Scottish & Southern Electricity Networks

SHEPD

Section ID 154

# Scottish Hydro Electric Power Distribution

# Project Description

# Bute – Cumbrae Cable Replacement

# Contents

# Definitions and Abbreviations

The following definitions are used within this document:

| | |
|---|---|
| SSEN | Scottish and Southern Electricity Networks |
| SHEPD | Scottish Hydro Electric Power Distribution plc |
| Cable | SHEPD submarine electricity cable network |

The following abbreviations and definitions may be used within this document:

| | |
|---|---|
| AtoN | Aid to Navigation |
| CFE | Controlled Flow Excavator |
| CLV | Cable Lay Vessel |
| DSV | Dive Support Vessel |
| DWA | Double Wired Armour |
| HDD | Horizontal Directional Drilling |
| HVAC | High-Voltage Alternating Current |
| ICPC | International Cable Protection Committee |
| kV | kilovolt |
| MAIB | Marine Accident Investigation Branch |
| MHWS | Mean High Water Springs |
| ML | Marine Licence |
| MLWS | Mean Low Water Springs |
| MSL | Mean Sea Level |
| NTM | Notice to Mariners |
| ODN | Ordnance Datum Newlyn |
| OHL | Overhead Line |
| OoS | Out of Service |
| PAC | Pre-application Consultation |
| PLGR | Pre-Lay Grapnel Run |
| PMF | Priority Marine Feature |
| PPY | Poly Propylene Yarn |
| PSD | Particle Size Distribution |
| ROV | Remotely Operated Vehicle |
| RPL | Route Position List |
| SNH | Scottish Natural Heritage |
| SWA | Single Wired Armour |
| UXO | Unexploded Ordnance |
| XLPE | Cross Linked Polyethylene |

# 1. Introduction

1.1. Scottish Hydro Electric Power Distribution plc (SHEPD) holds a licence under the Electricity Act 1989 for the distribution of electricity in the north of Scotland including the Islands. It has a statutory duty to provide an economic and efficient system for the distribution of electricity and to ensure that its assets are maintained so as to ensure a safe, secure and reliable supply to customers.

1.2. This document should be read in conjunction with the following documents:

- *Marine Licence Application Form*
- *CBRA Supporting Info*
- *Pre-Application Consultation Report (appended by Cost Benefit Analysis Model)*
- *Environmental Supporting Information*
- *Fishing Liaison Mitigation Action Plan (covering all legitimate sea users)*
- *Construction Environment Management Plan*
- *Operation, Inspection, Maintenance and Decommissioning Strategy*

# 2. Background

2.1. The Island of Great Cumbrae is normally fed via two 11kV submarine electricity cables from the Island of Bute. On the Sunday 26 February 2017 one of these cables faulted, leaving the island fed solely by the Sheriff's Port cable (Figure 1).

2.2. The failed cable was installed in 1980 and had already been identified as nearing the end of its operational life. This has been verified through our existing asset records and following recent visual inspections by ROV on the cable. In addition to this, the cable has been repaired since installation, with the age and depth of the cable making further repair difficult.

2.3. The proposed cable route installation will be further to the north to avoid cable crossings, rocky shore ends and provide a more secure long-term route. The 11kV cable will be replaced with a 33kV cable but operated at 11kV. This allows for future network upgrades on this circuit that are foreseen to be required in the future. The proposed route is shown below.

