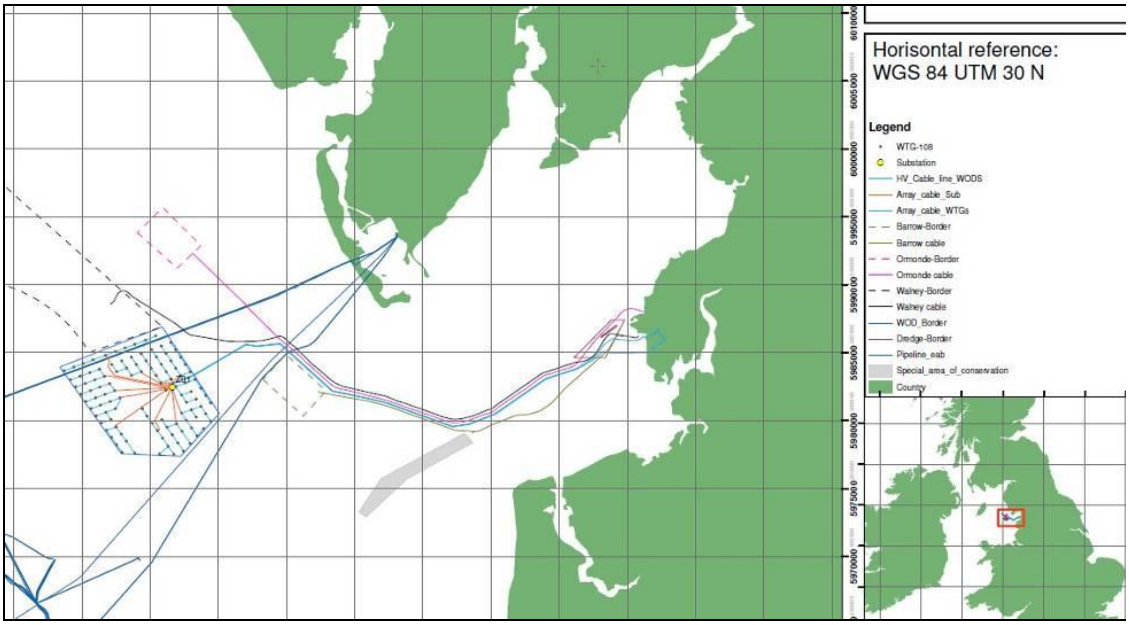


Figure 2.1: West of Duddon Sands Offshore Windfarm Development Area

WoDS Transmission plc has been formed to operate and maintain the Offshore Transmission Assets associated with the West of Duddon Sands Offshore Wind farm.

2.2 As Built Information

The Construction Design and Management (CDM) Regulations will apply and will require accurate as-built date as amended during the lifetime of the project to be used as a basis for the decommissioning methodologies. The Developer was responsible at the time of purchase for providing the Purchaser with this information. The following can be found in the appendices to this plan:

1. As-built positions for all structures
2. Details of the construction of all structures
3. Positions, depths of burial and other forms of cable protection for all subsea cables (both Export Cables and Inter-Array Cables):

Subject	Drawing title	Drawing number
Utility Systems 04 Structural Layout Drawings	Jacket structural drawings	WDSS01Z01UAB10_CTB585_001_e
Utility Systems 04 Structural Layout Drawings	Layout drawings	WDSS01Z01UAB10_CTL001_001_h
Utility Systems 04 Structural Layout Drawings	Layout drawings	WDSS01Z01UAB10_CTL001_002_j
Utility Systems 04 Structural Layout Drawings	Topside structural drawings	WDSS01Z01UAB10_CTB004_001_g
Utility Systems 04 Structural Layout Drawings	Topside structural drawings	WDSS01Z01UAB10_CTB005_001_g
Utility Systems 04 Structural Layout Drawings	Weight Load Plans	WDSS01Z01UAB10_CTL105_001f
155kV Export Cable North	Cable Protection Rock Installation North Location 2 KP 15.140 – KP15.2	BO-RP-826-11248-016
155kV Export Cable North	Cable Protection Rock Installation North Location 3 &4 KP 16.442 – KP16.620	BO-RP-826-11248-017
155kV Export Cable South	Cable Protection Rock Installation South Location KP15.090 – KP15.147	BO-RP-826-11248-018
155kV Export Cable South	Cable Protection Rock Installation South Location KP16.363 – KP16.475	BO-RP-826-11248-019

Table 2.1: List of structural and layout drawings found in the appendix to this programme

If at any time during the lifetime of the wind farm the as-built details change, for example, after a repair to a subsea cable, amended details will be prepared for the ongoing live status of as-built data.

2.3 Site Characteristics

The site characteristics are described by a comprehensive data set and information collated for the Environmental Impact Assessment (EIA) process of the West of Duddon Sands Offshore Windfarm. A full summary of this information is described in the West of Duddon Sands Offshore Windfarm, Environmental Statement[1].

2.3.1 Offshore Physical Characteristics

A brief summary of the key physical characteristics for the offshore locations of the West of Duddon Sands (WDS) Offshore Windfarm site is provided below.

2.3.1.1 *Geology*

According to the British Geological Survey (BGS) surface sediments are largely clayey silt, coarsening slightly to silty sand in the north and south. The surface sediments overlay denser sandy beds, which, in turn, lie above the undulating boulder clay surface. There are no apparent surface bedforms, indicating an area of slow deposition, consistent with the Eastern Irish Sea Mudbelt.

[1] West of Duddon Sands Offshore Windfarm Environmental Statement, RSK ENSR Environment Ltd for Morecambe Wind Limited, Project No P40196, 31st March 2006

Rockhead was not identified on any of the sub-bottom profiler data. However, the BGS map for Liverpool Bay indicates rockhead at approximately 15m below seabed.

2.3.1.2 *Bathymetry*

The bathymetric character of the WDS area is generally flat, with the seabed dipping slightly to the west. Water depths vary from 17.5m to 22.8m. The shallowest depths are found in the eastern most corner of the area where depths of slightly less than 17.5m below LAT (lowest astronomical tide) were recorded. The deepest water was recorded at 22.8m in the western most corner of the survey area. This results in a depth increase of 5.4m over a distance of roughly 12 km equating to a slope to the west of about 1 m in 2,200m.

2.3.1.3 *Existing Transport Patterns and Coastal Processes*

Over most of the windfarm area, the dominant driver for sediment transport is tidal current. At the windfarm site the tidal currents are just sufficient to transport silt and very fine sand, but significant transports will only occur during strong offshore winds when waves are sufficiently large to disturb the seabed. Along much of the cable route into Morecambe Bay there are moderate to strong tidal currents sufficient to transport sand and pebbles even in the absence of waves.

Within Morecambe Bay, all levels of wave energy will enhance tidal current effects by lifting sand into temporary suspension and thereby making it available for transport by the currents. Deposits of potentially mobile surface sediment lie within the main channels and along the intertidal margins of the estuary. Currents in the channels can be strong enough to create small scale, mobile bed forms (sand waves, mega-ripples) and large migrating banks.

2.3.1.4 *Metocean Conditions*

Waves

The WDS site is exposed to severe wave conditions generated within the East Irish Sea. The predominately south westerly winds have an effective fetch length of over 200km and the waves here are also enhanced by the swell entering from St George's Channel. The heights of the waves from other directions will be less severe due to the coastal morphology of the area and the protection offered by the mainland and the Isle of Man.

The 100-year significant wave height is estimated to be 7.5m (RSKENSR, 2006), with a maximum wave height estimated at 14m. Along the proposed cable routes wave conditions are affected by the reduced water depths, causing larger waves to break, thus reducing the extreme values.

Table 2.2: Extreme Water Levels in and Around the WDS Site

Return Period (years)	Haverigg Point (m)	Walney Island (m)	Cleveley (m)	WDS (assumed) (m)
1	5.6	5.7	5.6	5.4
10	6.2	6.3	6.3	6.0
100	6.7	6.8	6.8	6.5

Source: West of Duddon Sands Environmental Statement (RSKENSR, 2006)

Water Depths

Water depths across the study area vary from around 17m in the east to 23m, at LAT.

Summary Metocean Conditions

Further to the conditions reported in the Environmental Statement (RSKENSR, 2006), further observations were made during the assessment of the oceanographic conditions at the West of Duddon Sands Site[2]:

- Wind comes predominantly from South-Westerly to Westerly directions, which is also where the extreme wind speeds occur,
- The sea bed is gently sloping with vanishing slope and practically plane rising from W-N-W to E-S-E,
- There are insignificant sea bed changes,
- Waters are deep (18.2-23.6 LAT) relative to operational wave heights (Hs = 4 m at Vhub = 25m/s),
- The large tidal range (HAT-LAT ≈ 9 m) is characterized as strongly semi-diurnal,
- There is little swell penetration from the Atlantic Ocean,
- Wind driven waves dominate,
- Extreme waves are affected by the water depth due to tides,
- The dominating maximum waves are observed coming from the Atlantic Ocean generated by western and south-westerly wind directions,
- Operational wind sea grows expectedly with the wind, and
- Wind-wave misalignment is typical of offshore conditions.

Source: WDS Metocean Evaluation Input to Design Basis A

2.3.2 Offshore Biological Environment

A brief summary of the names and locations of Special Areas of Conservation (under the Habitats Directive) and Special Protection Areas (under the Birds Directive) that may be affected by the decommissioning programme of the West of Duddon Sands Offshore Windfarm site and cable corridors are provided below.

2.3.2.1 *Special Areas of Conservation and Special Protection Areas*

There are several Special Areas of Conservation sites along the coastline in the vicinity of the West of Duddon Sands Offshore Windfarm, including Shell Flat & Lune Deep, Morecambe Bay and the Drigg Coast[3]. The West of Walney Marine Conservation Area was designated in January 2016 and the number of sites is likely to expand in future years. All known sites and additional sites that may be being considered for designation at the time of the decommissioning will be considered.

Information on the designated sites and their locations are given in Table 2.3 and Table 2.4, and the location of the sites is shown in Figure 2.3 to Figure 2.5.

Table 2.3: Summary of Special Areas of Conservation in vicinity to the West of Duddon Sands Offshore Windfarm Site under the Habitats Directive

Site/location	Status
Shell Flat & Lune Deep	Ramsar, SSSI, SPA
Morecambe Bay	Ramsar, SSSI, SPA, SAC
Drigg Coast	Ramsar, SSSI, SPA, SAC
West of Walney	Marine Conservation Zone

Table 2.4: Summary of Special Protection Areas in vicinity to the West of Duddon

[2] WDS Metocean Evaluation Input to Design Basis A, Document No 1035683
[3] http://natura2000.eea.europa.eu/#

Sands Offshore Windfarm Site under the Birds Directive

Site/location	Status
Liverpool Bay	SPA and National Nature Reserve
Morecambe Bay	Ramsar, SSSI, SPA, SAC
Duddon Estuary	Ramsar, SSSI, SPA, SAC

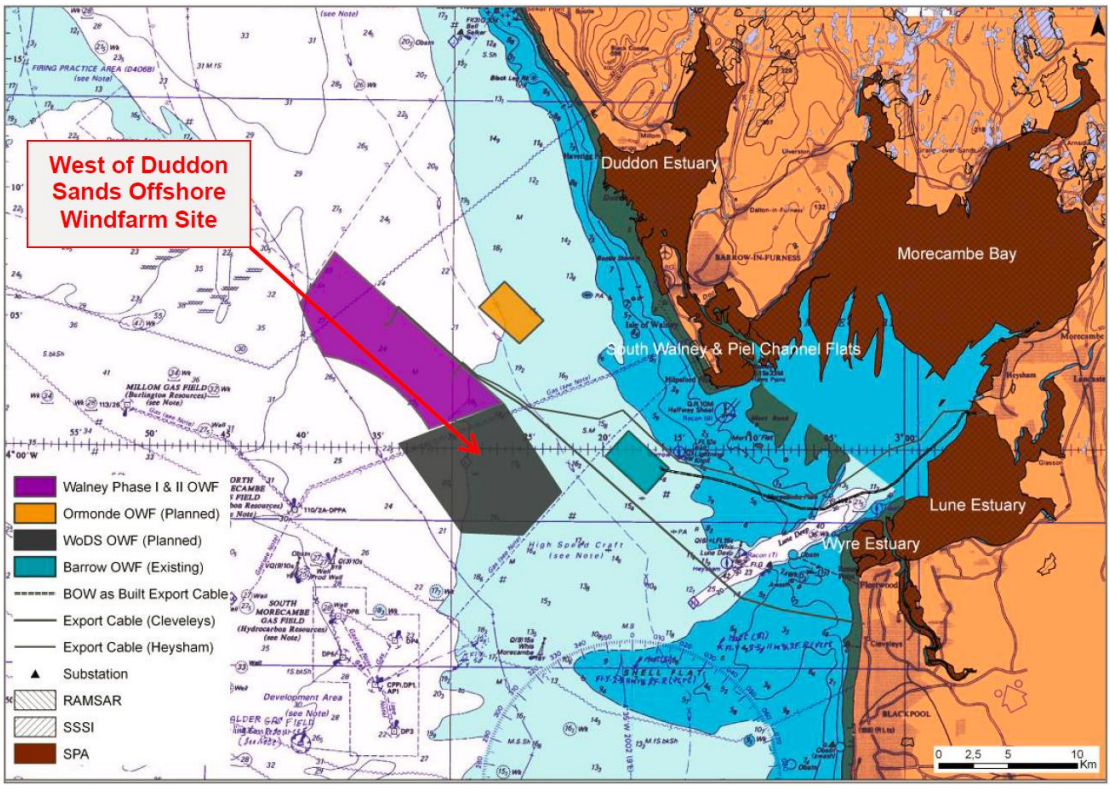


Figure 2.3: Ramsar Sites, Sites of Special Scientific Interest (SSSI) and Special Protected Areas (SPA)

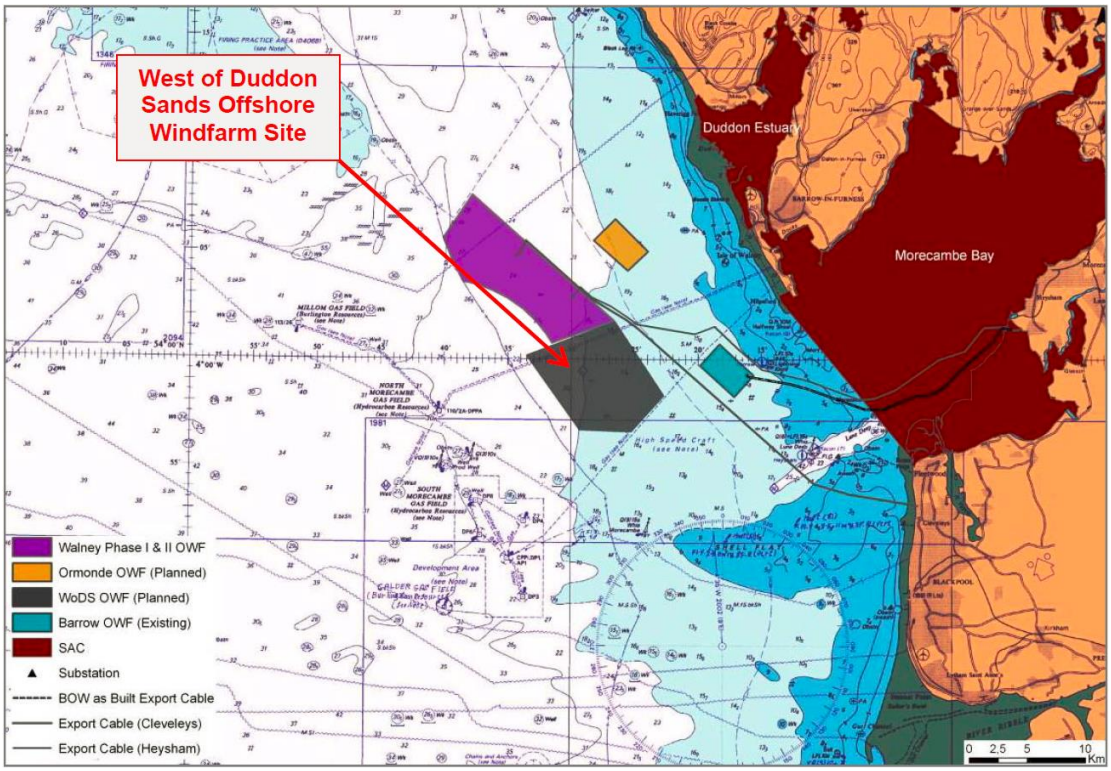


Figure 2.4: Special Areas of Conservation (SAC)

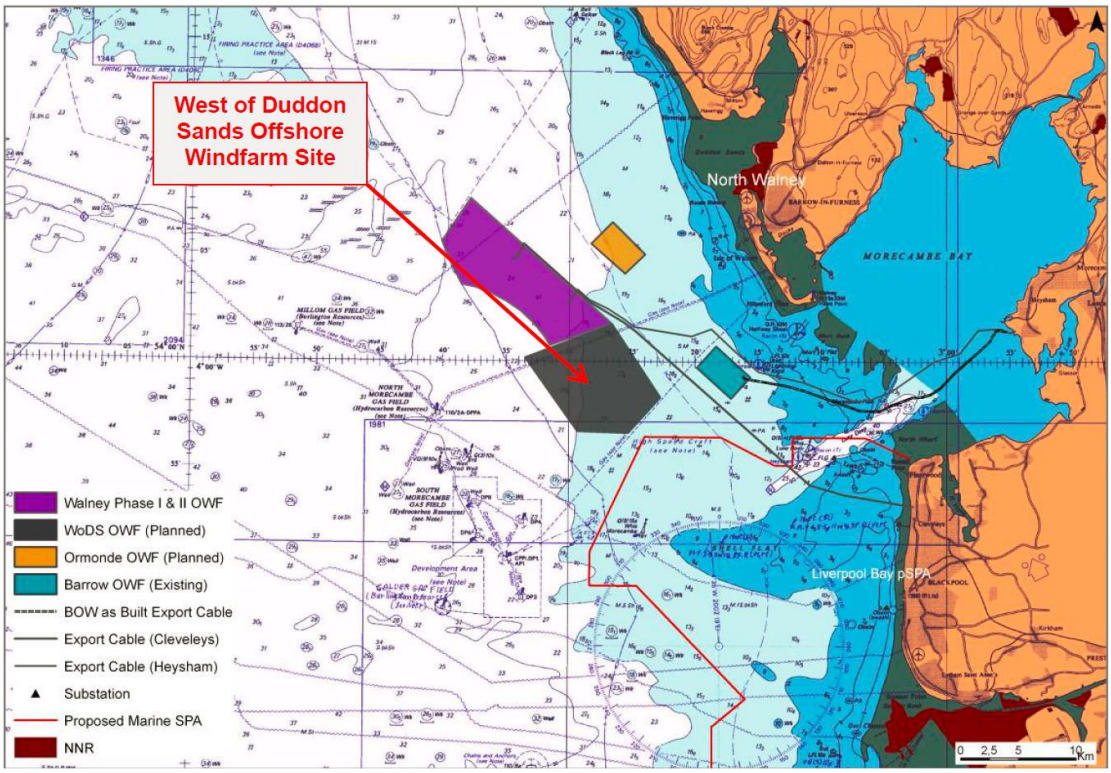


Figure 2.5: Liverpool Bay Marine SPA (SPA) and National Nature Reserve

2.3.3 Offshore Human Environment

A brief summary of the key issues concerning the human environment for the offshore

locations of The West of Duddon Sands Offshore Windfarm site and cable corridors are provided below.

