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Environmental Statement – Volume 3 – Appendix 3.4 Additional Supporting Information for Marine Works

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 – Regulation 5(2)(a)

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1.1. ROUTE PREPARATION FOR MARINE CABLE

1.1.1. SEABED DEBRIS

1.1.1.1. A Pre-lay Grapnel Run ('PLGR') will be undertaken to clear seabed debris in advance of the cable lay and burial. A grapnel hook will be towed by a vessel along the centre line of each bundled cable pair to a penetration depth of 1 m. Debris recovered by the grapnel will be collected on board the vessel for later recycling process or disposal at suitable onshore facilities.

1.1.2. OUT OF SERVICE CABLES

1.1.2.1. Where Out of Service ('OOS') cables are encountered, the cable will be cut at a length appropriate to the Marine Cable Corridor. The cut sections will be disposed of as appropriate at suitable onshore waste handling facilities. The rest of the OOS cable will remain in its existing condition on the seabed, the cut ends will be weighted down in line with industry guidance[1] and either be re-buried or covered with non-burial protection such as rock or concrete mattressing. There are approximately ten OOS cables along the UK Marine Cable Corridor. Note that locations may differ from those indicated at this time, some may no longer be present, and some may exist but be unmapped.

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[1] ICPC Recommendation No. 1: Management of Redundant and Out-of-Service Cables, Issue 13, January 2016

1.1.3. BOULDER REMOVAL

1.1.3.1. Surface boulders will be removed by ploughing and/or grabs. Towing a plough across the seabed in areas of the Marine Cable Corridor where large boulders have been identified can create a swathe of up to 15 m wide within which any boulders present will be pushed to one side. Multiple swathes will be required to clear the Marine Cable Corridor (up to approximately 80 m wide). The grab will be used to pick up any boulders not removed by the plough. These will not be recovered to deck, but instead will be relocated to beyond the edge of the Marine Cable Route, remaining within the Marine Cable Corridor. Boulders greater than 0.5 m in any one dimension were identified by the geophysical survey. Approximately 4% of the Marine Cable Corridor, measured along the Survey Centreline, intersects areas categorised as occasional boulders (10-20/10,000 m^2) and 10% numerous boulders (>20/10,000 m^2). Other individual boulders occur outside these areas, but at a lower density.

1.2. SANDWAVES AND LARGE RIPPLES

1.2.1.1. Areas of mobile sediments (i.e. ripples, large ripples and sandwaves) are known to be present along almost 30% (32.2 km) the Marine Cable Corridor. Mobile bedforms can be a constraint on installation due to related steep slope angles and the fact that their mobility could increase, or decrease, the depth of cover to the cable. Figure 3.6 of the ES Volume 2 (document reference 6.2.3.6) and Table 1 identify the location of sandwaves and large ripples along the Marine Cable Corridor. However, not all the areas of mobile bedforms are considered, at this time, a constraint on cable installation (although, due to their mobile nature, this may change over time). Figure 3.5 of the ES Volume 2 (document reference 6.2.3.5) illustrates the indicative areas where clearance activities of bedforms may be required. Of the bedforms that are currently considered a constraint so as to require dredging, large ripples occupy 0.7 km (<1% of the Marine Cable Corridor) at one location (Kilometre Point ('KP') 48.0-48.7), and sandwaves occupy 3.5 km (3.2% of the Marine Cable Corridor) across seven locations. There are occasional features that have been identified by the survey as sandwaves which are considered instead to be isolated non-mobile bed features.

1.2.1.2. Where possible, the marine cables will be routed within the Marine Cable Corridor to avoid mobile bedforms and therefore minimise the requirement for clearance. This will be undertaken during route engineering. However, since mobile sediments are, by definition, mobile, there may be a requirement for additional re-routing after the pre-installation survey and prior to construction.

1.2.1.3. In areas where sandwaves and ripples are present, and where re-routing of the marine cables to avoid such features is not possible, two clearance options are being considered to enable the cables to be buried to the required depth; Mass Flow Excavation ('MFE') and dredging.

1.2.1.4. Clearance of areas of sandwaves and large ripples will reduce excessive inclines, creating a flatter alignment for the installation equipment and enable burial in the more stable sediment below the bedforms, thereby reducing the risk of future exposure of the marine cables.