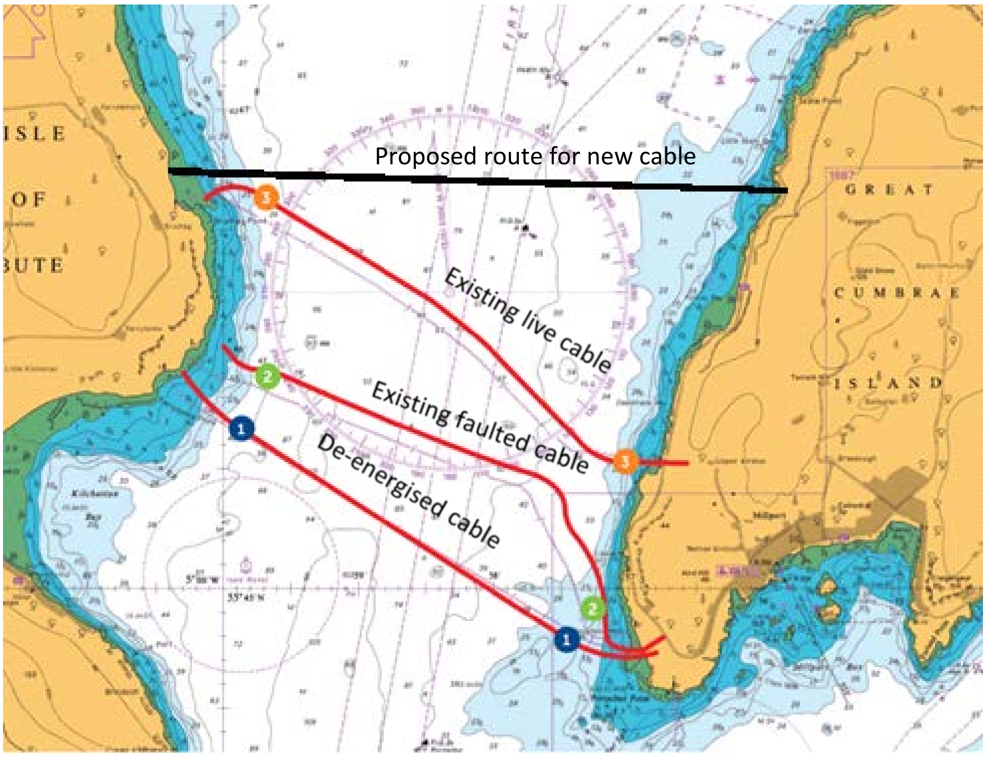
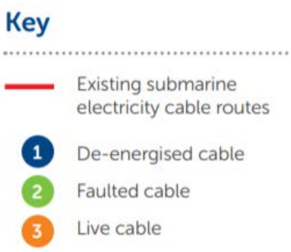



Figure 1 Existing Bute – Cumbrae cable routes



# 3. Proposed cable construction

3.1. Electricity will be transmitted using HVAC submarine cable technology. The typical cable structure is shown in Figure 2.

3.2. The proposed submarine cable consists of a three core design with copper round compacted stranded conductors, XLPE insulation, copper polyethylene laminated tape, polyethylene sheath, PPY, galvanized steel wire armour, PPY, with one interstitial armoured optical fibre cable. The cable is rated at 33 kV HVAC, with an outer diameter of 107 mm and weight of 13.7 kg/m in water. The proposed cable construction is shown in Figure 3.

Figure 2 Typical XLPE HVAC submarine cable structure

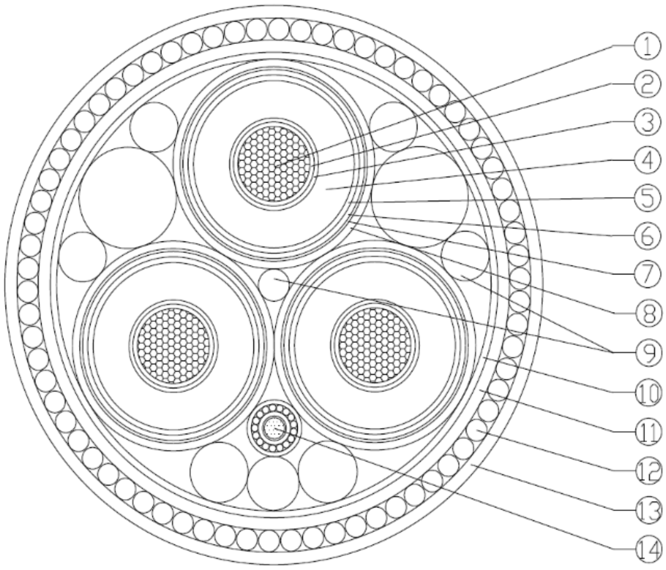
(Source: ABB)

3.3. The three core design minimises the resultant electric and magnetic fields produced from the cable during operation. This is further reduced by balancing the loads within each of the cable's individual phases.

3.4. The proposed single wired armour (SWA) construction will provide the cable with additional mechanical protection and will also help reduce the resultant electric and magnetic fields generated during operation of the cable.

3.5. Fibre optics will be installed integral to the submarine cable for the purpose of cable condition monitoring, control and power system protection.

3.6. The submarine cable conductor specification and power rating has been selected through assessment of historic demand on the existing SHEPD network and with consideration of future customer demand growth on the network.