2.3.3.1 *Other existing and planned installations in the vicinity*

Large-scale offshore wind energy activities are planned in the East Irish Sea. Barrow Offshore Windfarm, Ormonde Offshore Windfarm and the adjacent Walney Offshore Windfarm are constructed and operational. There are several active oil and gas fields in the vicinity of the West of Duddon Sands Offshore Windfarm. Windfarm locations and oil and gas fields are shown in Figure 2.6 below:

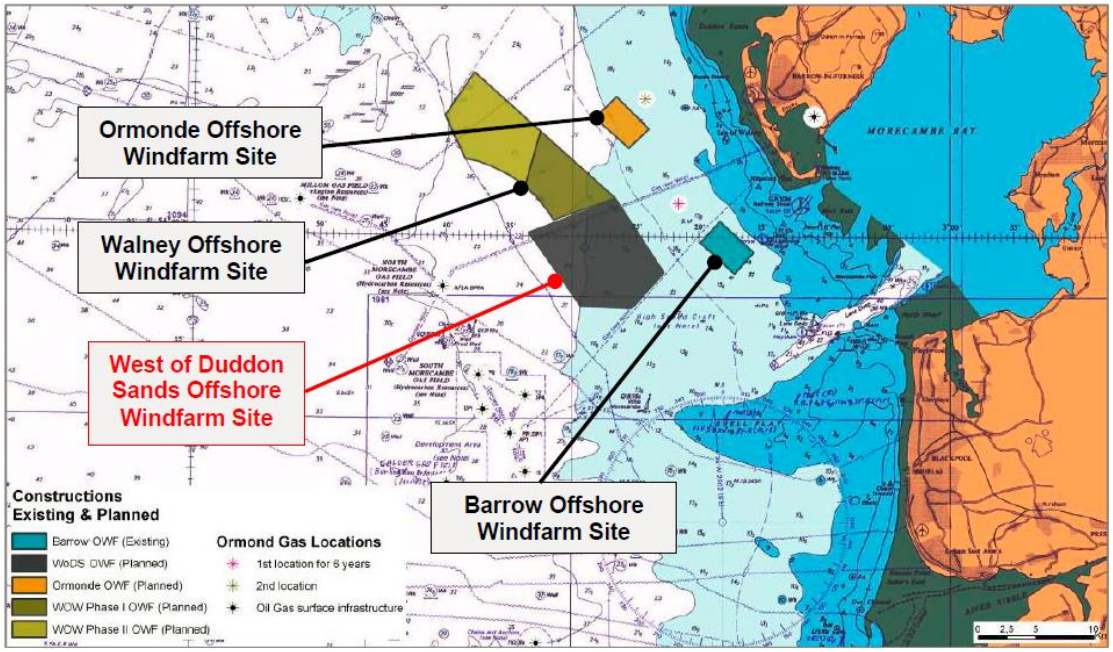


Figure 2.6: Existing and planned constructions in the vicinity of The West of Duddon Sands Offshore Windfarm

2.3.3.2 *Navigation*

Information about navigation in the area was obtained in 2012 from a 28-day maritime traffic survey carried out in support of a navigational risk assessment conducted for the West of Duddon Sands Offshore Windfarm[4]. The survey used a combination of shore-based radar, Automatic Identification System (AIS) and visual observations. Figure 2.7 below presents data collected in 2012.

[4] West of Duddon Sands Safety Zone Application, Anatec Ltd, October 2012

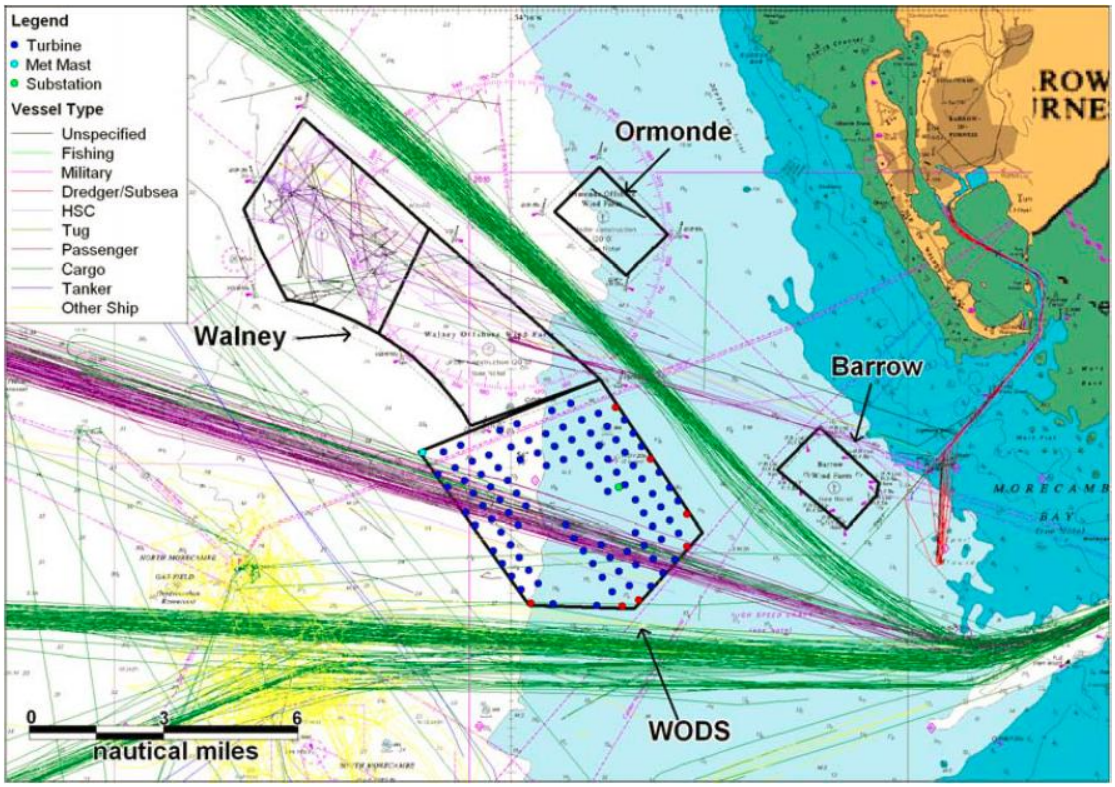


Figure 2.7: Updated AIS Shipping Tracks (28 days, June 2012)

Sixty-nine tracks passed through the West of Duddon Sands site during the June 2012 survey, an average of approximately three vessels per day. The vast majority of these vessels were the Ben-My-Chree ferry travelling between Heysham and Douglas which passes NW/SE through the WDS Offshore Windfarm site. The navigational risk analysis (NRA) identified that the WDS site is expected to displace NW/SE traffic to the south, hence increasing the congestion and the rate of encounters/collisions in this area. The anticipated re-routeing is illustrated in Figure 2.8, which includes the consented West of Duddon Sands Offshore Windfarm too.

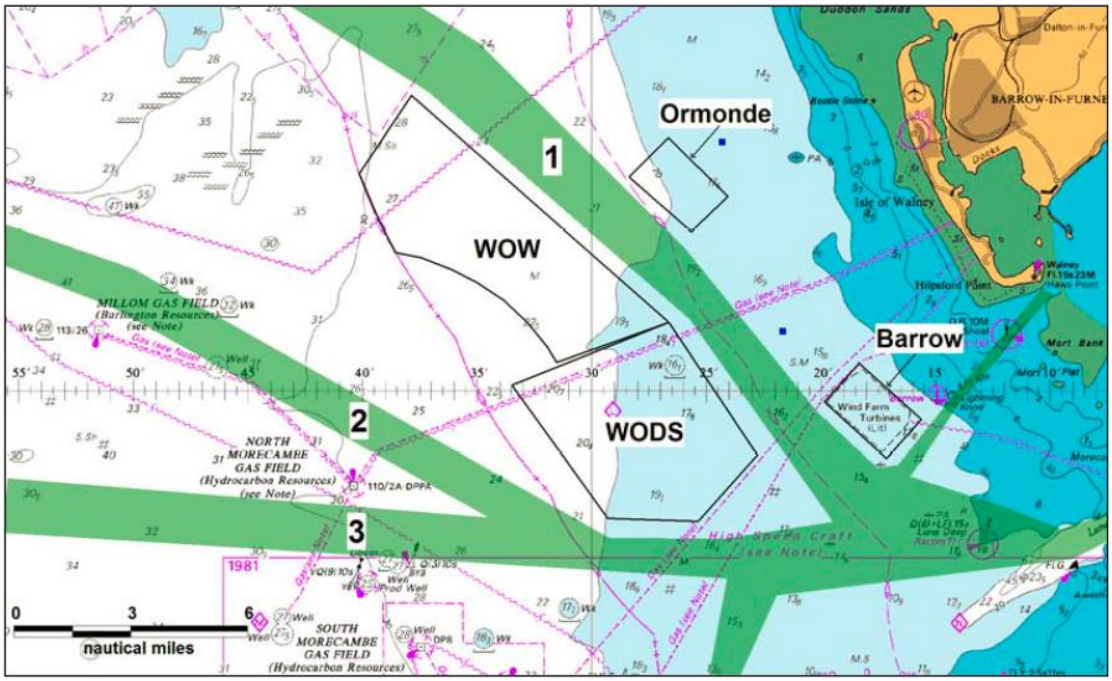


Figure 2.8: Anticipated Cumulative Impact of all NW Windfarms on Main Shipping Lanes (Anatec, 2012)

Although no operational safety zones are planned at West of Duddon Sands, experience at existing windfarms has indicated that merchant ships are likely to avoid the entire windfarm area during both construction and operation. Ships of any reasonable size are very unlikely to attempt to pass between turbines. The regular nature of the traffic should mean that the ferries can revise their passage plan (i.e., waypoints adjacent to West of Duddon Sands) at the start of operations with minimum disruption.

During decommissioning, a safety zone is expected to be established to prevent vessels not associated with the development work from entering the site.

2.3.3.3 *Commercial fishing*

National fisheries statistics are recorded by ICES statistical rectangles. The WDS site straddles the boundary between rectangles 37E6 and 36E6, with the greater proportion of the site area located in 36E6.

Fishing activities are not evenly distributed over the area. There are two large areas of concentrated activity to the north and south of the wind farm site and a smaller area immediately to the west of the site. The area of activity to the north of the site is the main area of nephrops fishing which accounts for the majority of the nephrops. A relatively small proportion of the southern extremity of this ground lies within the northern boundary of the wind farm site.

2.3.3.4 *Offshore Cultural Heritage*

A Written Scheme of Investigation (WSI) has been developed for the project to address the Marine Licence conditions relating to marine archaeology[5]. The WSI includes mitigation measures including exclusion zones around sites of archaeological potentials, requirements for further investigations, reporting requirements and finding procedures. Best practice guidance at the time of decommissioning (such as Historic England's Management of Research Projects in the Historic Environment (MoRPHE)[6] and The Crown Estate's Protocol for Archaeological Discoveries[7]) will be followed throughout the decommissioning phase of the West of Duddon Sands offshore windfarm. Decommissioning work will be undertaken in accordance with agreements made with Historic England and Lancashire County Council.

Sidescan sonar and magnetometer surveys were undertaken as part of the environmental impact assessment (RSKENSR, 2006) and anomalies identified were graded as of High, Medium, Low or Very Low archaeological potential during initial processing based on the sidescan image. After detailed analysis 280 anomalies of potential archaeological interest were identified from the sidescan sonar data within the windfarm area and route of the export cable. Of these, two sites within the windfarm area were considered to be of high archaeological potential; 44 of medium potential, and 173 of low or very low potential. None of the anomalies within the cable route were considered to be of high potential, 32 were considered to be of medium potential and 30 to be of low or very low potential. Similar analysis of the magnetometer data identified 15 anomalies within the windfarm area and 46 within the

[5] West of Duddon Sands Marine Archaeology Written Scheme of Investigation, RSK Environment Ltd for Scottish Power Renewables (WODS) Ltd and DONG Energy West of Duddon Sands (UK) Ltd, Document No P41315/Rev01, August 2012

[6] English Heritage, Management of Research Projects in the Historic Environment (MoRPHE), 2006

[7] The Crown Estate, Protocol for Archaeological Discoveries - Offshore Renewables Projects, December 2010

export cable route that could be of marine archaeology interest.

Figure 2.13 following illustrates the anomalies from the sidescan sonar and magnetometer surveys undertaken for the Environmental Statement.

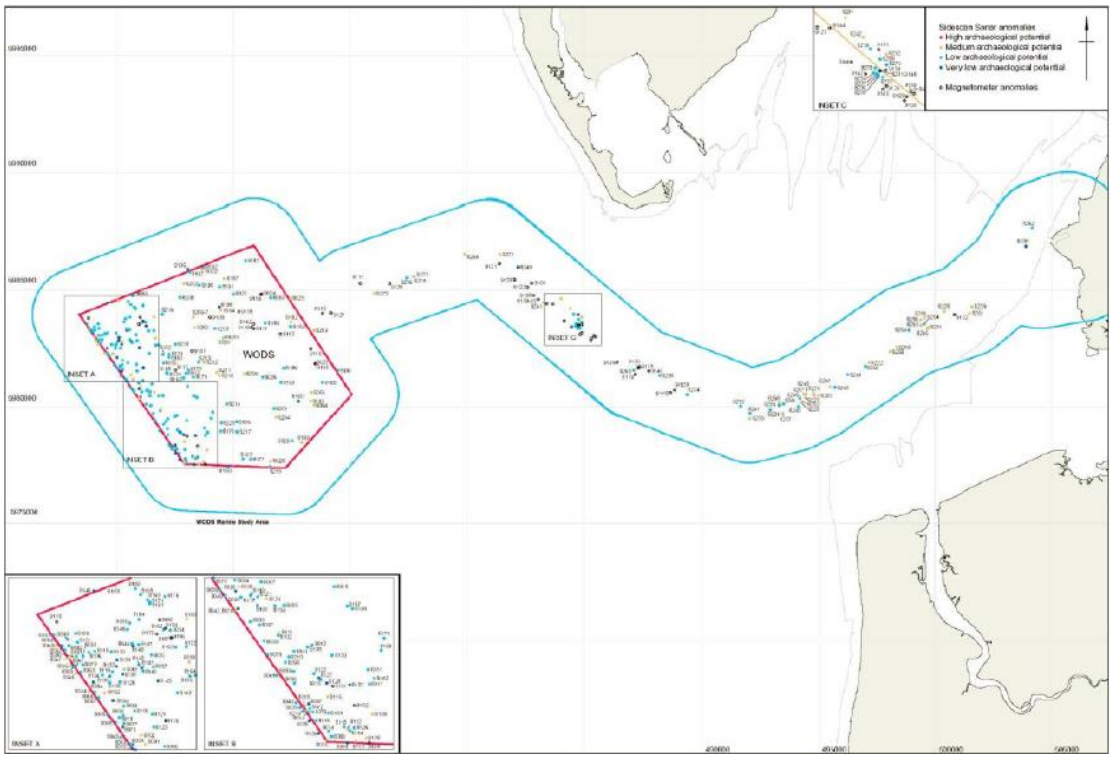


Figure 2.13: Sidescan Sonar and Magnetometer Anomalies (RSKENSR, 2006

2.3.3.5 *Dredging and military*

Anatec (2012) reports an aggregates dredging area approximately 13.7nm to the northwest of the WDS site. Dredgers were identified in the maritime traffic survey heading between the dredge area and the ports of Morecambe Bay. These vessels were considered likely to be affected in a similar manner to the merchant vessels discussed above (section 2.3.3.2).

Based on the 13.7 nm separation distance between the dredging licence area and the proposed windfarm, there will be no impact during active dredging operations. However, the maritime traffic survey, corroborated by the supplementary data supplied by British Marine Aggregate Producers Association (BMAPA), identified occasional dredger transits between Morecambe Bay ports and Area 331 passing through the proposed WDS site (average of one transit per week).

2.3.3.6 *Telecommunications*

Within the immediate local area there are a total of seven submarine telecoms cables, all of which cross the Irish Sea, either to Ireland or the Isle of Man. The majority of these have their UK landfall to the south of the proposed windfarms in the Southport and Blackpool areas. It is understood from currently available data that none of these run through WDS.

There are a total of ten television and two radio transmitters in the region that could be impacted by the presence of the turbines. The closest television transmitter is located in Barrow-in-Furness. Normally, television transmission does not present an issue for offshore windfarms, however, there remains a possibility that transmissions being received on the Isle of Man from the mainland UK transmissions could be affected.

There are also a number of telecommunications companies with mobile phone facilities and services in the area. In addition, there are two communications links (14173 and 26376) which interact with WDS. These are both microwave links operated by Centrica HRL for the purposes of communicating with the gas platforms in the Irish Sea. PagerPower was contracted by the consortium to identify the extent of the projects interaction with those links and advise on suitable mitigations.

2.3.3.7 *Military Exercise Areas*

The nearest military exercise area to the West of Duddon Sands Offshore Windfarm is the Ekmeals Firing range, which is situated on the coast near Ravenglass, approximately 30km north of Barrow. The firing range extends offshore 75km west and 40km south, with the southern boundary adjoining the north-western boundary of the West of Duddon Sands Offshore Windfarm site.

2.3.3.8 *Oil and gas*

Hydrocarbon exploitation is on-going in the northern part the East Irish Sea at numerous locations, and export gas via three pipelines to the Morecambe Bay gas terminal. The terminal is located between Barrow-in-Furness and Rampside.

3 Descriptions of items to be decommissioned

This section of the Decommissioning Plan contains details of all items which WoDS Transmission plc believes will form part of the scope of future offshore decommissioning works. The scope has been broken down into two separate areas:

1. Offshore Substation
2. Subsea Cables (Export)

3.1 Offshore Substation

Along with the individual wind turbine generators, the West of Duddon Sands Offshore Windfarm includes an offshore substation. The main purpose of the offshore substation is to house the electrical high and medium voltage components for transformation of the 36 kV voltages produced by the wind turbines, to 155 kV voltages that are exported to the onshore substation.

The Offshore Substation consists of a topside module placed on top of a jacket foundation. Components housed within the topside module will include two main transformers, one 170 kV gas insulated switchgear and one 36 kV switchgear. Besides the high and medium voltage components, the offshore substation is also equipped with a low voltage system supplying electrical power and lighting, emergency power by UPS, fire detection systems and communications equipment.

The topside module comprises a multi-storey steel structure with three deck levels as well as an open top deck, as shown in Figure 3.3. Access walkways and stairs are placed outside the walls of the modules.

The overall dimensions of the topside module are approximately 30 m long by 18 m wide, with a height of approximately 17 m, excluding the antenna mast, cantilevered walkway areas and other minor items. The weight of the topside module is approximately 1,655 tonnes.

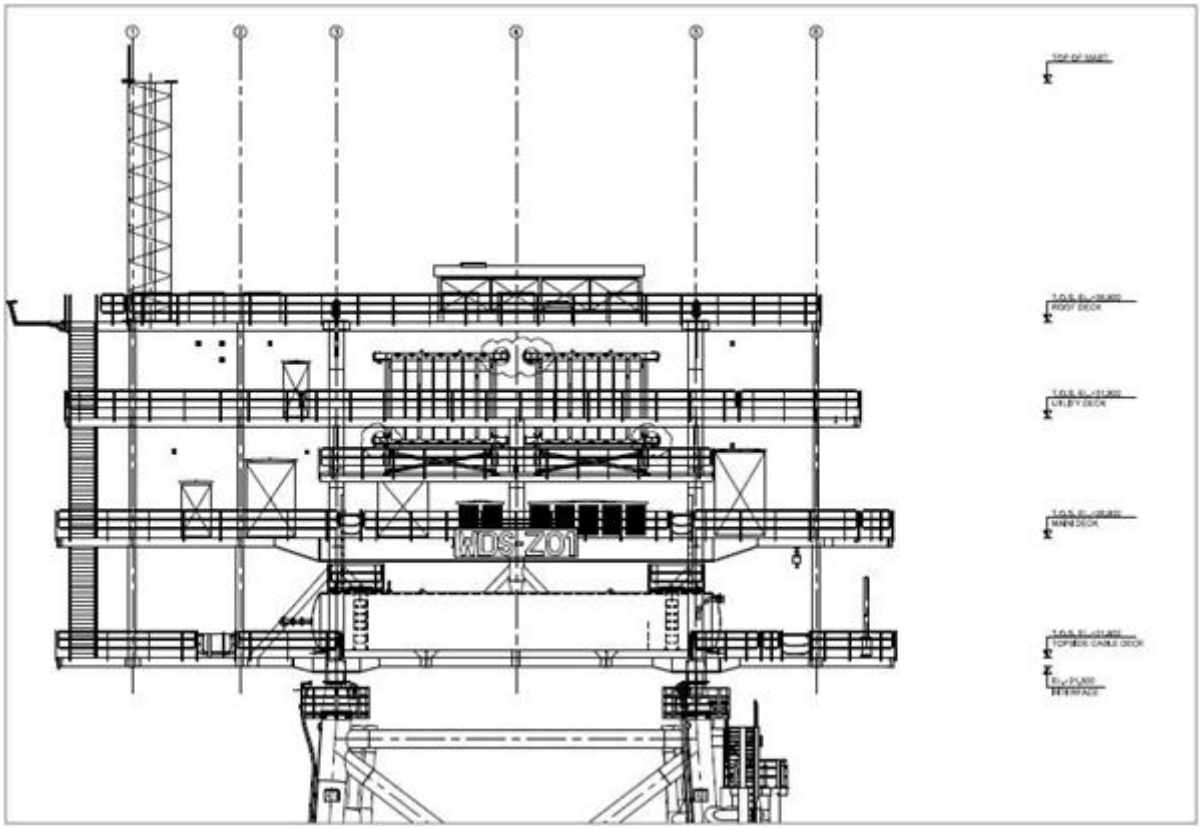


Figure 3.1: Elevation of Topside Module

The jacket foundation, which forms the foundation for the offshore substation, is formed of a lattice steel structure, as shown in Figure 3.4. Boat landings, intermediate platforms and ladders have been placed on the jacket foundation to ensure proper access to the topside module.