1.2.1.5. It is anticipated that between approximately 1,335,000 to 1,754,000 m^3 of sediment along the Marine Cable Corridor will need to be cleared by MFE and/or dredging. This volume also includes dredging/MFE required for other activities such as installation of the Horizontal Directional Drilling ('HDD') exit pits.

1.2.1.6. Disposal of dredged material will occur at multiple locations along the Marine Cable Corridor between KP 21 and KP 109. No disposal of dredged material will occur within shallower waters landward of KP 21. A constraints exercise identified the disposal site and plume dispersion modelling was undertaken to inform assessments of this activity. The approach to dredge and disposal (and the modelling) has been agreed with the relevant stakeholders (i.e. Natural England ('NE'). Joint Nature Conservation Committee ('JNCC'), Environment Agency ('EA') and Marine Management Organisation ('MMO')) and a Disposal Site Characterisation Report is presented within Appendix 6.5 of the ES Volume 3 (document reference 6.3.6.5).

Uneven Seabed

1.2.1.7. Uneven seabed due to the presence of gulleys, slopes and pits along the Marine Cable Corridor may require the placement of rock and/or the installation of mattresses, prior to cable installation, to create stable seabed surface to enable the safe installation of the marine cables. An analysis of survey data has identified the potential requirement for rock and/or mattresses at KP 25, KP 30 and between KP 42 – 50 where hollows, slopes and ridges have been identified. Table 1 summarises the location of slopes over 10° and the worst of the uneven ground identified along the Marine Cable Corridor. However, there may be features between KP 42 – 50, other than those identified in Table 1, that may require engineering before cable installation is possible.

Table 1 - Location of slopes over 10° and uneven ground along the UK Marine Cable Corridor

KP	Description
25.5	Slope over 10°, uneven hard ground
30.0	Slope over 10°, uneven hard ground
42.2	Slope over 10°, uneven hard ground
44.1	Slope over 10°, uneven hard ground
45.7	Slope over 10°, sandwaves
47.1	Slope over 10°, sand and gravel ridge
47.7 – 49.9	Slope over 10°, large ripples and sandwaves

1.3. MARINE CABLE INSTALLATION

1.3.1. SHALLOW WATER INSTALLATION

1.3.1.1. Preliminary estimates suggest that Cable Lay Vessel ('CLVs') can work to approximately KP 8.1 at all states of the tide, and inshore to approximately KP 4.9 at Mean High Water Springs ('MHWS'). Cable Lay Barge ('CLBs') can work to about KP 4.7 at all states of the tide and above KP 1.0 (close to the HDD exit) at MHWS. Therefore, it is likely that the CLB will need to operate between KP 1.0 and KP 4.7-8.1 depending on tide. In addition, it may be the case that, between KP 1.0 and KP 4.7 the CLB may need to ground out.

1.3.1.2. Potential worst-case CLB dimensions are likely to fall into the range 92 – 120 m length overall ('LOA') and 28 – 33 m beam and the barge would likely be held by a 4 – 8point mooring system. A maximum of 2 vessels would be grounded at any one time for a period up to a maximum of 4 weeks.

1.3.2. CABLE BURIAL

1.3.2.1. Novel techniques are always being developed e.g. Trailing Suction Hopper Dredger has recently been proposed to be used for pre-cut trenching instead of a displacement plough

1.3.3. BURIAL TOOLS

Ploughs

1.3.3.1. Ploughs are towed machines generally used for simultaneous cable lay and burial operations where the cable lay vessel controls the cable laying speed to match the plough performance and residual tension targets. Whilst they are essentially passive, ploughs can be steered and plough penetration depth is controlled remotely from the surface via an umbilical cable.