The jacket foundation is held in place with four 2.1 m diameter hollow steel piles, each of which has been driven approximately 29 m into the seabed. The weight of the jacket foundation is approximately 1,165 tonnes.

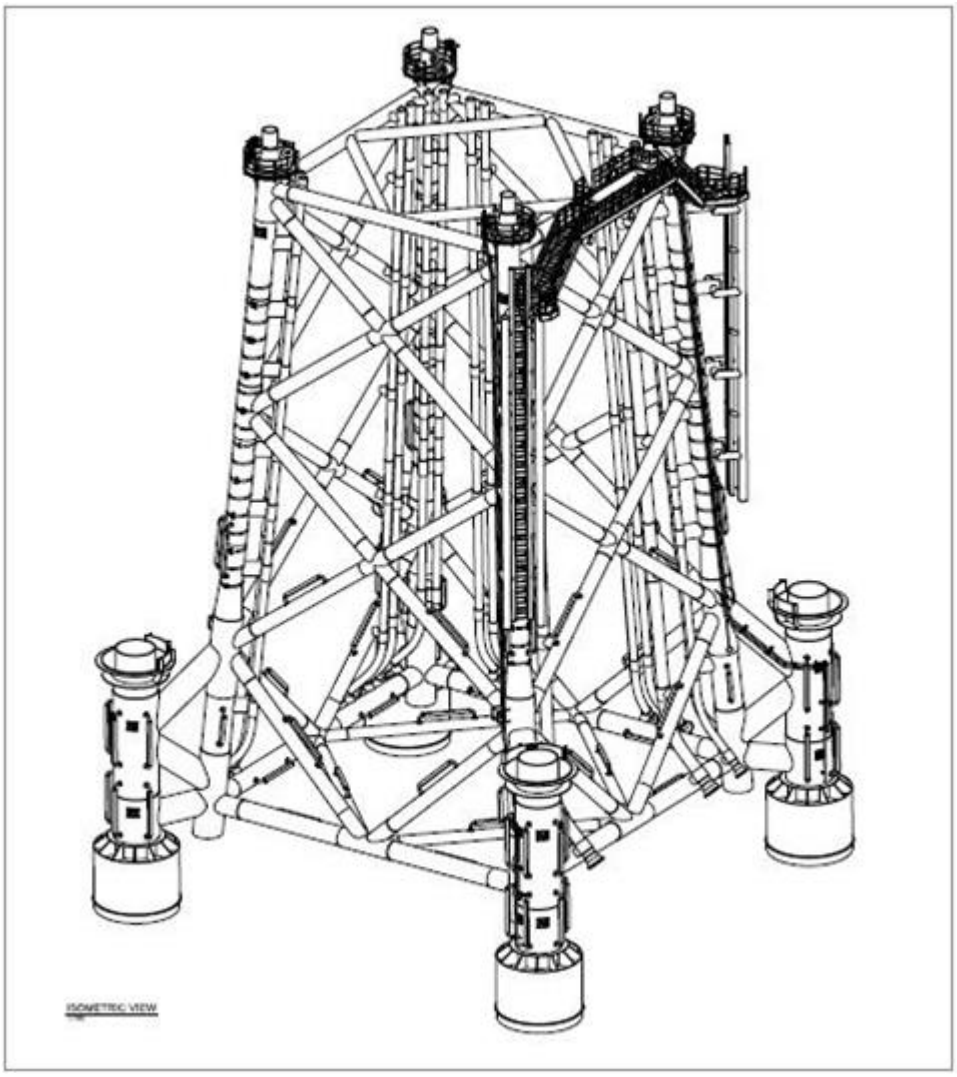


Figure 3.2: Isometric view of Jacket Foundation

The items to be decommissioned are as follows:

- All of the Topsides equipment and transformers. As this equipment has been installed in modular components, it will be lifted away in a similar fashion;
- The Topsides support structure;
- The Jacket structure, including all of the appurtenances such as J-Tubes and boat access systems;
- The piles, which will be cut off at 1m below seabed level at the bottom of any scour hole

The sections of cable (both Export owned by WoDST and Inter-array owned by JV West of Duddon Sands) which emanate away from the Offshore Substation from the exit point of the bellmouth on the J-tube to the touchdown point on the seabed and out further to the transition point where cable burial starts in the seabed. This will typically be a section of cable 10-25m long. All cables left within the J-tubes will also be recovered.

3.2 Export Cables

The export cables are single armoured three core 1000mm^2 Cu with cross linked polyethylene (XPLE) insulation rated 170kV, shown in Figure 3.3.

Conductor cross section	1000 mm²
Conductor material	Copper
Conductor design	Stranded, compacted
Conductor outside diameter	39.3 mm
Conductor shield material	Extruded semi conduct. PE
Conductor shield thickness	1.4 mm
Insulation material	Extruded XLPE
Insulation thickness	18.0 mm
Insulation shield material	Extruded semi conduct. PE
Insulation shield thickness	1.5 mm
Longitudinal water barrier: conductor / sheath	yes / yes
Metallic sheath material	Lead alloy
Metallic sheath thickness	2.7 mm
Inner sheath material	Semi conducting PE
Inner sheath thickness	2.5 mm

Bedding material	Polypropylen yarn
Armouring material, design and no. of wires	Galvanized steel wires, 84
Armouring thickness	7.0 mm
Outer cover material	Polypropylen yarn and bitumen
Total cable outside diameter	232 mm
Cable weight in air	107 kg/m
Cable weight in water	78 kg/m
Min. allowed bending radius during laying	3.5 m
Min. allowed bending radius during installation	2.4 m
Min. allowed bending radius on drum / turntable	2.0 m
Min. allowed bending radius during installation **one phase**	1.4 m
Min. allowed bending radius, single bending **one phase**	1.2 m
Max. allowable pulling force in the armouring (straight pull)	276 kN
Min. inner diameter of J-Tubes and pipes in foundations	590 mm

Figure 3.3: 33kV 3 Core Copper Cable diagram (left) and illustration (right).

There are two Export Cables which connect the WoDS Transmission plc offshore assets to the onshore assets. Their positions are illustrated in Figure 2.1. They are buried to 1-2m beneath the seabed depending on localised seabed conditions.

The Export Cables will for the most part be left buried in situ and will not form part of the decommissioning works. The exceptions being the sections of cable close to the Offshore substation and in areas of high seabed mobility. (See Section 4.3.3)

The sections left in place will also include the sections of cable which cross the subsea pipelines and other cables.

3.3 External Cable Protection

In addition to the removal of cable sections as identified in 3.2 above, any external cable protection will also be recovered.

An assessment will be made immediately prior to decommissioning to establish if the removal of this external cable protection would potentially cause more damage to the environment. It is possible that these features may have formed artificial reefs and as such may be better left in place and undisturbed.

4 Descriptions of Proposed decommissioning measures

This section of the Decommissioning Plan describes the measures to be taken for the decommissioning of the WoDS Transmission plc assets.

4.1 Adherence to relevant legislation & guidance

The proposed decommissioning measures set out in the following section aim to adhere to the following key UK and International legislation and guidance notes (please note this list is not exhaustive):

- Decommissioning of offshore renewable energy installations under the Energy Act 2004: Guidance notes for industry, DTI, January 2011
- 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, DTI
- Guidance documents on offshore wind farms by the OSPAR Commission – Protecting and conserving the North-East Atlantic and its resources
- Guidelines for environmental risk assessment and management, DEFRA, September, 2002
- United Nations Convention on the Law of the Sea (UNCLOS), 1982

Other legislation of relevance 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) 2007
- Appropriate Health & Safety Regulations

In considering the proposed decommissioning programme for the WoDS Transmission assets, WoDST has sought solutions for each offshore element of the wind farm that adhere to the following principles:

Guiding principle	Comments
No harm to people	WoDST is committed to adhering to the highest standards for health and safety throughout the lifecycle of the WoDST assets. WoDST seeks to promote safe practices and minimise risk in the development and implementation of de-commissioning solutions.
Consideration of the rights and needs of legitimate users of the sea	WoDST respects the rights and needs of other users of the seabed. Decommissioning activities will seek to minimise the impact on stakeholders and emphasis will be placed on clear, open communication.
Minimise environmental impact	The Best Practicable Environmental Option (BPEO), at the time of considering the precise decommissioning procedure, will be chosen in order to minimise impact on the environment at an acceptable cost.
Promote sustainable development	In decommissioning the WoDST assets, WoDST will seek to ensure that, as far as is reasonably practicable, future generations do not suffer from a diminished environment or from a compromised ability to make use of marine resources.
Adhere to the Polluter Pays Principle	WoDST's decommissioning and waste management provisions acknowledge our

	responsibility to incur the costs associated with our impact on the environment.
Maximise the reuse of materials	WoDST is committed to maximising the reuse of waste materials and pays full regard to the 'waste hierarchy'.
Commercial Viability	In order that commercial viability is maintained, the Best Available Technique Not Entailing Excessive Cost (BAT-NEEC) decommissioning solutions will be sought.
Practical Integrity	Solutions that are necessary to achieve one or more of the above objectives must be practicable.

4.2 Co-ordinating decommissioning

A number of other offshore windfarms are located in close proximity to the West of Duddon Sands Offshore Windfarm, including Ormonde Offshore Windfarm, Barrow Offshore Windfarm and Walney Offshore Windfarm.

Due to the offshore wind farm construction activity completed and/or planned in the East Irish Sea, it is conceivable that these wind farms will require decommissioning at similar times to WoDS Transmission plc assets and West of Duddon Sands Offshore Wind Farm. During the planning stages of decommissioning, WoDS Transmission plc will endeavour to liaise with the owners of other offshore installations in the vicinity of the West of Duddon Sands Windfarm, to phase the decommissioning process and look for potential partnerships where possible. This may minimise environmental impact, costs for vessel transport, staff and equipment, and make greatest utilisation of onshore handling facilities.

4.3 Plan of Works and Integration

A detailed plan of work will be prepared for the decommissioning works at least one year ahead of the proposed decommissioning date and will incorporate the results of a detailed and recent EIA on the subject. The process supporting the EIA will include pre-decommissioning surveys. The plan of work will include detailed Method Statements together with project specific hazard and risk assessments. WoDS Transmission plc will also liaise with other developers in the Eastern Irish Sea area, including JV West of Duddon Sands, to ensure that potential synergies for decommissioning facilities are investigated.

4.4 Proposed Method of Removal

The detailed Method Statement for the Decommissioning Plan will cover:

- Health and safety considerations
- Best Practicable Environmental Option (BPEO), the option which provides the most benefit or least damage to the environment as a whole in both the long and short term, at an acceptable cost; and
- Safety of surface and subsurface navigation.

For the decommissioning of the wind farm components which have to be removed, the installation methodology is generally reversed. The proposed methodology of removal has been split for the three separate areas as follows:

1. Scour Protection
2. Offshore Substation
3. Subsea Cables

4.4.1 Scour Protection

Scour protection materials, associated with the export cables, will not be completely removed during decommissioning. By their nature these materials would be difficult to recover and may provide useful marine habitat as artificial reefs by the time of decommissioning. Relevant stakeholders and regulators will be consulted to establish what the best approach is. If removal is deemed necessary, the removal sequence is anticipated to be:

- For rock armour, the individual boulders are likely to be recovered using a grab vessel, and transferred to a suitable barge for transport to an approved onshore site for appropriate disposal or re-use;
- The filter layer is likely to be dredged and transported to be disposed of at a licensed disposal area (this could be offshore or onshore)

4.4.2 Offshore Substation

It is expected that the offshore substation 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 the following:

- De-energise and isolate required electrical control and power cables from national grid and SCADA system;
- 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 Gas Insulated Switchgear supplier to ensure the safe removal of the SF6 Gas;
- Cutting welded stab-in connections between topside and foundation

Once this is complete, the topside will be lifted onto a barge for removal from the site. It is expected that the topside will be transported to shore where it will be dismantled, with electrical equipment and oil from transformers being removed and parts processed for reuse, recycled or disposal.

The justification for described removal of the topsides is outlined below:

Criterion	**Complete removal**
No harm to people	Safest option, involving standard procedures and minimal work offshore.
Consideration of the rights and needs of legitimate users of the sea	Complete removal of structure best long-term solution. Appropriate notification and consultation would precede temporary works/disturbance.
Minimise environmental impact	Risk of spillage slight as all pollutants are fully contained and removed in a few con-trolled lifts. The majority of dismantling takes place onshore
Promote sustainable development	Materials completely removed from site, ensures future generations do not suffer from a diminished environment or from a compromised ability to make use of marine resources.

Adhere to the Polluter Pays Principle	Entirely consistent: owner pays full cost of removal and disposal.
Maximise the reuse of materials.	Maximum potential for reuse of materials.
Commercial Viability	Most commercially viable solution: minimal works offshore, maximum resale/reuse value from materials, minimum residual risk.
Practical Integrity	Main risk is heavy lift and this can be mitigated by use of correct procedures and capable vessels and equipment. Most practical method.

The complete 'topside' structure will be removed in a single lift, taken by suitable vessel to an onshore facility where the equipment and structure will be dismantled and the constituent parts processed for reuse, recycling and or disposal.

Once the topside is removed, the jacket foundation will be decommissioned by cutting the legs of the jacket structure just above the piles approximately 1m below the seabed, and removed by crane. This will be achieved either through excavation outside and inside of piles to approximately 0.5m below anticipated level of cutting (including removal of scour protection or debris around the base of the foundation) or by use of a vibrator to facilitate lifting of the jacket out of the ground. The jacket will then be lifted onto a transport vessel and transported to shore for reuse, recycle or disposal.

The following table compares and contrasts the options of complete removal of foundations with the alternative of cutting 1m below seabed as described above. The same considerations apply to the foundations used for transformer platforms and met masts.

Criterion	**Complete removal**	**Cutting below seabed**
No harm to people	High risk to personnel associated with lifting extreme weights. Risk compounded by significant length of time needed to undertake works offshore. Diver operations would be required.	Fewer activities to be under-taken over a shorter time period offshore, minimising risk to personnel. Post decommissioning site monitoring will identify any unlikely exposure with the result that safety risk is insignificant.
Consideration of the rights and needs of legitimate users of the sea	Disadvantages to other users of the marine environment include disruption over a longer time period whilst the works are undertaken and remaining scour holes associated with excavation.	No risk presented providing cutting is to sufficient depth, site is monitored post decommissioning; any unlikely exposure identified.
Minimise environmental impact	Excavation pits over a wide area causing significant impact to marine environment. Associated dumping of excessive volume of waste material also required. Disturbance would take place over long time period. Some artificial reef habitat may be lost, but long term risk of decay and pollution will be eliminated.	Considerably reduced works footprint relative to complete removal. Works would take place over reduced time period and involve less equipment. Seabed recovery time shorter than complete removal scenario. Some artificial reef habitat may be lost, but long term risk of decay and pollution will be eliminated.

Promote sustainable development	In the long term complete removal affords maximum flexibility over use of seabed, though considerable destruction over the whole site in short-medium term	Some activities may be limited at the locations: Providing remaining structures do not become exposed most future activities will not be affected. Seabed recovery is highly likely.
Adhere to the Polluter Pays Principle	Consistent in principle, assuming a suitable disposal solution can be found for the excavated waste material and that the seabed can be restored.	Consistent as far as is reasonably practicable – all remains to be suitably buried.
Maximise the reuse of materials.	Maximum material potentially available for reuse.	Less material available for reuse relative to complete removal.
Commercial Viability	Not commercially viable – excavation and extreme lifting involves major equipment requirements over longer periods of time	Less expensive alternative to complete removal, involving minimal excavation.
Practical Integrity	Not a practical solution: Extreme risk associated with heavy lift, considerable excavation needed with associated storage or disposal of large volume of waste.	Standard procedures and equipment.

This analysis shows that cutting below seabed is preferable to complete removal on the grounds of safety, practical integrity and commercial viability.

WoDST considers that there is consistency between this proposal and the relevant circumstances set out in DTI/DECC guidance:

- Entire removal would involve extreme cost.
- Entire removal would involve an unacceptable risk to personnel.

It is also noted that this approach is standard practice within the oil and gas industry for similar structures.

Although WoDST is committed to cutting foundations below seabed, contingency plans will be put in place to ensure appropriate actions are carried out in the case that remaining structure(s) become exposed. Please see Section 10 for details.

On current knowledge, abrasive diamond wire cutting is likely to be the preferred method for cutting all the foundation structures at or below seabed.

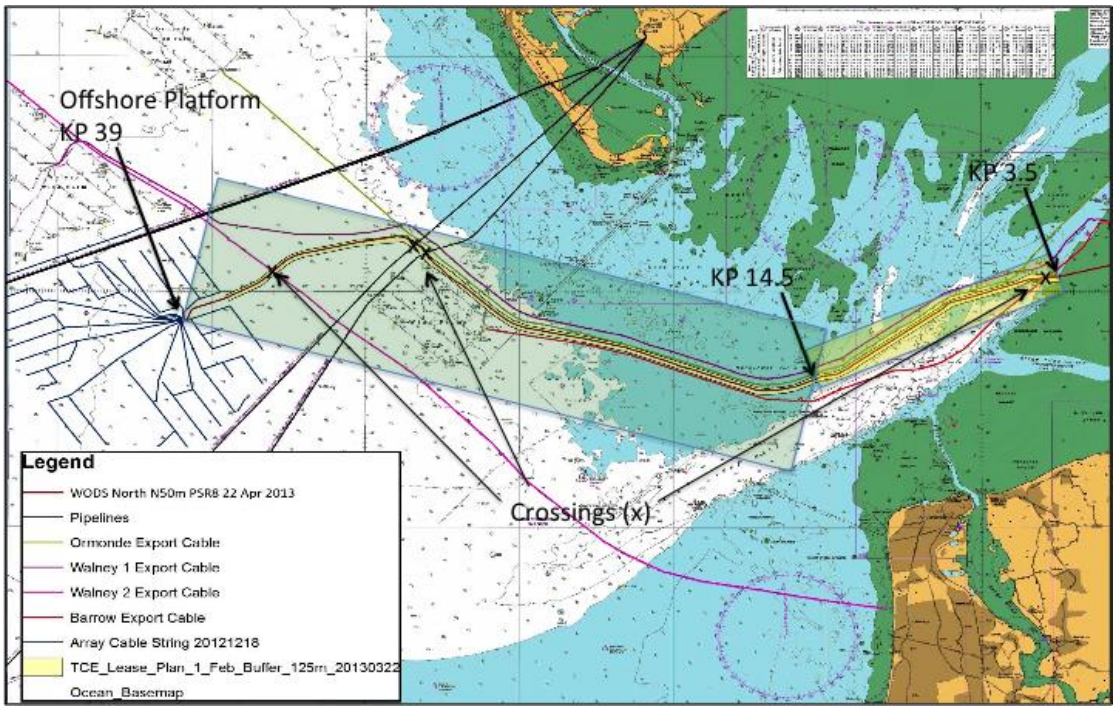
The use of divers for any of the removal works will be minimised and if possible eliminated completely.

The general methodology for decommissioning of the offshore substation platform monopiles is likely to be as follows:

- Operate cutting procedure at or below seabed
- Remove transition piece and upper part of monopile as a single object using suitable lifting vessel
- Transport to onshore location for offloading/disposal
- Remove internal equipment, disassemble onshore

4.4.3 Offshore Export Cables

Relevant stakeholders and regulators will be consulted to determine which sections of the offshore cables will need to be removed. If there are no issues with stakeholders/regulators and the risk of the cable becoming exposed is minimal as determined by a seabed mobility study undertaken by WoDST in 2015, then it is likely that the cable will be left in situ such as in the area marked by the pale green shaded rectangle on the chart below from around Kilometre Point ("KP") 14.5 to KP39 at the location of the offshore substation platform. The ends of the cables will be cut as close to the foundation as possible either prior to foundation removal, or at the same time. The ends will be weighted down and buried (probably using an ROV) to ensure they do not interfere with vessels etc. At cable or pipeline crossings (marked by "x" on the diagram below) the cables are likely to remain in place to avoid unnecessary risk to the integrity of the cable or pipeline. In areas where there is a significant risk of the cable becoming exposed following decommissioning as determined by a seabed mobility study undertaken by WoDST in 2015, then it is likely that the cable will be removed such as in the area marked by the pale yellow shaded rectangle on the chart below from around KP 3.5 to KP14.5.



The following table compares and contrasts the options of complete removal of the export cables with the alternative of cutting and leaving in situ.

Criterion	Complete removal	Leaving in situ
No harm to people	Risk to personnel not excessive	Cable buried within stable seabed does not pose safety risks to marine users

Consideration of the rights and needs legitimate users of the sea	Removal affords maximum flexibility over use of seabed	Cable buried within stable seabed does not pose safety risks to marine users
Minimise environmental impact	Given the considerable length of cable and the need for jetting techniques, removal would cause considerable damage and disruption to the seabed and established communities. These impacts could be considered large relative to the environmental gains from removal.	Benign - no environmental impact associated with long term disintegration of buried cables.
Promote sustainable development	Though considerable 'troughs' would remain on the seabed in the short-medium term, complete removal affords maximum flexibility over use of seabed in the long term.	Some future activities may be limited, e.g. extraction
Adhere to the Polluter Pays Principle	Consistent, assuming suitable disposal option is found for surplus cable components	Benign, no pollution risk
Maximise the reuse of materials.	Maximum material, e.g. copper, potentially available for reuse	No reuse possible if left in situ
Commercial Viability	Expensive operation, off-set to an extent by copper resale value	Limited cost involved with re-burial of cable 'ends'
Practical Integrity	Possible to undertake. Likely to cause damage to marine environment.	N/A

In the areas where removal of export cables is agreed, the following process is likely to be employed:

- Identify the location of the cables that need to be removed;
- 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 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. This is likely to be carried out using a water jetting tool similar to that used during cable installation;
- 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 onboard before transport to shore;
- Parts will be processed for reuse, recycle or disposal.

In order to avoid potential damage to the subsea pipelines and other cables, the offshore cables at the crossing points will not be removed.

4.5 Summary of Proposed Decommissioning Measures

A summary of the proposed decommissioning measures for the offshore components of the West of Duddon Sands Offshore Windfarm are outlined in the following table:

Component	Proposed decommissioning measure
Scour protection	Left in situ
Offshore substation	Complete removal of topside from site. Removal of jacket foundation and cut off of piles at 1m below seabed for removal
Export cables	Preferably left in situ from KP0-3.5 and KP14.5-39 and removed from KP3.5 -14.5 but dependent on stakeholders' views based upon survey results prior to commencement of decommissioning

4.6 Proposed Waste Management Solutions

Waste management will be carried out in accordance with all relevant legislation at the time. It is intended that the vast majority of all elements of the offshore wind farm will be taken back to land for reuse and recycling.

4.7 Details of any items which may be left in situ offshore following decommissioning

As described in the previous sections, it is proposed to leave some sections of offshore cables and the embedded piles in the seabed. The basis of this decision is that the item in question meets 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:

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
4. Entire removal would involve extreme costs.

The primary reason for leaving cables buried and embedded piles in the seabed is that their removal is likely to cause a major impact to the environment and may require significant and dangerous diver involvement. The complete recovery of all of the pile structures would entail a major excavation of the seabed that would be very costly and hugely damaging to the environment in the area.

4.8 Lighting and Navigational Marking

The West of Duddon Sands project is committed to exhibiting the appropriate marks and lights during the decommissioning of the wind farm.

In regard to aviation safety, the shape, colour and character of the lighting will be compliant with the relevant legislation at the time and as directed by the Civil Aviation Authority and relevant authorities.

In relation to navigational safety, lights and marks will be agreed with Trinity House, in consultation with the Maritime and Coastguard Agency. In particular, Trinity House will be consulted 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 project will provide the necessary marking specified.

5 Environmental Impact Assessment

JV West of Duddon Sands completed an Environmental Impact Assessment (EIA) of the total project including OFTO assets and wind farms in 2006. The resulting Environmental Statement including assessment of the environmental impacts related to the decommission phase was submitted as part of the consent application.

When the final decommissioning measures are known, the WoDS Transmission plc will review the EIA in conjunction with JV West of Duddon Sands to assess the potential impacts that may arise and are not covered in the initial EIA process and subsequent reviews. At this point, a decision will be made as to whether a more detailed assessment is required. Key criteria for this decision include:

- An updated review, identification and assessment of potential impacts on the environment. Potential impacts upon both the physical, biological and human environments will be assessed. Planned surveys in and around the West of Duddon Sands Offshore Windfarm which could inform this process could include:
    - Geophysical surveys (side scan sonar);
    - Geotechnical surveys;
    - Benthic grab/trawl surveys;
    - Ornithological surveys;
    - Marine Mammal surveys; and
    - Fish surveys.
- An updated review, identification and assessment of potential impacts relating to interference with other legitimate uses of the sea. It is possible that the nature and/or intensity of human activities taking place on/around the West of Duddon Sands Offshore Wind farm site (including OFTO assets), such as commercial fishing, have changed over the lifetime of the project. A review will be undertaken to identify those activities with the potential to be affected by decommissioning
- An updated review, identification and assessment of the potential impacts of decommissioning on the local community, i.e. potential socio-economic impacts
- An updated review, identification and assessment of potential impacts on historic environment interests, in particular marine archaeological features.

If required, a specific EIA covering the decommissioning process will be prepared in conjunction with JV West of Duddon Sands, which will fill in any gaps in relation to the above. Furthermore, it will describe the measures envisaged to avoid and reduce, and if possible, remedy adverse impacts.

The use of explosives is not proposed, however should they be necessary during the course of decommissioning, the potential impact of these on marine life, particularly marine mammals, will be assessed. Should the need to use explosives arise, a comprehensive mitigation strategy will be proposed following all appropriate guidelines and regulations such as those set out by the Joint Nature Conservation Committee (JNCC).

6 Consultations with key stakeholder and general public

JV West of Duddon Sands maintained a high level of consultation with key stakeholders at a local and at a national level, from the scoping and Environmental Statement stage and past consent of the project to date for WODS. WoDS Transmission plc worked in conjunction with

JV West of Duddon Sands to ensure that this level of consultation was continued throughout the construction phase, as well as the decommissioning phase of the project.

WoDS Transmission plc has consulted on the draft Decommissioning Programme and has contacted a range of stakeholders including the following:

- Historic England;
- Environment Agency;
- Marine Management Organisation; Maritime and Coastguard Agency;
- Natural England; Peel Ports – Heysham Harbour; and
- Trinity House Lighthouse Service;

The plan was further made available on the project website for a period of 30 days.

In addition to consultation with these bodies, the West of Duddon Sands project also proposes to maintain close consultation with the local commercial fishing industry.

At the time of decommissioning, and in accordance with relevant clauses of the West of Duddon Sands Offshore Windfarm consent under Section 36 of the Electricity Act 1989, notices to mariners and other navigational warnings of the position and nature of the decommissioning activities taking place will be issued. Efforts will be made to ensure that this information reaches mariners in the shipping and fishing industry as well as recreational mariners. Timely and proactive communication with the fishing community will occur before decommissioning works. Activity will be widely advertised, the finishing industry will be consulted and operations carried out with regard to minimising impact on the fishing industry. The UK Hydrographic Office will be notified as appropriate on the progress and completion of the works.

6.1 Summary of Consultation Responses

Organisation	Date of response	Key Issues
Associated British Ports – Barrow	No response	**-**
Associated British Ports – Fleetwood	No response	**-**
Chamber of Shipping	No response	**-**
Environment Agency	30th March 2016	**No comments**
Historic England	No response	**-**
Joint Nature Conservation Committee	No response	**-**
Marine Management Organisation	23rd March 2016	**The MMO consider that decommissioning should ensure the removal of the foundations to a minimum of 1metre below seabed level, this will ensure that navigational safety is maintained.** **The MMO note from the proposal that the scour protection and export cabling is to remain "in-situ". The MMO advise that decommissioning should consider whether complete removal of all scour and sub-sea cabling is feasible, and that if this is not practical then this should be detailed within the decommissioning plan to clearly evidence the reasoning for leaving material "in-situ".** **The MMO believe that any decommissioning that allows "constructed" items to remain "in-situ" and un-monitored for an unexpected life-cycle could potentially pose a risk to both the environment in which it sits, and additionally a risk to other users of the sea through accidental interaction between infrastructure and third parties. The MMO therefore consider that any material remaining in situ should be subject to monitoring as long as that material remains, or sufficient evidence should be presented within the decommissioning plan to clarify why the material will not pose a long term risk.** **The MMO acknowledge the current commitment of undertaking geophysical surveys, post-decommissioning, at year points 1 and 5. However we would re-iterate our comments that**

		assuming infrastructure is left "in-situ" then long- term monitoring of the areas should be undertaken to ensure site integrity is maintained. **The WoDS development is now fully commissioned and the "as built information" should be incorporated into the decommissioning plan.** **The WoDS development is situated within a number of designated areas which may be expanded upon in future years. All known sites, and additional sites that maybe being considered for designation at the time of decommissioning should be considered within the decommissioning plan.** **Existing Transport Patterns and Coastal Processes – The draft plan states that "significant transports will only occur during strong offshore winds when waves are sufficiently large to disturb the seabed. Along much of the cable route into Morecambe Bay there are moderate to strong tidal currents sufficient to transport sand and pebbles even in the absence of waves". The MMO would again query the lack of post-decommissioning monitoring especially when it is being proposed that some of the infrastructure is to be left "in-situ".** **The MMO note that it is proposed that communication with all the respective other sea users prior to decommissioning will be undertaken. However, it should be part of this plan to detail how this engagement will take place and when.** **Continued navigational safety is paramount and early engagement with stakeholders will play a key role in ensuring navigational safety is maintained. It should be documented that Notices to Mariners will be issued and that The Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW) guidance will be followed.** **"During decommissioning…." It should be made clear as to what type of safety zone is to be employed as some are voluntary and do not require a formal safety zone application under section 95 of the Energy Act 2004.** **It should be noted that English Heritage are now known as Historic England.**

		A number of anomalies have been identified during the offshore cultural heritage investigations. Clarification as to what these anomalies are should be included in the decommissioning plan, giving details where further investigation was necessary. **The WoDS development is now commissioned and a number of surveys have been undertaken "post-construction" the current drafting of this section is considered in the current /future tense (i.e. "scour protection will…" these should be re-drafted to state have/has/did etc.).** **Consideration should also be given to any lighting and marking requirements within this section.** **The draft plan states that the piles from the jacket foundations will be cut off at 2m below seabed level. The MMO are content with this proposal. In addition, please refer to Point 1.** **The MMO advise that decommissioning should consider whether complete removal of all scour and sub-sea cabling is feasible, and that if this is not practical then this should be detailed within the decommissioning plan to clearly evidence the reasoning for leaving material "in-situ".** **External Cable Protection – The MMO are content with the proposal to carry out surveys prior to any removal of cable protection to ensure environmental integrity is maintained. However, should no "artificial reef" have developed and the cable protection is removed then how can it be determined that the cable will remain buried once the protection is removed? How will safety be maintained once the proposed 1 year and 5 year surveys have been completed?** **Adherence to Relevant Legislation & Guidance - The MMO consider the list to be incomplete (i.e. UK Marine Policy Statement, Waste/Water Framework Directives, Environmental Permitting Regulations 2007 (as amended) etc.) and would suggest the following drafting:** **The proposed decommissioning measures set out in the following section aim to adhere to the following key UK and International Legislation and Guidance Notes (please note this list is not exhaustive).**

		Scour Protection – The MMO consider it too early in the decommissioning process to determine whether scour protection will be fully removed or whether it would remain "in-situ", and we query which stakeholders and regulators were consulted to establish the "best approach"? **Additionally, should it be determined that scour material is to be dredged and/or disposed of offshore, then a site characterisation report would need to be undertaken at the identified site disposal area.** **The MMO advise that the Commercial Fishing Industry as well as other sea users who may be effected (i.e. Royal Yachting Association) should be engaged in any discussions regarding decommissioning proposals.** **The MMO consider that timeframes should be included in the details here, both for the reporting of any anomalies and for the rectifying/making safe those anomalies.** **We also consider that a geophysical survey 1 year after completion of decommissioning to be too long a timeframe, particularly as it appears to be uncertain whether all decommissioning activities will remove infrastructure to such an extent that navigational hazards can be ruled out.**
Maritime and Coastguard Agency	21st March 2016	**For the purposes of updating nautical charts and publications, the MCA requires a post-decommissioning high resolution swath bathymetry survey of the site and cable route to IHO Order 1a standard and the data and reports shared with the MCA and UKHO.**
Nation Federation of Fishermen's Organisations	No response	**-**
National British Marine Aggregate Producers Association	No response	**-**
Natural England	No response	**-**
North Western Inshore Sea Fisheries and Conservation Authority	3rd March 2016	**The West of Walney Marine Conservation Zone was designated in January 2016 and must be considered in section 2.3.2 Offshore Biological Environment.**

		Timely and proactive communication with the fishing community should occur before decommissioning works. Activity should be widely advertised, the finishing industry should be consulted and operations carried out with regard to minimising impact on the fishing industry.
Peel Ports – Heysham Harbour	No response	**-**
Royal Yacht Association	No response	**-**
Trinity House	**18th March 2016**	**No issues**

7 Costs

The costs associated with decommissioning the offshore transmission assets have been estimated by WoDS Transmission. The estimates cover the following subject areas:

- Design of removal techniques;
- Health, safety and environmental constraints
- Optimum removal techniques for major items;
- Logistics;
- Transportation and off-loading;
- Management and disposal of materials onshore;
- Survey requirements to confirm decommissioning works complete; and
- Potential post-decommissioning surveys and monitoring (if required).

As no additional equipment will be deployed during the decommissioning activities, the vast majority of the costs consist of the hire of vessels and equipment used to remove the structures. The current indications on costs are £3.39M.

8 Financial Security

WoDS Transmission plc is planned to be a Special Purpose Vehicle (SPV) designed solely for the operation of the WoDS Transmission plc assets. All consents, licences, loans, assets and revenues involved in the OFTO will be owned by WoDS Transmission plc. WoDS Transmission plc will provide adequate Financial Security to cover its obligations under this Decommissioning Plan without recourse to any of its shareholders, who may themselves change from time to time over the project life.

It is fully recognised that WoDS Transmission plc itself will have to provide funds to cover the main decommissioning activity that is expected to occur at the end of the 20 years.

The Company's decommissioning plan is based mainly upon the proposals put forward by JV West of Duddon Sands for the decommissioning of its wind farms and has been reviewed and amended as appropriate by Arup as technical adviser to the Consortium and Frontier Power who will provide management services to the Company once the Project has closed.

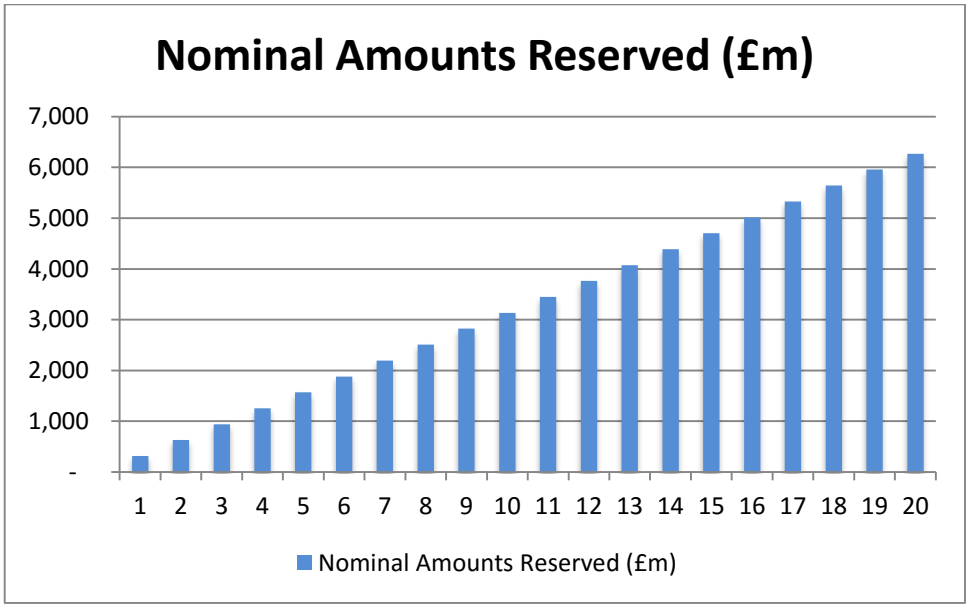
The acquisition of the OFTO assets by the Company will be financed through a mixture of equity (injected by Macquarie Group and 3i BIFML) and limited-recourse senior debt sitting in the Company. Upon completion of the transaction, OFGEM will grant the Company a transmission owner licence through which the Company will be entitled to receive a fully RPI-linked availability payment for a period of 20 years. It is to be noted that the Company's revenue entitlement is only linked to the availability of the OFTO assets and is in no way linked to the electricity production of the wind farm, thus showing great stability and resilience to downside events. Moreover, any penalties imposed by OFGEM through the licence will be limited to 10% of the revenues for a given year.

Regarding the financial security plan to cover future decommissioning liabilities, the Company is proposing to use a mid-life and continuous accrual decommissioning fund (the "Decommissioning Reserve Account" or "DRA"). Such an approach is stated as being normally acceptable in section 8.7 of the Guidelines.

Future decommissioning liabilities will materialise at the earliest 20 years after the grant of the licence. The DRA will be funded from year 11 to year 20 of the licence period through cash flows generated by the project. In order of priority, the DRA deposits will occur after payment of operating costs (O&M costs, insurance, administrative costs etc.) and after senior debt service (principal and interest payments) but before any equity distributions.

In the base case, the DRA will be funded through 20 deposits every semester from the start of year 11 to the end of year 20 of the licence period. These equal deposits will be calculated according to the decommissioning costs estimated by Arup and inflated with UK RPI for 20 years. The following schedule shows the nominal amounts deposited in the DRA in the base case:

Reserving Period	Licence period Year	% Reserve at start of period	Nominal Amounts Reserved (£m)
1	10	0%	314
2	11	5%	627
3	11	10%	941
4	12	15%	1,254
5	12	20%	1,568
6	13	25%	1,881
7	13	30%	2,195
8	14	35%	2,508
9	14	40%	2,822
10	15	45%	3,135
11	15	50%	3,449
12	16	55%	3,762
13	16	60%	4,076
14	17	65%	4,389
15	17	70%	4,703
16	18	75%	5,016
17	18	80%	5,330
18	19	85%	5,643
19	19	90%	5,957
20	20	95%	6,270
	20	**100%**	



Over the life of the project, the amounts to be deposited will be regularly updated:

- Yearly for actual inflation and forecasted inflation
- From time to time an update of the Project technical adviser decommissioning costs forecast, based on the then available market and technological information

WoDS Transmission plc believes the proposed structure and mechanics of ensuring the decommissioning obligations are met by a cash-funded account for 10 years is very prudent and offers a secure solution:

- A 10-year reservation period ensures protection against any potential decommissioning costs being brought forward;
- Arup has provided a thorough analysis of the Project's decommissioning obligations, providing a sound forecast for the magnitude of the costs;
- The Company is expecting to receive an investment grade credit rating from a recognised credit rating agency, supporting its healthy cash flows and ability to meet its decommissioning obligations with no liability carried over to the British public and as required under the OFTO Licence;
- The DRA is receiving cash injections after payments to senior debt in the cash flow waterfall, but is senior to any payments to equity holders;
- The proposed DRA is a cash reserve, providing a much more robust and readily available security than Letters of Credit, Bonds or reserve facilities;
- The total DRA reserve represents <10% of the total distributions to equity under the same 10-year period;
- The cash flow into the DRA is a maximum of 22% out of distributions to equity in any given year, increasing to 58% if the decommissioning costs are doubled;
- The Project's equity distributions are relatively back-ended (due to the RPI-linked nature of the Company's revenues under the licence) and thus provide sufficient support for any potential additional decommissioning burdens in the late stage in the Project's life; and
- Under the proposed decommissioning reserving structure, the decommissioning costs need to increase by approximately >500% before the Company cannot fully fund the DRA deposits, underpinning that the Company has got an extremely robust structure in place to fund its decommissioning obligations.