1.3.3.2. There are two principal types of cable plough: displacement and non-displacement ploughs:

- Displacement ploughs create an open v-shaped trench into which the cable is laid. Displacement ploughs are commonly used for pre-cut trenching for cable installation and are suitable for use with most types of sediment. The trench that is created may be backfilled using backfill blades at the rear of the machine, through a second pass by a separate backfill plough or left to backfill naturally. Displacement ploughs can only be used in water depths greater than 10 m; they are therefore not suitable for shallow water installation activities. Due to the nature of the activity, the use of a displacement plough will cause disturbance to the seabed, the extent of disturbance will be dependent on the characteristics of the surface and shallow seabed sediments. The seabed and sea surface footprint of a displacement plough is greater than that of other burial installation methods.
- Non-displacement ploughs (Plate 1) are designed to slice through the seabed using a thin-bladed share so as not to create an open trench and therefore causing minimal disturbance to the seabed. Non-displacement ploughs are suitable for use with most types of sediments.

Plate 1 - Non-displacement cable plough (image courtesy of DeepOcean)

1.3.3.3. In addition to the seabed characteristics, other considerations for the selection of ploughs as a burial technique include manoeuvrability requirements, depth of water, cable bending requirement and the requirement for pre-lay trenching.

Jet Trenching

1.3.3.4. Jet trenching machines (Plate 2) are typically used post-cable lay, to bury marine cables. Within non-cohesive material (e.g. sands and gravels) high flow and low-pressure water jets are used to enable the sediments to be fluidised and displaced. Conversely, to trench a cable through cohesive sediments (e.g. clay), low flow and high-pressure water jets are utilised to mobilise clays. Use of water jets to fluidise the seabed sediments underneath the cables allows the formation of a trench into which the cable can sink under its own weight, or by a depressor, to the required depth.

1.3.3.5. The trench created may be partially or completely filled by the settling of the fluidised material. The previous seabed level typically recovers over time through natural sedimentation.

Plate 2 - Jet trencher (image courtesy of DeepOcean)

1.3.3.6. In addition to seabed characteristics, other considerations for the use of jet trenching as a burial technique include local water currents, water depth, organic content in seabed sediment, cohesiveness of sediment (increased clay content reduces the performance of jetting) and sediment size (larger sediments i.e. gravels reduce the performance of jetting).

Mechanical Trenching

1.3.3.7. Mechanical trenchers are typically mounted on tracked vessels and use a cutting wheel or a chain to cut a defined trench through the seabed (see Plate 3) Mechanical trenchers can operate in the majority of sediments, including hard bedrock but do not work as effectively in mobile sands, unless scoop-like teeth are attached to the chains.

1.3.3.8. Mechanical trenchers are fitted with cutting teeth which cut the trench and mechanical scoops which transport the cut material away from the trench. The cable is then guided into the trench base by a depressor arm. In some instances, divers are used to assist in the laying of the cable.

Plate 3 - The trench created during mechanical trenching can be back filled or left to refill through natural sedimentation.

1.3.3.9. Mechanical trenchers can be used for pre-lay trenching, post-lay burial and simultaneous lay and burial.

1.3.3.10. Seabed characteristics need to be considered prior to the use of mechanical trenching as a burial methodology. In areas of softer sediments, there is a risk of trench collapse due to instability, as well as clogging of the cutters. Harder or coarser sediments, such as gravel and cobbles, can also jam the cutters, resulting in the requirement for recovery and maintenance and therefore possible delays during installation. Mechanical trenchers have relatively low installation speeds and are therefore impracticable to use for long distances of cable.

Cable Burial Depth and Width

1.3.3.11. The Cable Burial Risk Assessment has identified the threatline, which is the maximum depth of interaction from subsea hazards such as fishing and anchoring. The threatline is largely driven by shipping (frequency and vessel size, hence probability of anchor threat, and potential depth of anchor penetration) and fishing (frequency and type). Due to the proximity of the Traffic Separation Scheme, containing major vessels transiting to and from the UK and northern Europe, and the vessel movements associated with the major ports of Portsmouth and Southampton, shipping (and hence anchoring) is considered the prime risk to the marine cables in UK waters.

1.3.3.12. The threatline has been assessed as part of the burial strategy to determine the Target Depth of Lowering ('TDL') which the installation contractor will be required to achieve. The TDL is illustrated in Plate 4 and the definition of the parameters provided below.