The above analysis shows that transparent and effective arrangements are in place to ensure the performance of the Company's decommissioning obligations through a 10-year, mid-life and continuous accrual decommissioning fund. The financial strength of a renewable energy project late in its operational life (compared to an Oil or Gas activity that depletes over time) is such that decommissioning obligations can be met from operational cash flows.

As outlined above, WoDS Transmission plc proposed structure shows robustness and ability to successfully meet the required obligations even under adverse changes to the timing or cost of the assets decommissioning. If requested by DECC, WoDS Transmission plc can provide further analysis and data (including financial model sensitivities) to show the resilience of the Company cash flows.

9 Schedule

A revised EIA may be commissioned two years ahead of the proposed decommissioning period (refer to Section 4). A detailed schedule of the decommissioning works will then be prepared a year before the start of the works taking on board the results of the EIA and its consultation process. Such schedules will be forwarded for DECC review and approval.

The schedules will clearly map out the sequence of decommissioning activities, providing detail for the offshore removal works. The Offshore Substation is expected to take up to three (3) weeks to decommission, remove and load onto a barge for transport to shore for recycling.

10 Project Management and Verification

The final Decommissioning Plan will provide information on how WoDS Transmission plc will manage the implementation of the decommissioning works and also provide assurance to the DECC concerning progress and compliance.

The project management of the decommissioning works will be undertaken with rigor expected of such a project. The OFTO 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 to schedule and in accordance with the requirements of the Decommissioning Plan.

11 Sea-bed clearance

In accordance with the Polluter Pays Principle, WoDS Transmission plc in conjunction with JV West of Duddon Sands proposes to clear the seabed in accordance with the provisions made in this decommissioning programme and Marine Licence, and to collect and provide evidence to reflect this.

Following decommissioning, surveys (e.g. side scan 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 seabed, which may have arisen from activities related to the WoDS Transmission plc, and which may pose a risk to navigation, other users of the sea or the marine environment.

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

Consideration will also be afforded to 'Archaeological Exclusion Zones' described in the project Written Scheme of Investigation, in order that these are not inadvertently cleared in the process of removing any potential wind farm debris. Analysis of the survey data will also ensure that items for removal and disposal relate only to the wind farm. The appropriate competent authority will be approached regarding the identification of other anomalies which may be of archaeological interest.

12 Restoration of the site

WoDS Transmission plc is committed to restoring the site and cable corridors to the condition it was in prior to construction, as far as it is reasonably practical. Consistent with the decommissioning provisions detailed above, the key restoration work will relate to:

- Ensuring that all cut foundations are made safe and adequately covered
- Ensuring that cable ends are adequately buried

Scour protection materials will not be completely removed during decommissioning. By their nature these materials would be difficult and almost impossible to recover and, in any case, they might provide useful marine habitat as artificial reefs by the time of decommissioning.

Active restoration by mechanical excavation is not considered, as it would pose an unnecessary risk to personnel and the environment. Allowing the sea to self-settle is considered sufficient and in proportion to the limited environmental impact of the proposed decommissioning. This latter approach is also proposed with respect to the in-filling of any scour pits left after the main decommissioning works. Any scour pits that form in this area will have been produced due to the presence of the monopile structures acting on local hydrodynamic processes. Upon removal of these structures, it is predicted that these scour pits will start to infill naturally.

13 Post-decommissioning monitoring, maintenance and management of the site

WoDS Transmission plc proposes that the following post-decommissioning monitoring surveys be carried out:

- Full geophysical survey (swath, sidescan, magnetometer). Survey to be carried out by independent survey contractor and all results issued to DECC for review and comment.
- High resolution swath bathymetry survey of the site and cable route to IHO Order 1a standard and the data and reports shared with the MCA and UKHO.

It is proposed that geophysical surveys be carried out 1 and 5 years after decommissioning has been completed.

Should any elements of the wind farm be detected to be protruding above the seabed, WoDS Transmission plc will notify the UK Hydrographic Office so that suitable notation of a potential anchoring hazard can be marked on relevant charts and mariners informed accordingly.

Following this notification, WoDS Transmission plc will undertake remedial decommissioning work to remove or re-bury these structures. The exact technique used for these remedial measures will depend on the type/size of the structure of the item(s) found to be protruding above the seabed, but are likely to be similar to those used in the primary decommissioning works.

14 Supporting Studies

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

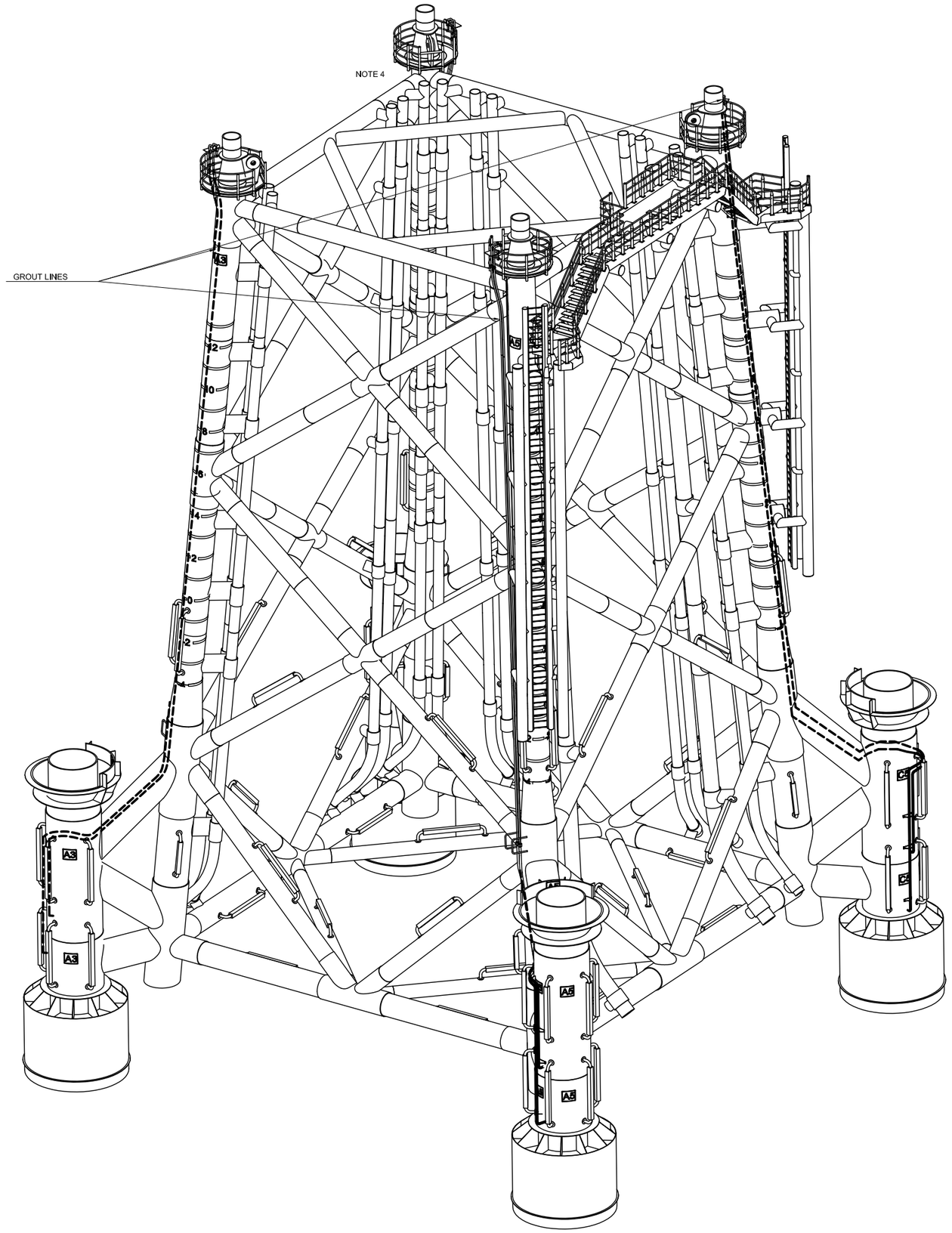
The following documents inform and support the decommissioning provisions contained in this document:

- West of Duddon Sands Offshore Windfarm Environmental Statement, RSK ENSR Environment Ltd for Morecambe Wind Limited, Project No P40196, 31st March 2006;
- Decommissioning of offshore renewable energy installations under the Energy Act 2004: Guidance notes for the Industry, DECC, January 2011;
- WDS Metocean Evaluation Input to Design Basis A, Document No 1035683; West of Duddon Sands Safety Zone Application, Anatec Ltd, October 2012;
- West of Duddon Sands Marine Archaeology Written Scheme of Investigation, RSK Environment Ltd for Scottish Power Renewables (WODS) Ltd and DONG Energy West of Duddon Sands (UK) Ltd, Document No P41315/Rev 01, August 2012;
- Marine and Coastal Access Act 2009; Marine Licence Number: 33317/10/1

Appendix

Following drawings can be found in this appendix

Subject	Drawing title	Drawing number
Utility Systems 04 Structural Layout Drawings	Jacket structural drawings	WDSS01Z01UAB10_CTB585_001_e
Utility Systems 04 Structural Layout Drawings	Layout drawings	WDSS01Z01UAB10_CTL001_001_h
Utility Systems 04 Structural Layout Drawings	Layout drawings	WDSS01Z01UAB10_CTL001_002_j
Utility Systems 04 Structural Layout Drawings	Topside structural drawings	WDSS01Z01UAB10_CTB004_001_g
Utility Systems 04 Structural Layout Drawings	Topside structural drawings	WDSS01Z01UAB10_CTB005_001_g
Utility Systems 04 Structural Layout Drawings	Weight Load Plans	WDSS01Z01UAB10_CTL105_001f
155kV Export Cable North	Cable Protection Rock Installation North Location 2 KP 15.140 – KP15.2	BO-RP-826-11248-016
155kV Export Cable North	Cable Protection Rock Installation North Location 3 &4 KP 16.442 – KP16.620	BO-RP-826-11248-017
155kV Export Cable South	Cable Protection Rock Installation South Location KP15.090 – KP15.147	BO-RP-826-11248-018
155kV Export Cable South	Cable Protection Rock Installation South Location KP16.363 – KP16.475	BO-RP-826-11248-019



ISOMETRIC VIEW
LOOKING NORTH-WEST

AS BUILT

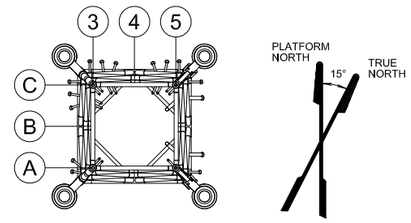
NOTES:

1. FOR GENERAL NOTES SEE DWG. NO. Z01UAB10 & CTB501
2. DIMENSIONS IN MM.
3. LEVELS IN M AND RELATIVE TO L.A.T.
4. GROUT LINES NOT SHOWN ON C3-LEG.

LEGEND:

GROUT LINE ON NEAR SIDE OF STRUCTURE.
GROUT LINE ON FAR SIDE OF STRUCTURE.

KEYPLAN



Rev.	Date	Check.	Appr.	Description
e	14-06-2013	TOL	AT	AS BUILT
d	15-12-2011	JSU	AT	ISSUED FOR CONSTRUCTION
c	30-09-2011	TC	AT	RE-ISSUED FOR CERTIFICATION
b	13-05-2011	JSU	AT	FOR CERTIFICATION
a	01-03-2011	TOL	AT	FOR TENDER

Drawn by	Checked	Approved
15-02-2011 HHL	01-03-2011 TOL	01-03-2011 AT

Scale	Size	File name
1:100	A1	WDS01Z01UAB10_CTB585_001_e.DWG

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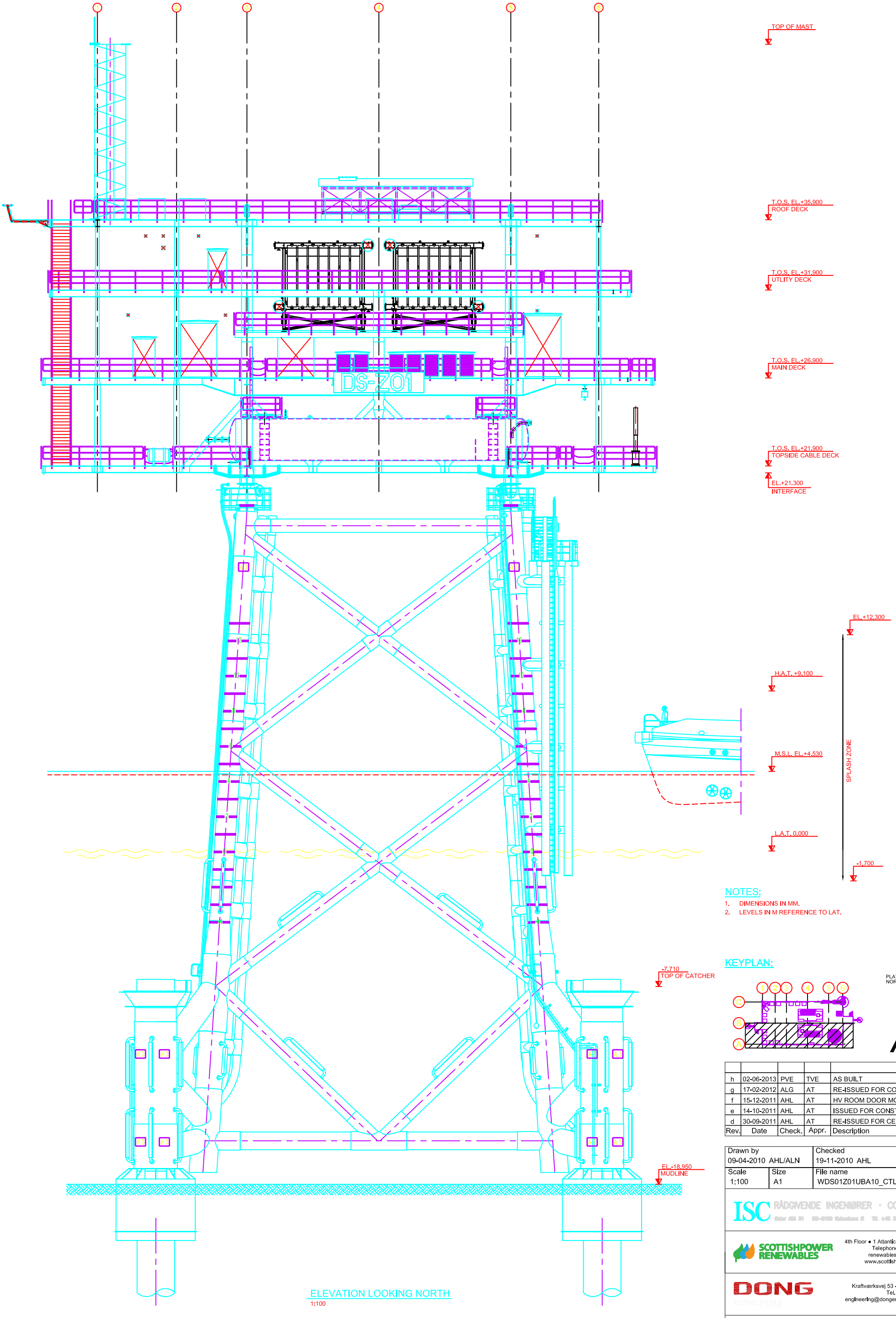
WEST OF DUDDON SANDS WINDFARM
OFFSHORE SUBSTATION
GROUT SYSTEM
STRUCTURAL STEEL, JACKET

Plant/project	Drawing no.	Sheet	Rev.
1-00307	Z01UAB10 & CTB585	001	e



ELEVATION LOOKING NORTH
1:100

NOTES:

1. DIMENSIONS IN MM.
2. LEVELS IN M REFERENCE TO LAT.

KEYPLAN:

Rev.	Date	Check.	Appr.	Description
h	02-06-2013	PVE	TVE	AS BUILT
g	17-02-2012	ALG	AT	RE-ISSUED FOR CONSTRUCTION
f	15-12-2011	AHL	AT	HV ROOM DOOR MODIFIED
e	14-10-2011	AHL	AT	ISSUED FOR CONSTRUCTION
d	30-09-2011	AHL	AT	RE-ISSUED FOR CERTIFICATION

Drawn by	Checked	Approved
09-04-2010 AHL/ALN	19-11-2010 AHL	19-11-2010 AT

Scale	Size	File name
1:100	A1	WDS01Z01UBA10_CTL001_001_g.dwg

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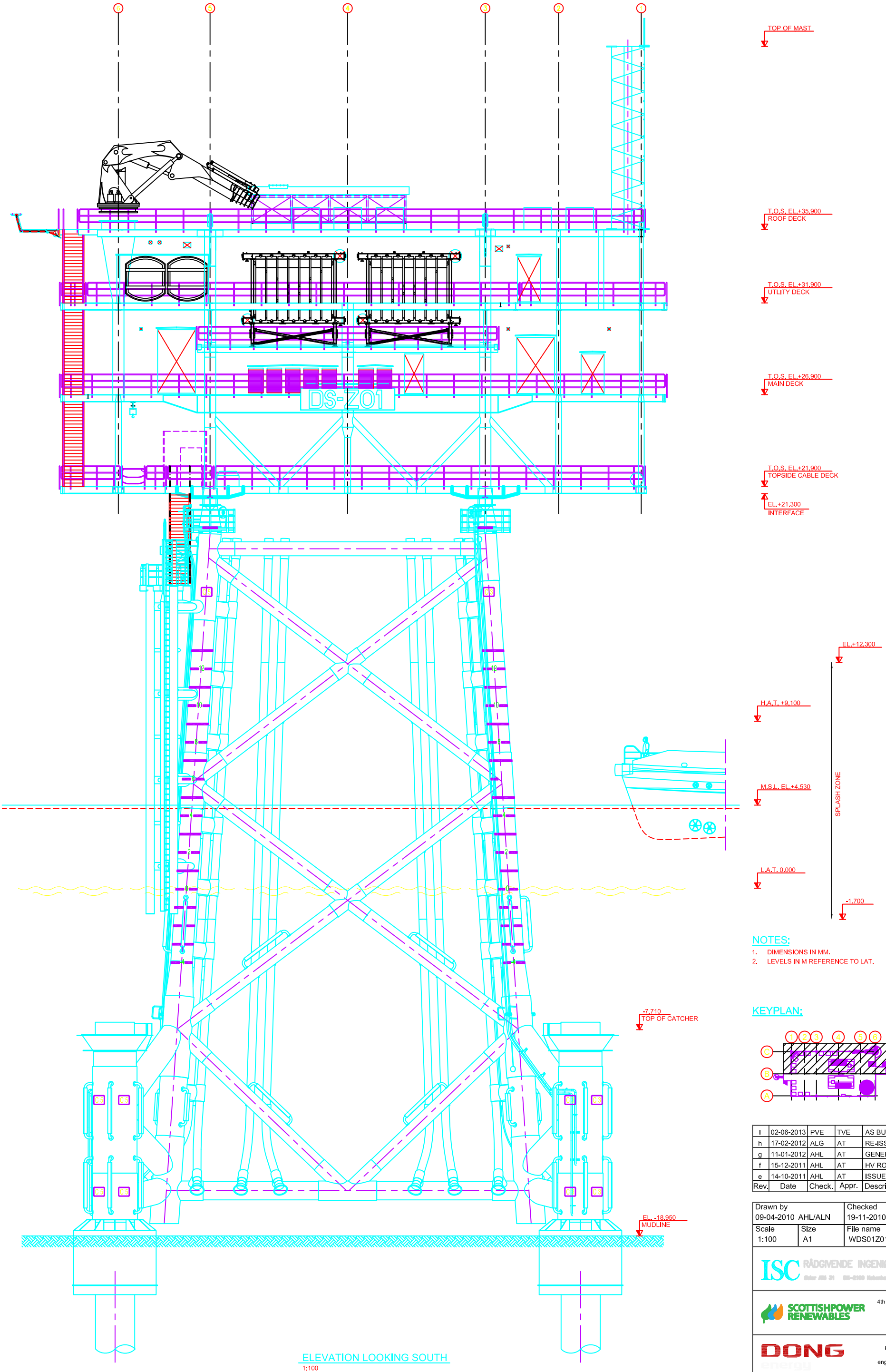
WEST OF DUDDON SANDS WINDFARM
OFFSHORE SUBSTATION
ELEVATION LOOKING NORTH
LAYOUT

Plant/project	Drawing no.	Sheet	Rev.
1-00307	Z01UAB10 & CTL001	001	h



ELEVATION LOOKING SOUTH
1:100

NOTES:
1. DIMENSIONS IN MM.
2. LEVELS IN M REFERENCE TO LAT.