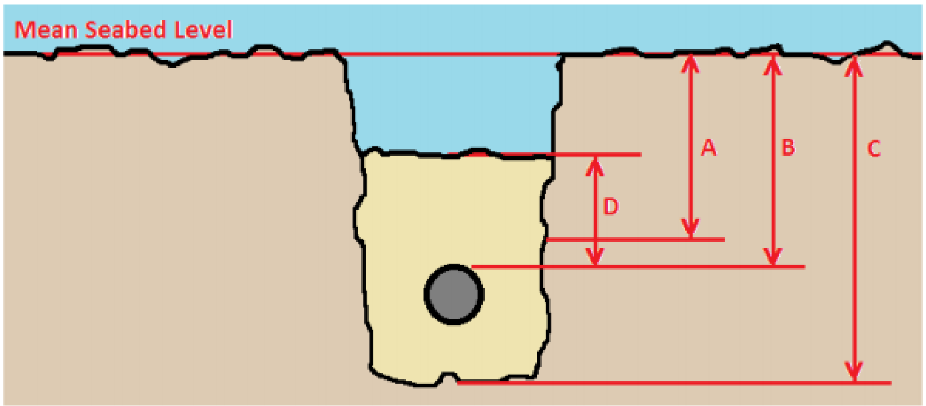

Plate 4 - Definition of Trench parameters (Carbon Trust, 2015)

- A (Recommended minimum depth of lowering) – minimum depth recommended for protection from external threats, direct output of the risk assessment;
- B (Target depth of lowering) – depth that cable installers should target, specified by the developer. Should be equal to or greater than the recommended depth of lowering;
- C (Target trench depth) – based on the cable properties and the trenching tool selected; and
- D (Depth of cover) – thickness of material on top of the cable after trenching.

1.3.3.13. Preliminary estimates suggest that the TDL to achieve burial protection against external hazards in UK waters generally varies from 1.0 m to 3.0 m. These target depths are from a stable seabed level, i.e. after clearance of significant sandwaves and large ripples. In three locations the estimated threatline is deeper than 3.0 m (KP 2.0-2.8, 43.8-44.2 and 44.9-45.2). For these sections (totalling approximately 1500 m), due to the limitations of trenching equipment, a TDL of 3.0 m has been anticipated, however, as indicated in Table 3.3 of Chapter 3 (Description of the Proposed Development) of the Environmental Statement ('ES') Volume 1 (document reference 6.1.3), it is also anticipated

1.3.3.14. that non-burial protection will also be required in these sections to ensure adequate protection to the cable.

1.3.3.15. As indicated above, where TDL is 3 m (and the threatline exceeds this) there is a higher probability that the target will not be achieved, and a potential need for additional protection, and therefore a likelihood that planned remedial non-burial protection will be required.

Cable Crossings

1.3.3.16. Figure 3.8 of the ES Volume 2 (document reference 6.2.3.8) illustrates two typical cable crossing methods. In the worst-case (Option 1), where the footprint of rock berms for the cable crossing is largest, the pre-lay berm (a single berm in preparation for both cables) will typically be 30 m x 100 m and the post lay berms 600 m x 30 m (one for each cable pair).

Cable Sections and Joints

1.3.3.17. CLVs are limited to the maximum quantity of cable they can carry on board (typically 40 km to 120 km of bundled cable pair for Dynamic Positioning ('DP') CLVs, and 18 km to 40 km for CLBs).

1.3.3.18. There may also be a requirement for larger omega joints to be installed however, the final number and location of cable joints will be determined once the contractors have been appointed and is dependent on a number of factors including final cable weight, type of CLV used (and hence cable load capacity) and the final marine cable installation methodology, particularly at the Landfall and in shallow waters.

1.3.3.19. It is anticipated that the joints will be manufactured on board the CLV and will take approximately 5 – 6 days to complete and 1 – 2 days to deploy onto the seabed, during which time the vessel will be anchored or positioned by DP.

1.3.4. NON-BURIAL PROTECTION FOR REPAIR AND MAINTENANCE

1.3.4.1. The requirement for additional non-burial protection which may be needed during the operational phase of the Proposed Development has been considered within this Application. In order to prevent an incremental increase in non-burial protection occurring over the lifetime of the Proposed Development and to ensure that an allowance for the placement of non-burial protection for the operational phase of the project is assessed fully, an indicative contingency (10% of the cable route length) for the amount of protection required has been calculated.

1.3.4.2. Further details relating to maintenance and repair are also provided in Section 3.5.9 of Chapter 3 (Description of the Proposed Development).

1.3.5. LANDFALL INSTALLATION (MARINE)

1.3.5.1. The following paragraphs describe the landfall installation activities specific to the marine environment. Section 3.5.8 of Chapter 3 (Description of the Proposed Development) describes the landfall installation activities specific to the onshore environment. More detail on the approach to HDD is included in Appendix 3.2 (Marine Worst-Case Design Parameters) of the ES Volume 3 (document reference 6.3.3.2). The Landfall HDD operations will drill surface to surface boreholes under the intertidal area. The HDD method limits disturbance to the environment when compared with open trenching techniques. For the purpose of this description, the onshore entry/exit is referred to as the Transition Joint Bay(‘TJB’), with the other end referred to as the marine entry/exit point. The use of HDD avoids the need for any trenching operations on Eastney Beach or in the nearshore area.

1.3.5.2. Marine to onshore HDD requires temporary works including a jack-up barge, three to four trestles/lattice frameworks, with 36” steel casings attached to the trestles. The operations will also require a multicat, a safety vessel, a crew transfer vessel, and up to four workboats to tow out the ducts, connect the end caps and provide other operational support.

1.3.5.3. The casings will be 24 – 36 m long and will need to be driven into the seabed at the 10 – 12 degree angle until the end is at approximately 5 m depth to ensure that there is a good seal to avoid drilling fluid breakout. Each casing will take 2 x 12 hours shifts to install (ID2 in Table 5 below). To drive the trestle supports for the casings into the seabed and then install the steel casings into the seabed and relocate to the next duct location would take approximately 43 x 12 hour shifts for all four ducts (i.e. the items ID1, ID2 and ID8 shown in Table 5.). Then, a pilot hole will be drilled into the seabed using wire-guided drilling techniques and advanced in stages until the required length to the exit point at the onshore TJB is reached.

1.3.5.4. Once complete, the pilot hole will be enlarged through several passes with reamers until the required diameter for duct installation is reached. A second drilling rig would be located at the TJB location to assist with reaming and duct installation.

1.3.5.5. The jack up vessel may stay in one location or be moved between bores i.e. located at four different locations, one for each bore, depending on the final duct and cable separation and specific barge deck space.

1.3.5.6. The ducts either high-density polyethylene ('HDPE') or steel, are welded together and floated out to the marine location for installation. Once installed, there may be a period of time between duct installation and cable pull. If that is the case, the ducts would be protected by non-burial protection techniques, such as rock bags, mattressing or placed rock. This would be within the previously excavated marine entry/exit pits, thereby ensuring that navigable depth is maintained.

1.3.5.7. Pulling winches, located onshore, will be used to pull the cable though the ducts using a pulling wire.

1.3.5.8. To the seaward side of the marine entry/exit point the four cables will be bundled in to two pairs and then be trenched, in that form, for the remainder of the marine route. Trenches and non-burial protection may be required for the transition from four HDD ducts to two bundled pairs of buried cables.

1.3.5.9. A typical breakdown for the HDD installation works is shown in Table 5.

Table 5 Typical breakdown of 12 hr shifts for HDD installation works

		No. 12 hr shifts			
ID	**Activity**	**Duct 1**	**Duct 2**	**Duct 3**	**Duct 4**
1	Install 3 trestles and set up casing for driving	8	8	8	8
2	Drive casing	2	2	2	2
3	Set up for drilling	21	21	21	21
4	Drill pilot hole for full length	14	14	14	14
5	Ream hole for full length	17	17	17	17
6	Install duct for full length	10	10	10	10
7	Pull casing	4	4	4	4
8	Relocate to next duct	1	1	1	Demob

1.3.6. MAINTENANCE AND REPAIR

Post-lay Marine Surveys

1.3.6.1. Post installation, a survey will be undertaken along the Marine Cable Route to ensure the Marine Cables are adequately buried and the risk to navigation reduced as low as reasonably practical and that the crossings have been constructed as designed.