KEYPLAN:

Rev.	Date	Check.	Appr.	Description
i	02-06-2013	PVE	TVE	AS BUILT
h	17-02-2012	ALG	AT	RE-ISSUED FOR CONSTRUCTION
g	11-01-2012	AHL	AT	GENERAL UPDATE
f	15-12-2011	AHL	AT	HV ROOM DOOR MODIFIED
e	14-10-2011	AHL	AT	ISSUED FOR CERTIFICATION

Drawn by	Checked	Approved
09-04-2010 AHL/ALN	19-11-2010 AHL	19-11-2010 AT

Scale	Size	File name
1:100	A1	WDS01Z01UBA10_CTL001_002_h.dwg

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WEST OF DUDDON SANDS WINDFARM
OFFSHORE SUBSTATION
ELEVATION LOOKING SOUTH
LAYOUT

Plant/project	Drawing no.	Sheet	Rev.
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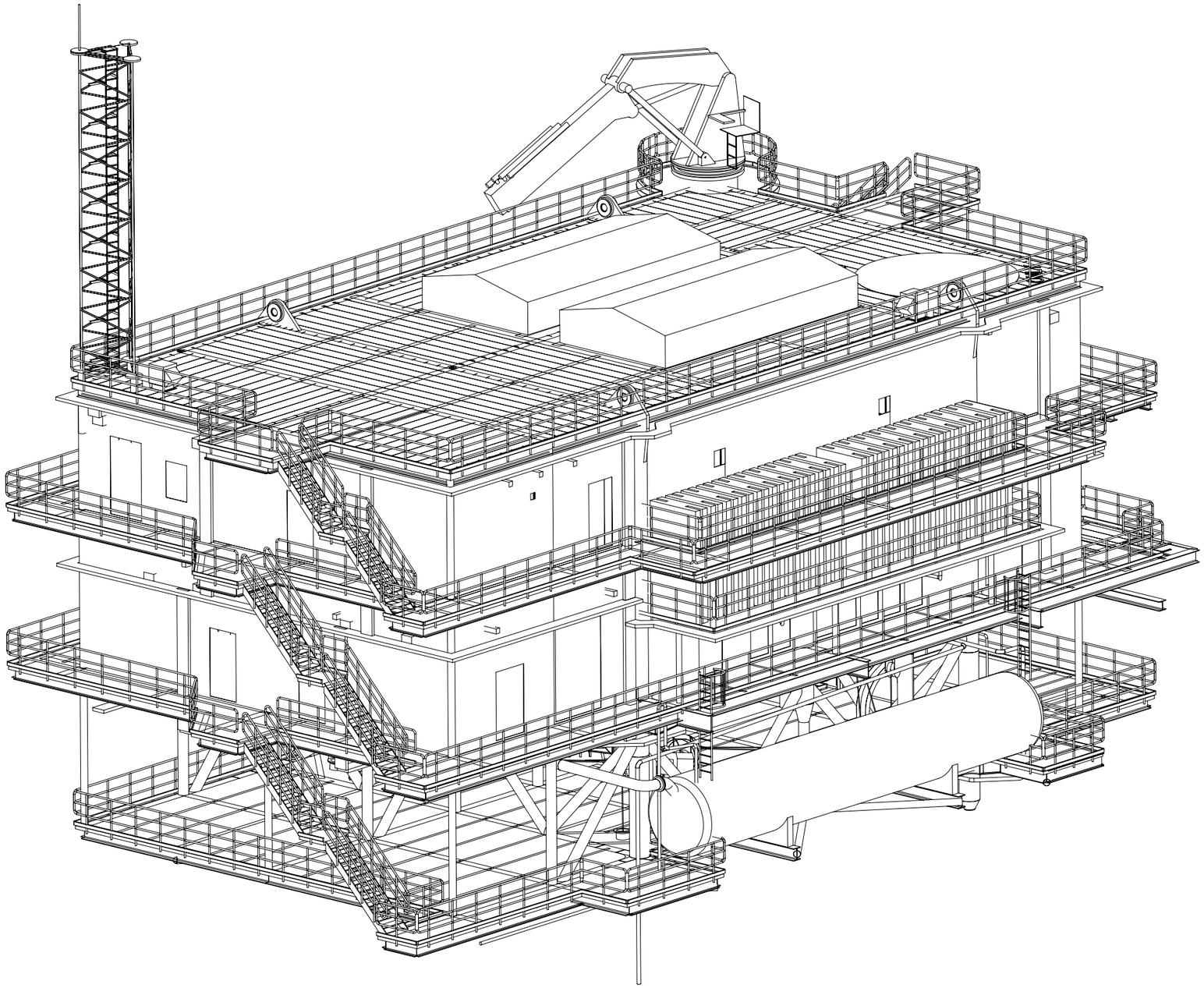
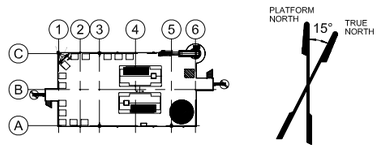


ISOMETRIC VIEW
LOOKING NORTH/EAST

NOTES:
1. DIMENSIONS IN MM.
2. LEVELS IN M RELATIVE TO L.A.T.
3. FOR GENERAL NOTES REFER DWG. NO. 001

KEYPLAN:



Rev.	Date	Check.	Appr.	Description
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Drawn by	Checked	Approved
25-02-2013 JB	14-03-2013 WD	19-03-2013 PP

Scale	Size	File name
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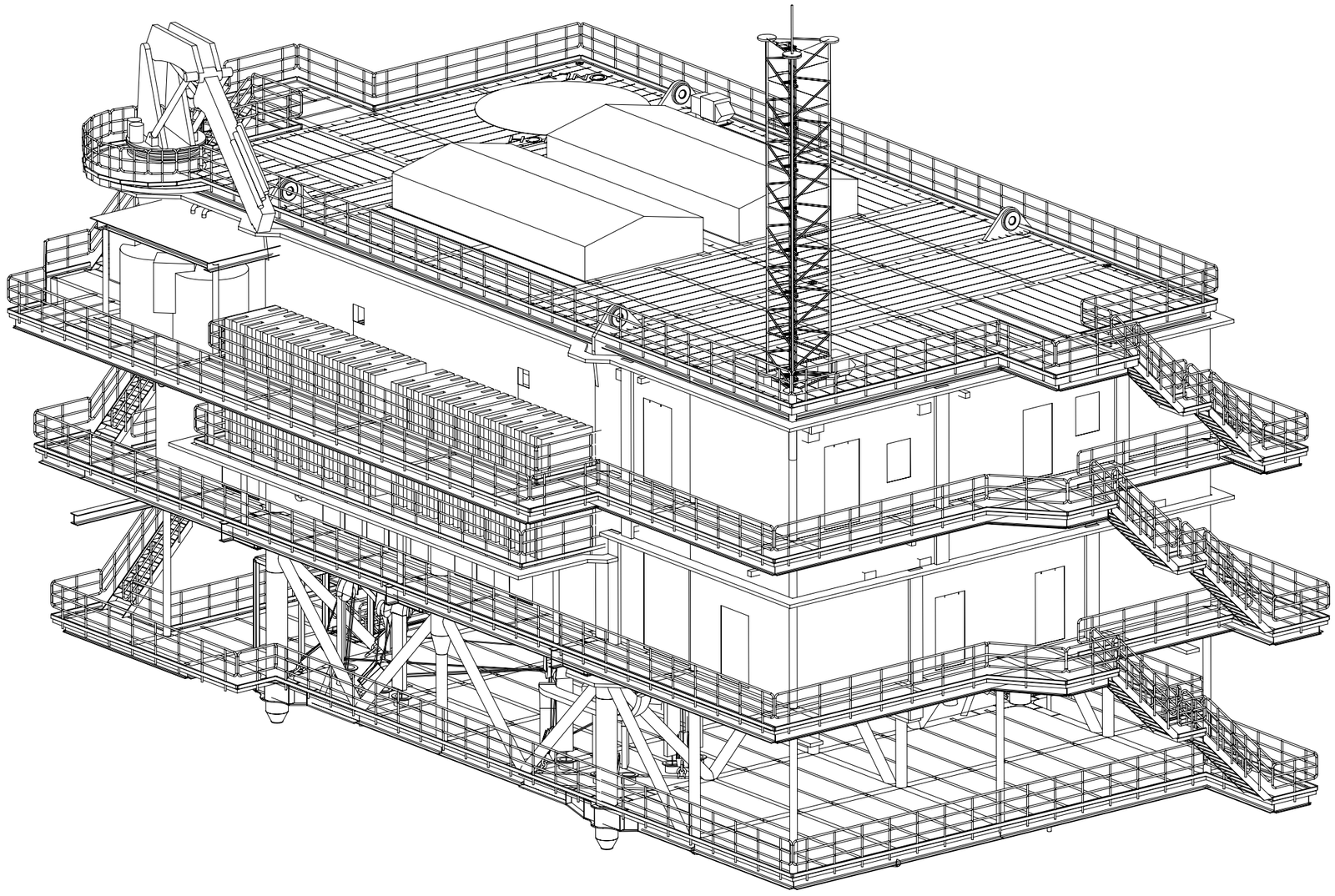
WEST OF DUDDON SANDS WINDFARM
OFFSHORE SUBSTATION
GENERAL ARR. ISOMETRIC II
STRUCTURAL STEEL, TOPSIDE

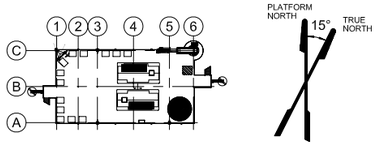
Plant/project	Drawing no.	Sheet	Rev.
1-00307	Z01UAB10 & CTB004	001	g



ISOMETRIC VIEW
LOOKING SOUTH/EAST

NOTES:
1. DIMENSIONS IN MM.
2. LEVELS IN M RELATIVE TO L.A.T.
3. FOR GENERAL NOTES REFER DWG. NO. 001

KEYPLAN:



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Drawn by	Checked	Approved
25-02-2013 JB	14-03-2013 WD	19-03-2013 PP

Scale	Size	File name
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WEST OF DUDDON SANDS WINDFARM
OFFSHORE SUBSTATION
GENERAL ARR. ISOMETRIC III
STRUCTURAL STEEL, TOPSIDE

Plant/project	Drawing no.	Sheet	Rev.
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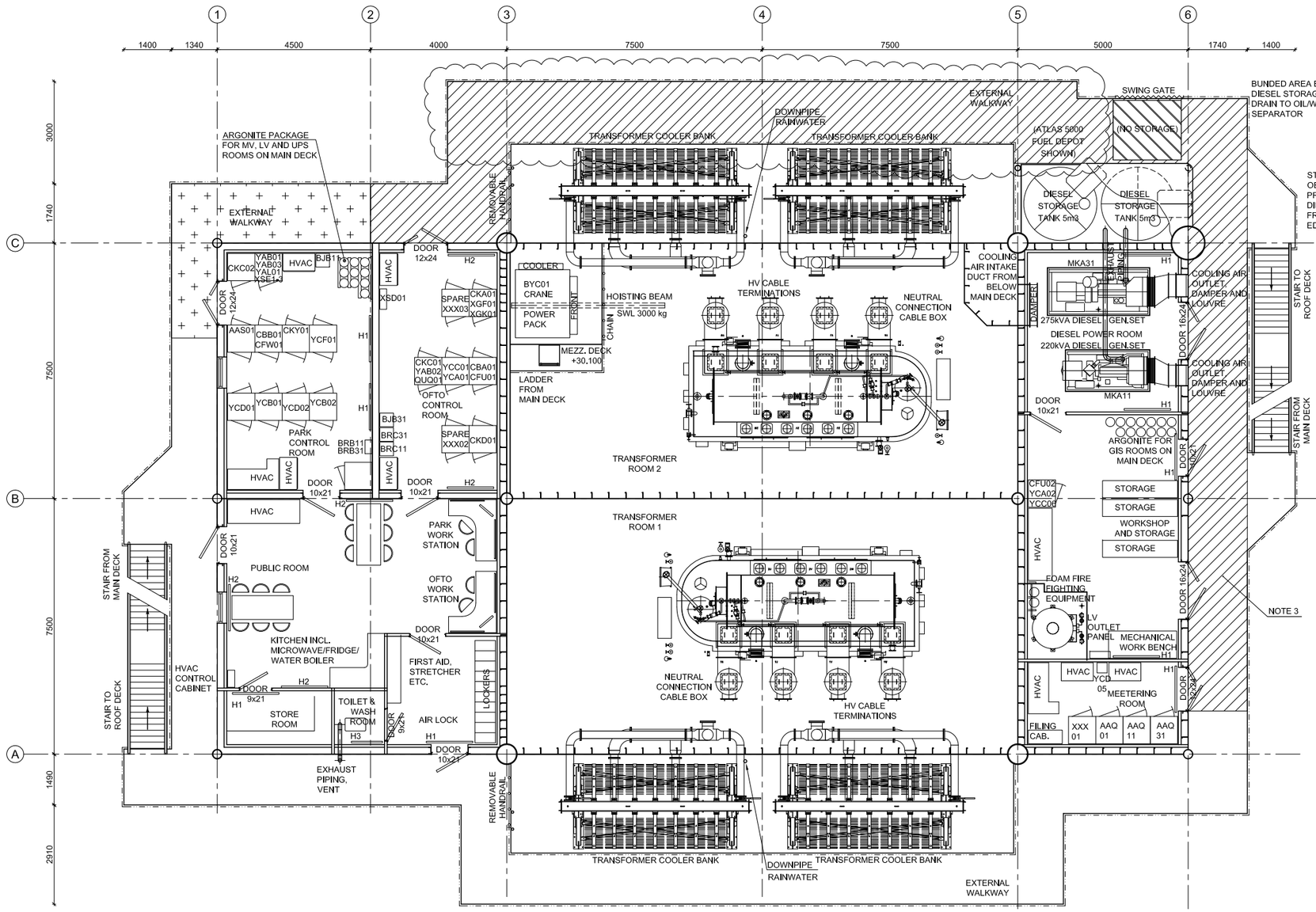


UTILITY DECK T.O.S. EL. +31.900

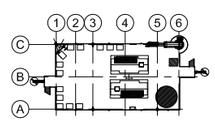
1:50

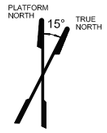
NOTES:

1. DIMENSIONS IN MM.
2. LEVELS IN M RELATIVE TO LAT.
3. IN GENERAL DURING TRANSPORT OF EQUIPMENT ON GRATING, MAXIMUM LOAD MUST NOT EXCEED 400 kg/m² AND A POINT LOAD OF 400 kg.

LEGEND:

1. -MAXIMUM TRANSPORT LOAD 1000 kg/m²
   -MAXIMUM TRANSPORT POINT LOAD 500 kg
2. -MAXIMUM TRANSPORT LOAD 500 kg/m²
   -MAXIMUM TRANSPORT POINT LOAD 500 kg





Rev.	Date	Check.	Appr.	Description
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e	30-09-2011	PLS	AT	RE-ISSUED FOR TENDER
d	01-06-2011	ALG	AT	FOR CERTIFICATION
c	01-03-2011	ALG	AT	FOR TENDER
b	19-11-2010	ALG	AT	CONCEPT DESIGN

Drawn by	Checked	Approved
11-06-2010 PHB/ALN	02-09-2010 ALG	02-09-2010 AT

Scale	Size	File name
1:50	A0	WDS01Z01UBA10_CTL105_001_f.DWG

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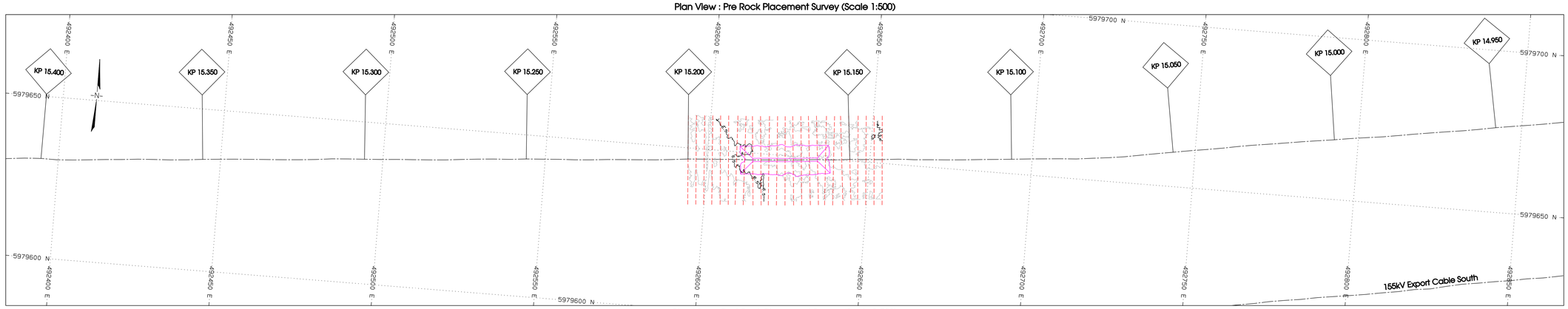
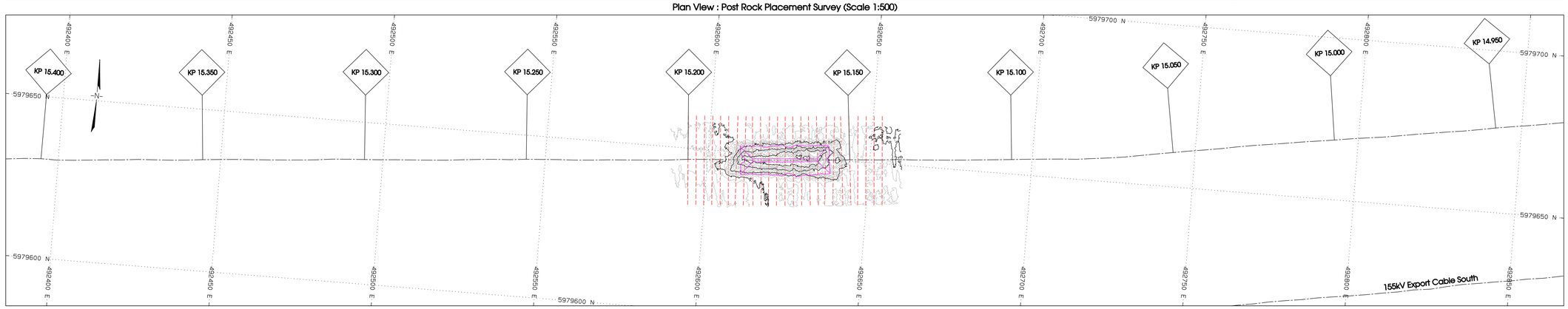
WEST OF DUDDON SANDS WINDFARM
OFFSHORE SUBSTATION
UTILITY DECK, TRANSPORT LOAD PLAN
WEIGT & TRANSPORT LOADS, TOPSIDE