1.3.6.2. The specification of this is site-specific, driven by factors such as burial depth achieved, seabed conditions, risk to cable and seabed mobility. However, at this stage it is assumed that a multibeam echo sounder and cable tracker survey would be undertaken on completion of cable installation. If remedial works are required, further post-works surveys may be required

1.3.6.3. If a post-lay burial methodology is adopted, and whilst burial should occur within two months of cable lay, a survey may be undertaken after cable installation, prior to cable burial (depending on the time between lay and burial) and also following the burial operations.

1.3.6.4. For simultaneous cable installation operations using a cable plough the ‘as-built’ status is not always established with a post-lay survey. The depth of lowering can be derived from the plough sensors.

1.3.7. MAINTENANCE, REPAIR AND OPERATION

1.3.7.1. Once the approximate failure location has been identified, deburial will be undertaken by Remotely Operated Vehicle ('ROV')-based jet systems / mass flow excavator (to remove sediment) and/or a grapnel run. Any existing mattressing or rock dump would have to be removed first. An ROV will be flown along the suspected damaged section of the exposed cable to check for any obvious sign of cable fault. The bundled cable pair will then be clamped either side of the fault location and cut with a diamond or guillotine cutter or similar.

1.3.7.2. Because the joint is being made between two ends that have already been installed on the seabed, it cannot be re-laid as an in-line joint (as the construction joints are likely to have been). Instead, an omega (or hairpin) joint is used because the cables need to be laid parallel to each other but perpendicular to the overall cable alignment. Sufficient cable needs to be recovered for cable slack management and for both ends to be replaced simultaneously. This typically requires a length of cable up to 3 x water depth to be recovered from the seabed (e.g. in the worst-case, at the maximum water depth of approximately 70 m, this could amount to approximately 1,100 m of cable to typically be recovered and re-laid for each repair of a cable pair.) The actual length of cable to be replaced depends on the installation geometry described above, but also on the number of cables damaged (one cable, one pair or both pairs), and the extent of that damage (including water ingress) to the specific cables.

1.3.7.3. After successful jointing and laydown, the cable will lie in a hairpin (or omega) configuration to the side of the cable route. The joint body (and omega) will not be able to be handled with a burial tool so other methods, such as pre-dredging of a seabed pit and/or placement of rock, may be required. In areas that require significant depth of lowering or cover it can be difficult to provide the required levels of protection without the use of non-burial protection. Accordingly, the Application has incorporated a non-burial protection contingency to ensure that an allowance for non-burial protection for maintenance and repair activities has been assessed. This contingency is discussed in further detail in Appendix 3.2 (Marine Worst-Case Design Parameters).

1.3.7.4. The actual jointing operation of stripping back the cable and connection of the separate cable section is a delicate process which takes up to 5 – 6 days, the handling of the joint and deployment to the seabed can take 1 – 2 days depending on the methodology. Depending on the extent of cable damage, cable repair operations typically have a duration of several weeks to months.

Electric and Magnetic Fields

1.3.7.5. The peak magnetic field values will be confirmed at the final design stage once the cable supplier has been appointed.

1.3.7.6. The peak magnetic field strengths at various distances are shown in Table 3.5 of ES Chapter 3 (Description of the Proposed Development), with the profile of the field shown beneath in Plate 5.