Plant/project	Drawing no.	Sheet	Rev.
1-00307	Z01UAB10 & CTL105	001	f

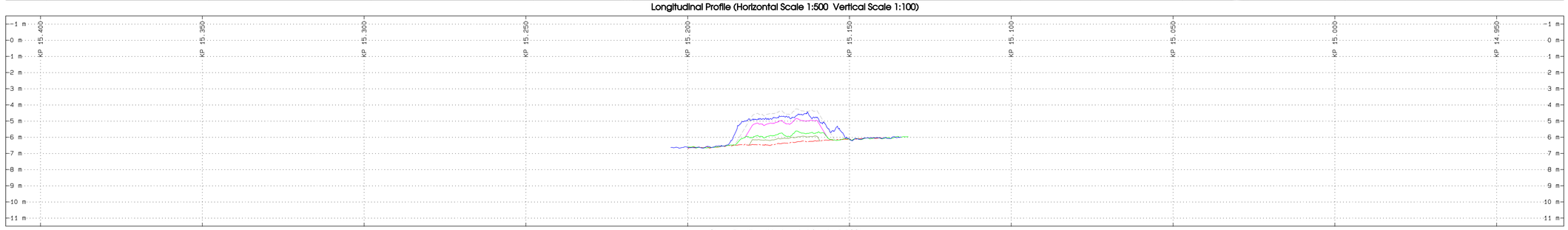
Plan View : Pre Rock Placement Survey (Scale 1:500)



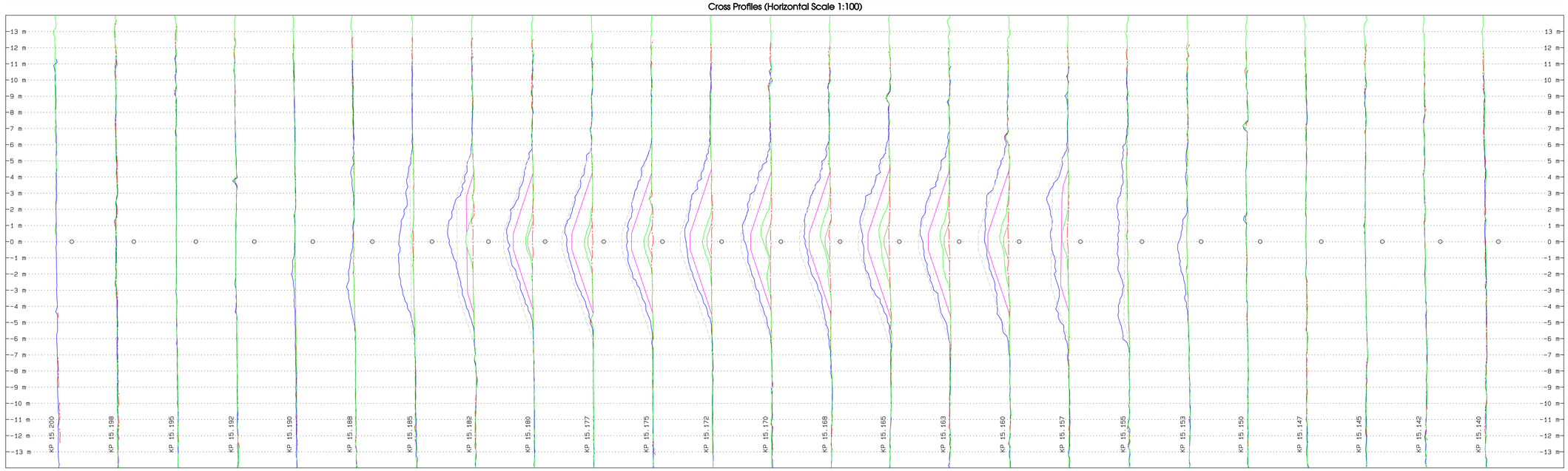
Plan View : Post Rock Placement Survey (Scale 1:500)



Longitudinal Profile (Horizontal Scale 1:500 Vertical Scale 1:100)



Cross Profiles (Horizontal Scale 1:100)



NOTES

GEODETIC INFORMATION

All coordinates in metres.

Spheroid	: GRS80 (Geodetic Reference System 1980)
Datum	: ETRS89 (European Terrestrial Reference System 1989)
Projection	: Universal Transverse Mercator (UTM)
Zone	: 30 North
Central Meridian (CM)	: 3° West
Scale Factor on CM	: 0.9996

DATUM SHIFT PARAMETERS for secondary DGPS only (From WGS 84 to ETRS89)

Translation X	: 0.0533 metres
Translation Y	: 0.0505 metres
Translation Z	: -0.0803 metres
Rotation X	: 0.00171356 "
Rotation Y	: 0.011320019 "
Rotation Z	: -0.018296720 "
Scale Factor	: 0.002308323 ppm

VERTICAL DATUM

All depths in metres reduced to LAT (VORF), 2011 version

KILOMETRE POSTS

Kilometre Posts are based on the As-Laid Client Database:
"F111006_North_Route_As_Built_KP0.000_KP38.810_rev00_DoBList.xlsx"

DTM PARAMETERS

Cell Size : 0.25 m

SURFACE POSITIONING

RTK DGPS System	: Trimble SPS851 (RTK Signal Provided by DONG)
DGPS System	: C&C Technologies C-NAV
Motion Sensor	: Seatex MRU5
Gyro	: SeaPath 330

SUB-SURFACE POSITIONING

Manual Layback

SURVEY EQUIPMENT FALL PIPE ROV

Multibeam Echosounder	: Reson SeaBat 8125
Bathy Unit	: Tritech Sealking Bathy sensor SC13
Gyro	: IXSea Phins
Motion Sensor	: IXSea Phins
Doppler Log	: RDI Workhorse Navigator (1200 kHz)

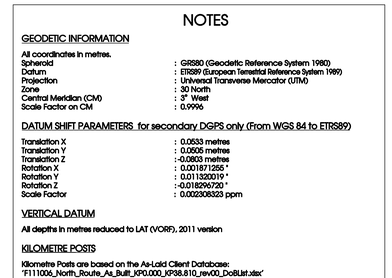
LEGEND

PLAN VIEWS

- As-Laid Export Cable with Kilometre Post Annotation
- Cross Profile Position
- Bathymetric Contour at 0.1m Interval
- 125.0 Bathymetric Contour at 0.5m Interval
- Rock Berm Armour Design

LONGITUDINAL PROFILE	CROSS PROFILES
Pre Survey	
Post Armour Survey	
Post Filter Survey	
Maximum Armour Design	
Armour Design	
Filter Design	
As-Supplied Export Cable	○

KEYPLAN



Scale 1 : 500

-10m 0m 10m 20m 30m 40m 50m

Scale 1 : 100

-2m 0m 2m 4m 6m 8m 10m

EMPLOYER

DONG energy

SCOTTISHPOWER RENEWABLES

CONTRACTOR

Offshore Wind Force V.O.F

ROCK PLACEMENT SUB-CONTRACTOR

Boskalis Offshore

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Boskalis Offshore
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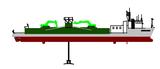
3350 AA Papendrecht
The Netherlands
T: +31 (0)78 6969 000
F: +31 (0)78 6969 555
Email: offshore@boskalis.nl
Web: www.boskalis.com



PROJECT

West of Duddon Sands Offshore Wind Farm

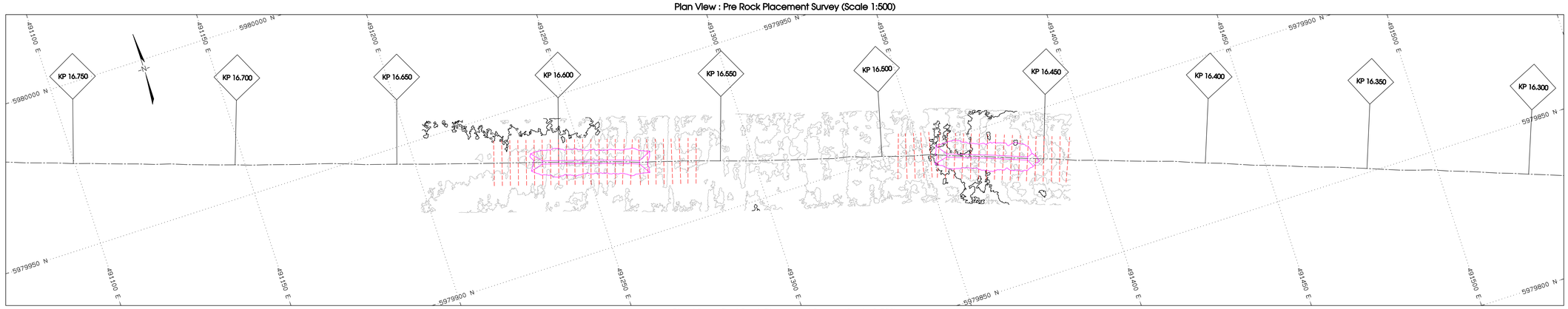
TITLE

155kV Export Cable North
Cable Protection Rock Installation
Location 2
KP 15.140 - KP 15.200

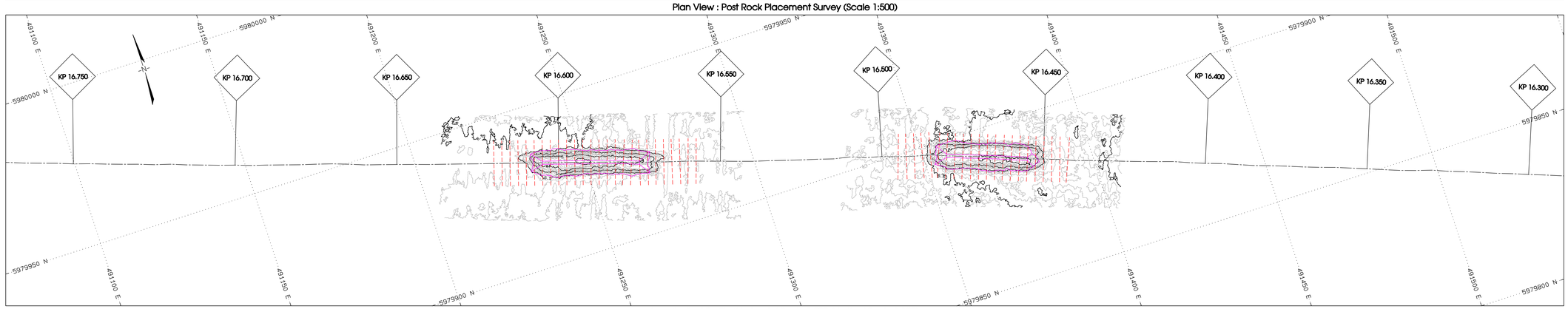
Contractor:	N/A		Sheet 1 of 1
Sub-contractor:	DWG No. : BO-SH-826-11348-016		
Pre Survey :	13/09/2014	Chart No. :	
Post Survey :	14/09/2014	Date Drawn :	14/09/2014

REV No.	DATE	DESCRIPTION	ORIGINATOR PREP	CHK	APP	CLIENT APP	COMP
00	14/09/2014	As-Built	MTA	CT	SGRA		

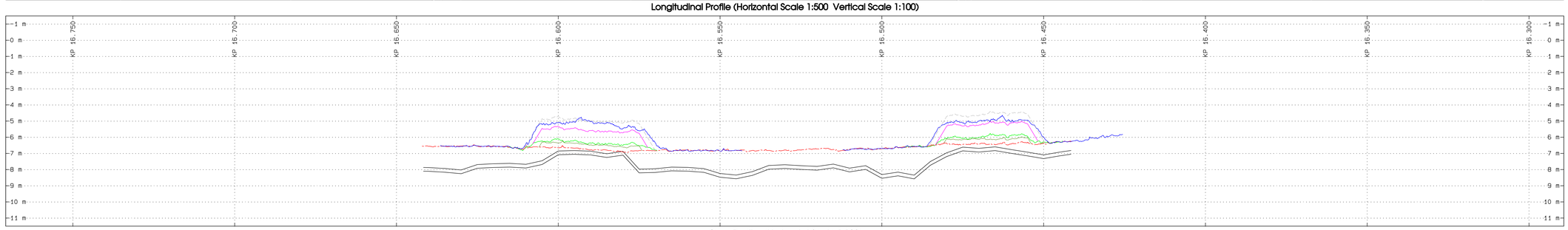
Plan View : Pre Rock Placement Survey (Scale 1:500)



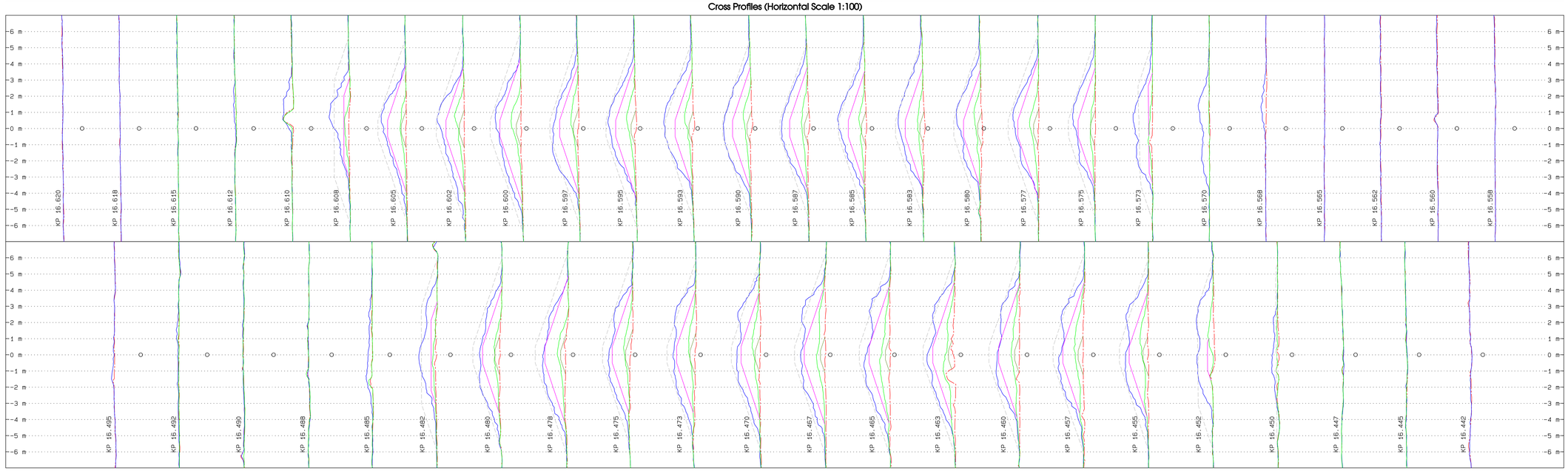
Plan View : Post Rock Placement Survey (Scale 1:500)



Longitudinal Profile (Horizontal Scale 1:500 Vertical Scale 1:100)



Cross Profiles (Horizontal Scale 1:100)



NOTES

GEODETIC INFORMATION

All coordinates in metres.

Spheroid	: GRS80 (Geodetic Reference System 1980)
Datum	: ETRS89 (European Terrestrial Reference System 1989)
Projection	: Universal Transverse Mercator (UTM)
Zone	: 30 North
Central Meridian (CM)	: 3° West
Scale Factor on CM	: 0.9996

DATUM SHIFT PARAMETERS for secondary DGPS only (From WGS 84 to ETRS89)

Translation X	: 0.0533 metres
Translation Y	: 0.0505 metres
Translation Z	: -0.0803 metres
Rotation X	: 0.001871256 "
Rotation Y	: 0.011320019 "
Rotation Z	: -0.018296720 "
Scale Factor	: 0.002308323 ppm

VERTICAL DATUM

All depths in metres reduced to LAT (VORF), 2011 version

KILOMETRE POSTS

Kilometre Posts are based on the As-Laid Client Database:
"F111006_North_Route_As_Built_KP0.000_KP38.810_rev00_DoBList.xlsx"

DTM PARAMETERS

Cell Size : 0.25 m

SURFACE POSITIONING

RTK DGPS System	: Trimble SPS851 (RTK Signal Provided by DONG)
DGPS System	: C&C Technologies C-NAV
Motion Sensor	: Seatex MRU5
Gyro	: SeaPath 330

SUB-SURFACE POSITIONING

Manual Layback

SURVEY EQUIPMENT FALL PIPE ROV

Multibeam Echosounder	: Reson SeaBat 8125
Bathy Unit	: Tritech Sealking Bathy sensor SC13
Gyro	: IXSea Phins
Motion Sensor	: IXSea Phins
Doppler Log	: RDI Workhorse Navigator (1200 kHz)

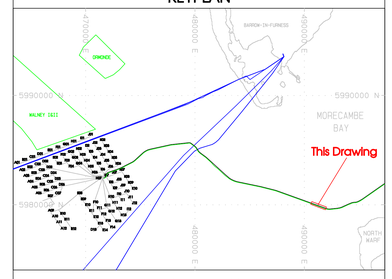
LEGEND

PLAN VIEWS

- As-Laid Export Cable with Kilometre Post Annotation
- Cross Profile Position
- Bathymetric Contour at 0.1m Interval
- 125.0 Bathymetric Contour at 0.5m Interval
- Rock Berm Armour Design

LONGITUDINAL PROFILE	CROSS PROFILES
Pre Survey	
Post Armour Survey	
Post Filter Survey	
Maximum Armour Design	
Armour Design	
Filter Design	
As-Supplied Export Cable	○

KEYPLAN



Scale 1 : 500

-10m 0m 10m 20m 30m 40m 50m

Scale 1 : 100

-2m 0m 2m 4m 6m 8m 10m

EMPLOYER

DONG energy

SCOTTISHPOWER RENEWABLES

CONTRACTOR

Offshore Wind Force V.O.F

ROCK PLACEMENT SUB-CONTRACTOR

Boskalis Offshore

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Boskalis Offshore
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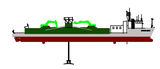
Postbus 43
3350 AA Papendrecht
The Netherlands
T: +31 (0)78 6969 000
F: +31 (0)78 6969 555
Email: offshore@boskalis.nl
Web: www.boskalis.com



PROJECT

West of Duddon Sands Offshore Wind Farm

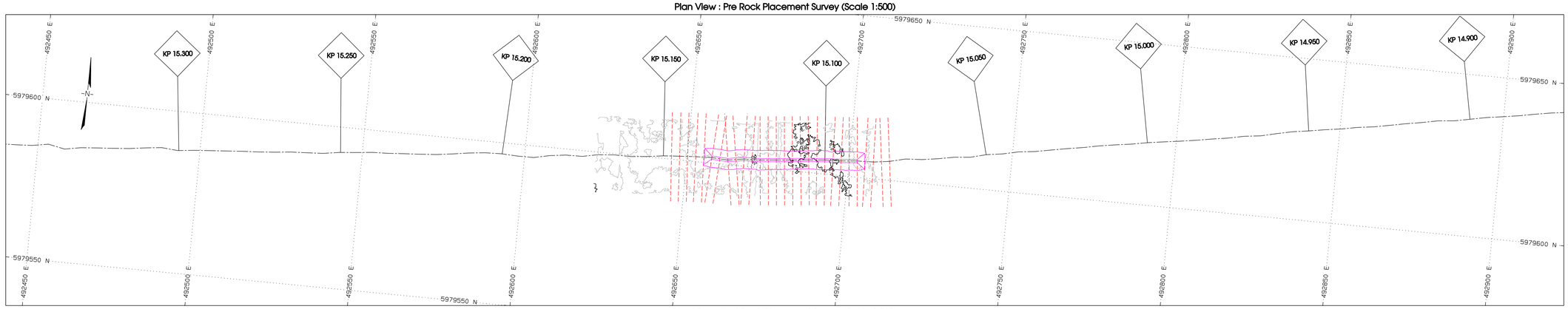
TITLE

155kV Export Cable North
Cable Protection Rock Installation
Location 3 & 4
KP 16.442 - KP 16.620

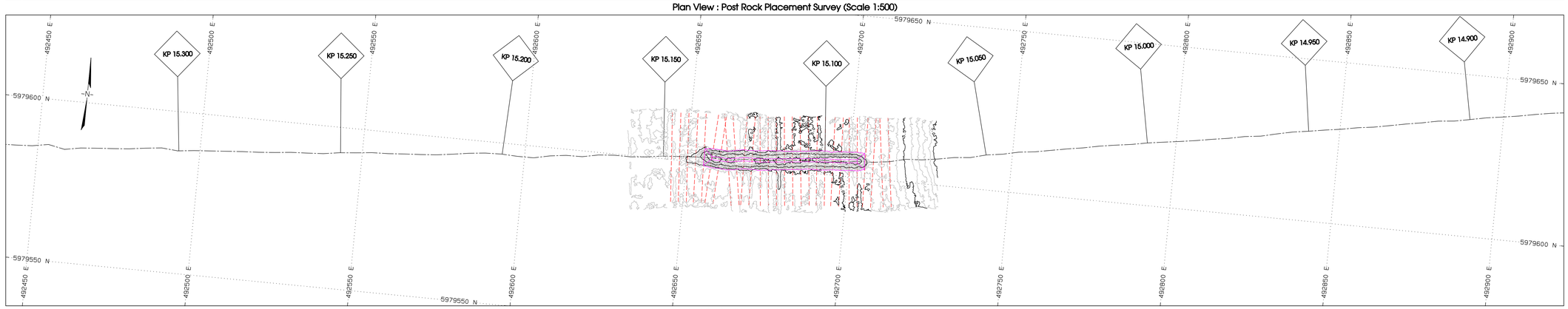
Contractor:	N/A		Sheet 1 of 1
Sub-contractor:	DWG No. : BO-SH-826-11348-017		
Pre Survey :	12/09/2014	Chart No. :	
Post Survey :	14/09/2014	Date Drawn :	14/09/2014

REV No.	DATE	DESCRIPTION	ORIGINATOR PREP	CHK	APP	CLIENT APP	COMP
00	14/09/2014	As-Built	MTA	CT	SGRA		

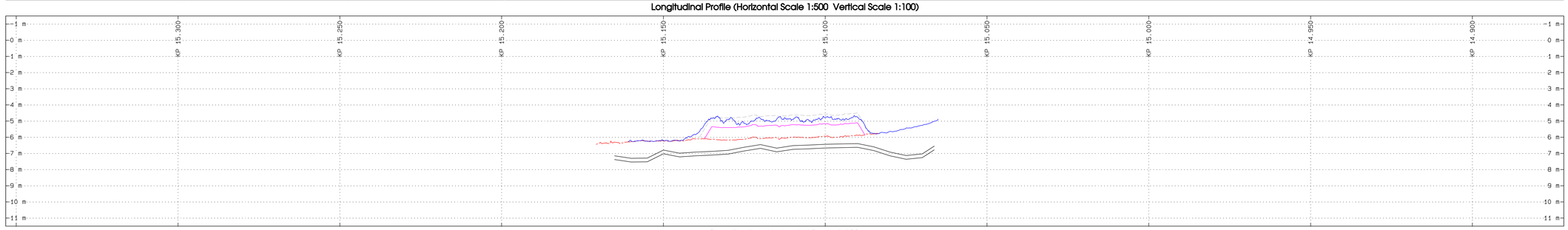
Plan View : Pre Rock Placement Survey (Scale 1:500)



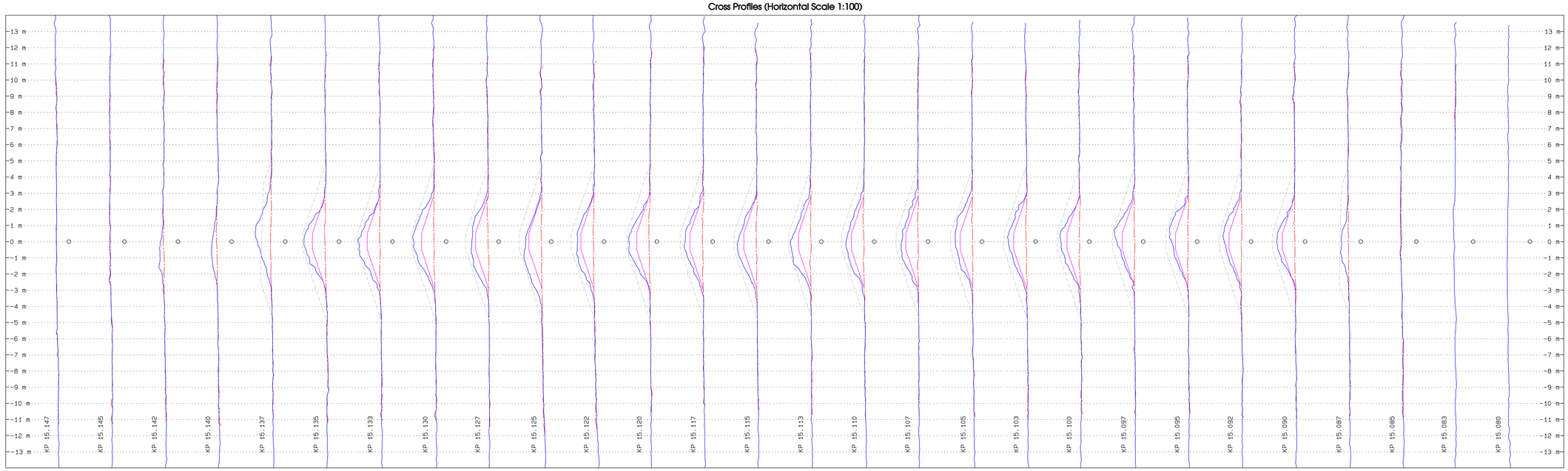
Plan View : Post Rock Placement Survey (Scale 1:500)



Longitudinal Profile (Horizontal Scale 1:500 Vertical Scale 1:100)



Cross Profiles (Horizontal Scale 1:100)



NOTES

GEODETIC INFORMATION

All coordinates in metres.

Spheroid	: GRS80 (Geodetic Reference System 1980)
Datum	: ETRS89 (European Terrestrial Reference System 1989)
Projection	: Universal Transverse Mercator (UTM)
Zone	: 30 North
Central Meridian (CM)	: 3° West
Scale Factor on CM	: 0.9996

DATUM SHIFT PARAMETERS for secondary DGPS only (From WGS 84 to ETRS89)

Translation X	: 0.0533 metres
Translation Y	: 0.0505 metres
Translation Z	: -0.0803 metres
Rotation X	: 0.001871356 "
Rotation Y	: 0.011320019 "
Rotation Z	: -0.018296720 "
Scale Factor	: 0.002308323 ppm

VERTICAL DATUM

All depths in metres reduced to LAT (VORF), 2011 version

KILOMETRE POSTS

Kilometre Posts are based on the As-Laid Client Database:
"F111006_South_Route_As_Built_KP0.005_KP38.740_rev00_DoBList.xlsx"

DTM PARAMETERS

Cell Size : 0.25 m

SURFACE POSITIONING

RTK DGPS System	: Trimble SPS851 (RTK Signal Provided by DONG)
DGPS System	: C&C Technologies C-NAV
Motion Sensor	: Seatex MRU5
Gyro	: SeaPath 330

SUB-SURFACE POSITIONING

Manual Layback

SURVEY EQUIPMENT FALL PIPE ROV

Multibeam Echosounder	: Reson SeaBat 8125
Bathy Unit	: Tritech Sealking Bathy sensor SC13
Gyro	: IXSea Phins
Motion Sensor	: IXSea Phins
Doppler Log	: RDI Workhorse Navigator (1200 kHz)

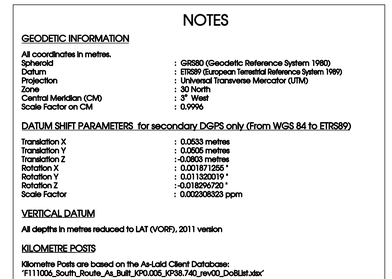
LEGEND

PLAN VIEWS

- As-Laid Export Cable with Kilometre Post Annotation
- Cross Profile Position
- Bathymetric Contour at 0.1m Interval
- 125.0 Bathymetric Contour at 0.5m Interval
- Rock Berm Armour Design

LONGITUDINAL PROFILE	CROSS PROFILES
Pre Survey	
Post Armour Survey	
Post Filter Survey	
Maximum Armour Design	
Armour Design	
Filter Design	
As-Supplied Export Cable	○

KEYPLAN



Scale 1 : 500

-10m 0m 10m 20m 30m 40m 50m

Scale 1 : 100

-2m 0m 2m 4m 6m 8m 10m

EMPLOYER

DONG energy

SCOTTISHPOWER RENEWABLES

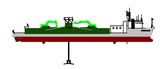
CONTRACTOR

Offshore Wind Force V.O.F

ROCK PLACEMENT SUB-CONTRACTOR

Boskalis Offshore

D.P.F.P.V. SEAHORSE
Boskalis Offshore
Rosmolenweg 20
Postbus 43
3350 AA Papendrecht
The Netherlands
T: +31 (0)78 6969 000
F: +31 (0)78 6969 555
Email: offshore@boskalis.nl
Web: www.boskalis.com



PROJECT

West of Duddon Sands Offshore Wind Farm

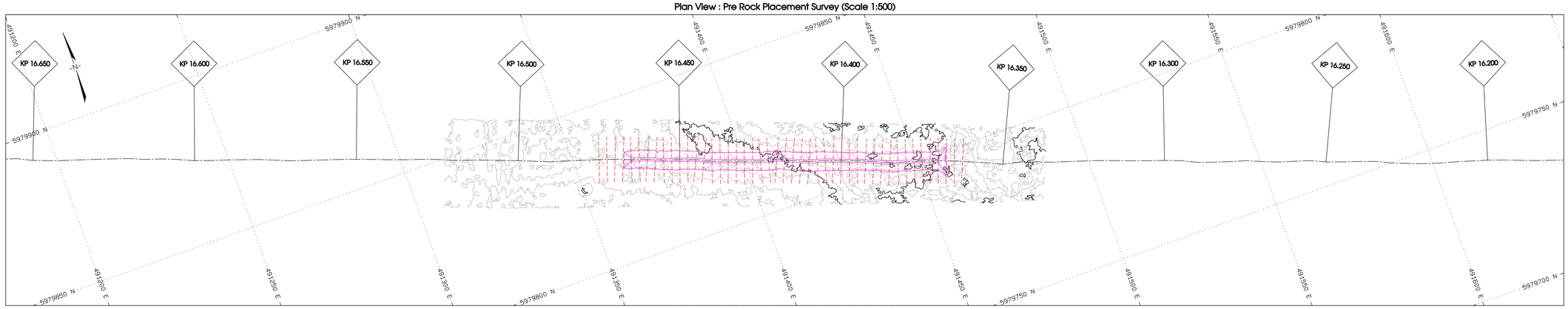
TITLE

155kV Export Cable South
Cable Protection Rock Installation
Location 2
KP 15.080 - KP 15.147

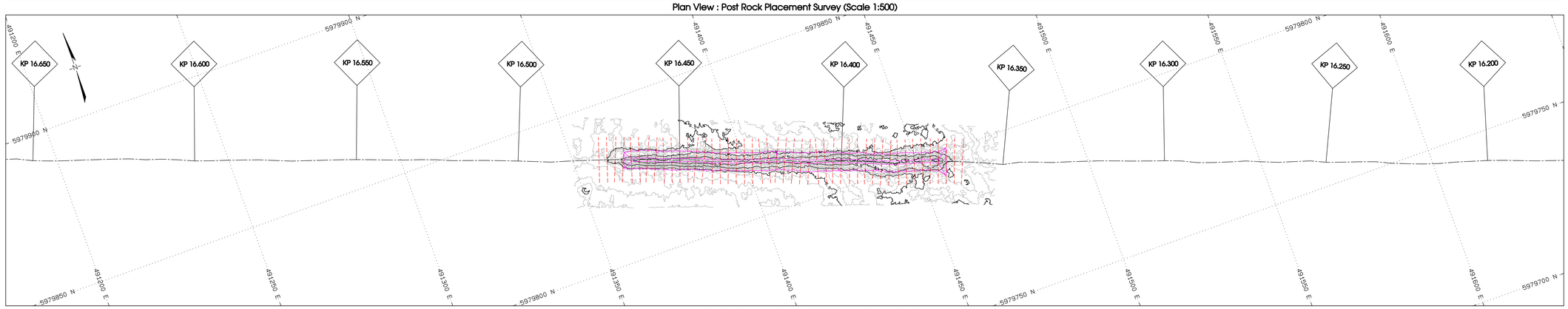
Contractor:	N/A		Sheet 1 of 1
Sub-contractor:	DWG No. : BO-SH-826-11348-018		
Pre Survey :	13/09/2014	Chart No. :	
Post Survey :	14/09/2014	Date Drawn :	14/09/2014

REV No.	DATE	DESCRIPTION	ORIGINATOR			CLIENT	COMP
			PREP	CHK	APP	APP	APP
00	14/09/2014	As-Built	DPIT	CT	SGRA		

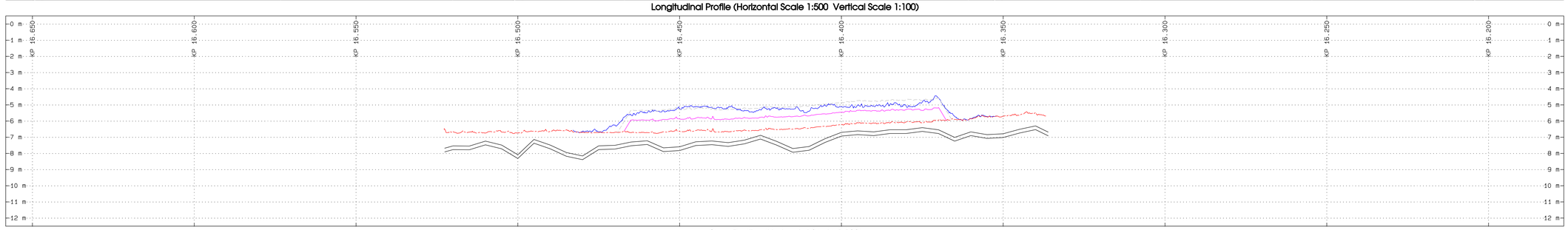
Plan View : Pre Rock Placement Survey (Scale 1:500)



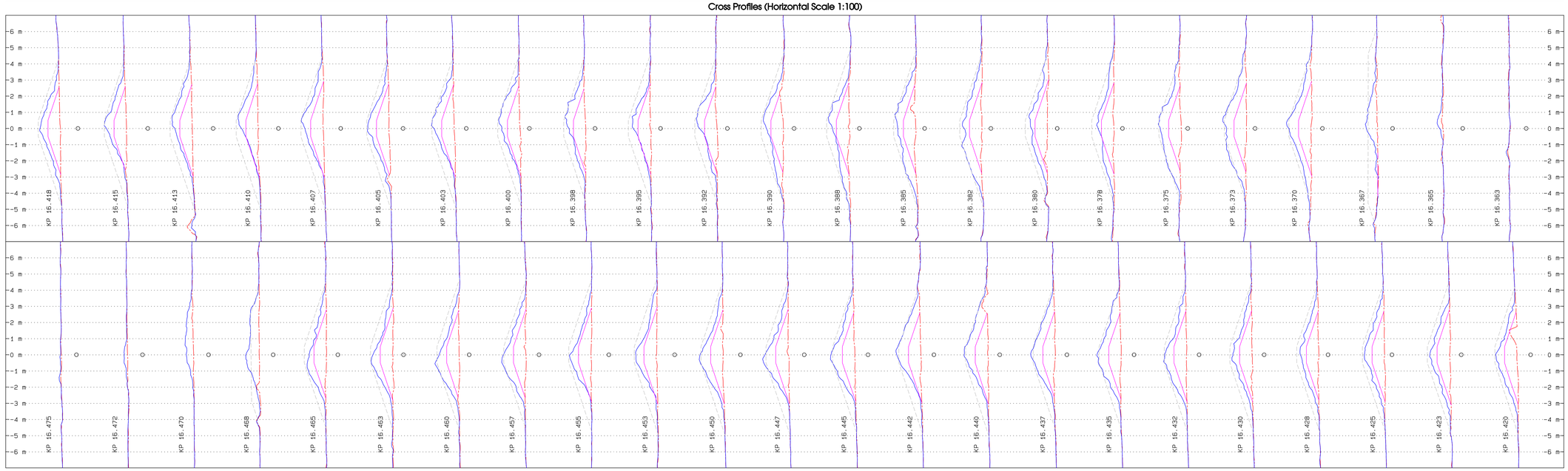
Plan View : Post Rock Placement Survey (Scale 1:500)



Longitudinal Profile (Horizontal Scale 1:500 Vertical Scale 1:100)



Cross Profiles (Horizontal Scale 1:100)



NOTES

GEODETIC INFORMATION

All coordinates in metres.

Spheroid	: GRS80 (Geodetic Reference System 1980)
Datum	: ETRS89 (European Terrestrial Reference System 1989)
Projection	: Universal Transverse Mercator (UTM)
Zone	: 30 North
Central Meridian (CM)	: 3° West
Scale Factor on CM	: 0.9996

DATUM SHIFT PARAMETERS for secondary DGPS only (From WGS 84 to ETRS89)

Translation X	: 0.0533 metres
Translation Y	: 0.0505 metres
Translation Z	: -0.0803 metres
Rotation X	: 0.001871256 "
Rotation Y	: 0.011320019 "
Rotation Z	: -0.018296720 "
Scale Factor	: 0.002308323 ppm

VERTICAL DATUM

All depths in metres reduced to LAT (VORF), 2011 version

KILOMETRE POSTS

Kilometre Posts are based on the As-Laid Client Database:
"F111006_South_Route_As_Built_KP0.005_KP38.740_rev00_DoBList.xlsx"

DTM PARAMETERS

Cell Size : 0.25 m

SURFACE POSITIONING

RTK DGPS System	: Trimble SPS851 (RTK Signal Provided by DONG)
DGPS System	: C&C Technologies C-NAV
Motion Sensor	: Seatex MRU5
Gyro	: SeaPath 330

SUB-SURFACE POSITIONING

Manual Layback

SURVEY EQUIPMENT FALL PIPE ROV

Multibeam Echosounder	: Reson SeaBat 8125
Bathy Unit	: Tritech Sealking Bathy sensor SC13
Gyro	: IXSea Phins
Motion Sensor	: IXSea Phins
Doppler Log	: RDI Workhorse Navigator (1200 kHz)

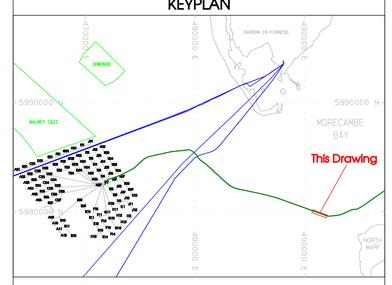
LEGEND

PLAN VIEWS

- As-Laid Export Cable with Kilometre Post Annotation
- Cross Profile Position
- Bathymetric Contour at 0.1m Interval
- 125.0 Bathymetric Contour at 0.5m Interval
- Rock Berm Armour Design

LONGITUDINAL PROFILE	CROSS PROFILES
Pre Survey	
Post Armour Survey	
Post Filter Survey	
Maximum Armour Design	
Armour Design	
Filter Design	
As-Supplied Export Cable	○

KEYPLAN



Scale 1 : 500

−10m 0m 10m 20m 30m 40m 50m

Scale 1 : 100

−2m 0m 2m 4m 6m 8m 10m

EMPLOYER

DONG energy

SCOTTISHPOWER RENEWABLES

CONTRACTOR

Offshore Wind Force V.O.F

ROCK PLACEMENT SUB-CONTRACTOR

Boskalis Offshore

D.P.F.P.V. SEAHORSE
Boskalis Offshore
Rosmolenweg 20
Postbus 43
3350 AA Papendrecht
The Netherlands
T: +31 (0)78 6969 000
F: +31 (0)78 6969 555
Email: offshore@boskalis.nl
Web: www.boskalis.com

PROJECT

West of Duddon Sands Offshore Wind Farm

TITLE

155kV Export Cable South
Cable Protection Rock Installation
Location 3
KP 16.363 - KP 16.475

Contractor:	N/A		Sheet 1 of 1
Sub-contractor:	DWG No. : BO-SH-826-11348-019		
Pre Survey :	12/09/2014	Chart No. :	
Post Survey :	13/09/2014	Date Drawn :	13/09/2014

REV No.	DATE	DESCRIPTION	PREP	CHK	APP	APP	APP
			ORIGINATOR			CLIENT	COMP
00	13/09/2014	As-Built	DPIT	CT	SGRA		