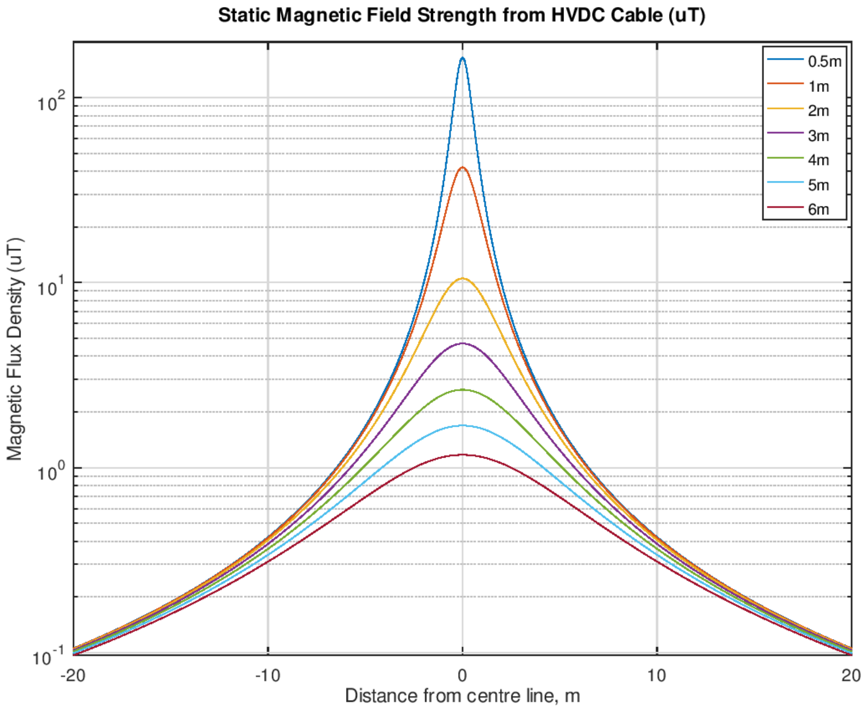

Plate 5 - Estimated magnetic field profiles at different levels above the Marine Cable

1.3.7.7. Installation of the marine cables as bundled circuits will also minimise the impact of compass deviation as a result of magnetic field emissions.

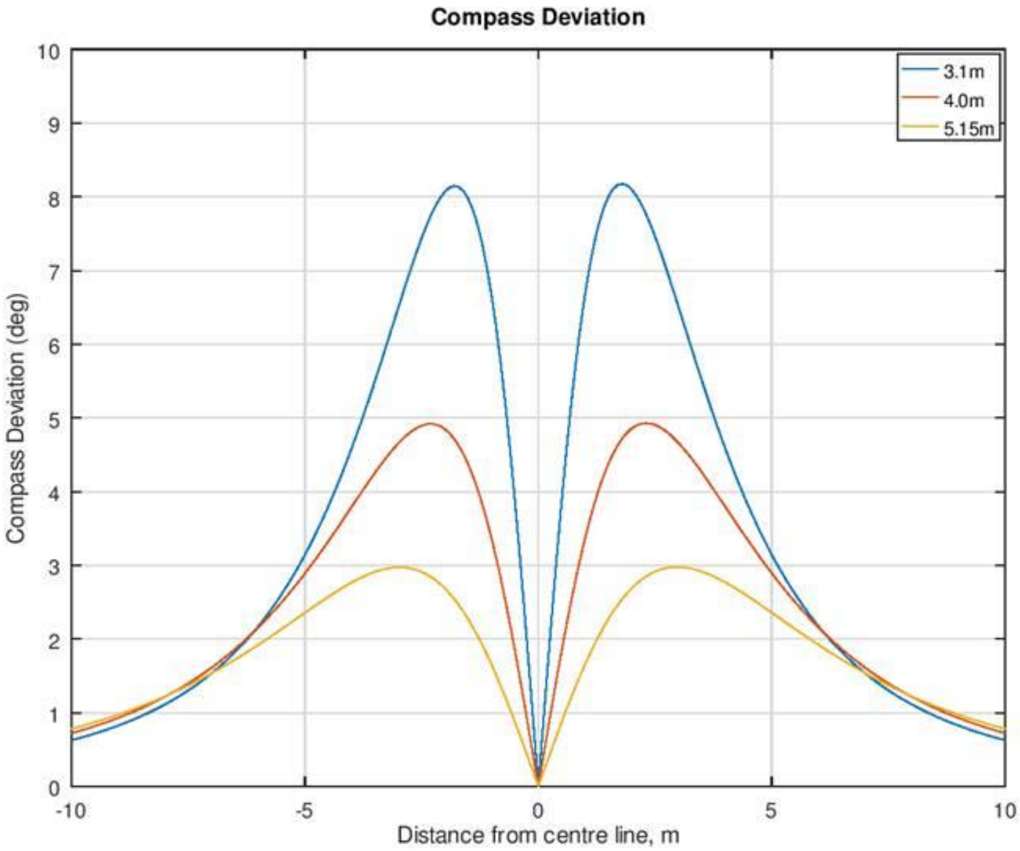

Plate 6 – Compass deviation due to magnetic field from the cable at different levels above the Marine Cable

1.3.7.8. Plate 6 illustrates the peak compass deviation at different distances above the cable (this includes burial depth and water depth). The Maritime and Coastguard Agency ('MCA') has advised that compass deviation should not exceed 3 degrees over 95% of the whole navigable section of the route (i.e. UK and French waters), and not exceed 5 degrees over 5% of the route. Plate 6 indicates that this distance between the cable and measurement point (assumed to be the compass) must be as indicated in Table 6:

Table 6 – Required minimum distances above cable to meet MCA advisory maximum compass deviation levels

Compass deviation not exceeding	Percentage of navigable route	Required minimum distance above cable
3 degrees	95	5.15m
5 degrees	5	4.0m

1.3.7.9. Whilst any ships compass is likely to be at a greater elevation, the worst case has been assumed that the compass deviation would be measured at Lowest Astronomical Tide (‘LAT’). It has also been assumed that navigation is possible to LAT. On this basis, over 97% of the route will have compass deviations of less than 3 degrees, 2.5% between 3 and 5 degrees, and less than 0.5% more than 5 degrees. The greatest compass deviation is predicted to occur in very shallow water, where vessel traffic is likely to be low. Where vessel traffic is greatest (entrance to the Solent and the Traffic Separation Scheme (‘TSS’) corridors) compass deviation is predicted to be lowest. The approximate relative direction of the cable to the shipping corridors is illustrated in Table 7.

Table 7 – Approximate cable angle to shipping traffic flow for high traffic areas

Section	Shipping Density	KP	Cable distance from LAT (m)	Approximate cable angle to traffic flow
Langstone Harbour approach	Medium	0-2	3-4	<10
Langstone Harbour / Chichester Harbour approaches	High	2-7	4-6	70-90
Solent approaches	Medium - High	7-13, 25-31	10	<45
TSS North	Medium - High	62-74	49-58	50-70
TSS South	Medium – High	84-102	40-50	45-65

1.3.8. DECOMMISSIONING STAGE

1.3.8.1. The importance of considering the decommissioning process as part of the early stages of the consenting process is acknowledged. It is anticipated that a separate Marine Licence application for decommissioning works may be required closer to the time of decommissioning. The decommissioning plan would support a Marine Licence and provide the level of detail that cannot be provided years in advance.

1.3.8.2. At the time of decommissioning, the options for decommissioning the cable will be evaluated and could include consideration of leaving the Marine Cable in situ, removal of the entire Marine Cable or removal of sections of the Marine Cable. These options will be evaluated against the environmental implications, safe navigability of the area for other sea users and liability risks and will consider the most current and/or relevant decommissioning guidance that is available at the time.

1.3.8.3. A similar process will be undertaken for decommissioning of other infrastructure installed as part of the Proposed Development such as non-burial cable protection.

1.3.8.4. Prior to any removal of buried cables, the cable will need to be located, which may require the seabed to be excavated through dredging and/or MFE.

1.3.8.5. Should it be decided to remove the Marine Cables from the seabed, removal would typically be undertaken by using jetting techniques to expose a section of the cable or a specialised grapnel to raise the cable to the surface. Removal could either be by attaching a grapnel to the cable to lift it back onto the cable recovery vessel or through using a roller along the full length of the cable to raise to seabed level and using the grapnel to lift it, in sections, to the cable recovery vessel.

1.3.8.6. Whilst large cables can be pulled directly from the seabed without the requirement for de-burial works due to their high tensile capacity, the cable properties are likely to be compromised, therefore any cables recovered using this method will be deemed as scrap cable. Any sub-sea trenches left after cable removal will be filled by the natural action of tides and currents. A post-recovery survey would be undertaken and provided to regulators to confirm the successful removal of the cable.

1.3.8.7. It is anticipated that the size, type and number of vessels used in the retrieval of cable would be similar to that used during installation.

1.3.8.8. Following retrieval of the buried cable, it will be transported back to shore where it will be disposed of in accordance with the relevant waste management legislation and best practice. The principles of the Waste Hierarchy will be applied which states a preference of avoiding the production of waste altogether and re-use or recycling of materials preferable to disposal