1 Copper stranded conductors
2 Semiconductive waterblocking tape
3 Non-metallic screen
4 XLPE insulation
5 Non-metallic screen
6 Semiconductive waterblocking tape
7 Metallic screen
8 HDPE sheath
9 Non-hydroscopic fillers
10 Binding tape
11 PPY separator layer
12 Layer of galvanized steel armouring
13 PPY outer layers
14 Fibre optic

Figure 3 Cable construction

# 4. Pre-installation survey requirements

4.1. Geophysical marine surveys were undertaken during July and August 2018 in order to confirm the viability of the proposed new cable route in relation to seabed conditions, bathymetry and any other seabed features. Geotechnical surveys have been arranged to be carried out, after these have been completed the cable burial risk assessment will be updated based on the results. Geophysical surveys were undertaken over a 1,000 m wide corridor centred along the line between the proposed new landfalls. The main objectives of the marine surveys were to identify:

- seabed conditions (e.g. sand, rock, mud) to optimise the proposed marine route corridor (avoidance of rock outcrops)
- potential geological constraints, such as dykes, rock pinnacles, sand waves, incised channels etc.
- locations of potential engineering constraints and/or safety hazards, such as existing pipelines and cables either in service or out of service, wrecks, marine debris.
- areas of potential biological and ecological importance (such as biogenic and rocky reefs, priority marine features etc.) to allow habitat mapping and inform the requirement for additional surveys and assessment.

4.2. The following marine surveys were undertaken:

- Multibeam Echosounder (MBES)
- Side Scan Sonar (SSS)
- Sub Bottom Profiler
- Magnetometer
- Drop down video

4.3. The surveyed corridor was centred along a straight line between the two proposed landfall sites at Kerrylamont Bay and Bell Bay. See Figure 4.

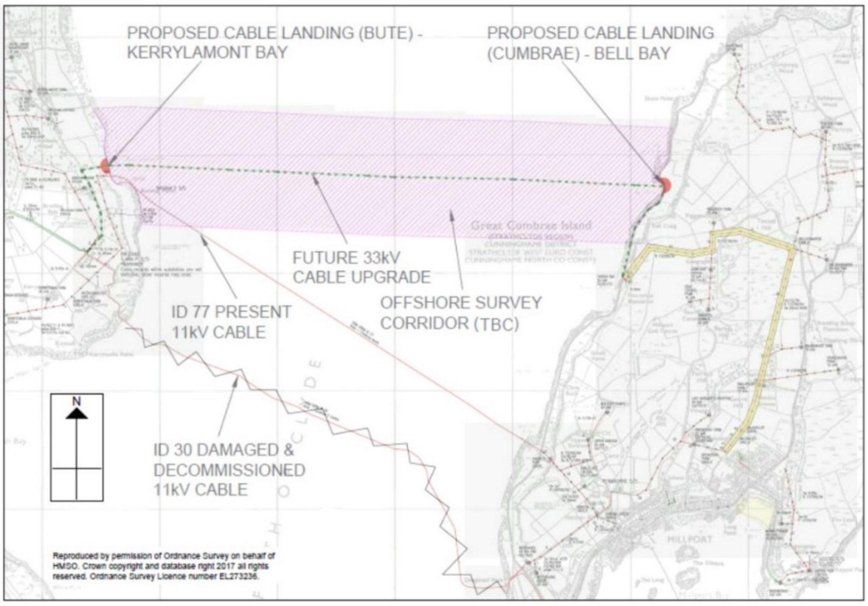



Figure 4 Survey Corridor

4.4. The resulting surveys of the marine environment have confirmed a viable replacement cable route within this corridor.

4.5. Sub Bottom Profile surveys have been carried out along the route to determine the depth of sediment coverage above the bedrock layer.

4.6. The bathymetric data along the surveyed route has highlighted a short area of boulders at the western end of the route (approx. 41m in length) and variable sediment coverage along the rest of the proposed route. See Figure 5.

4.7. Environmental Supporting Information has been prepared in light of the information found during the survey. In summary no major environmentally sensitive issues were found. Please refer to the ESI for more information.

4.8. The cable route has been optimized to minimize the impact on the environment.

4.9. There are no identified SACs or MPAs with benthic features which overlap with the survey corridors. In 1990 Greater and Little Cumbrae were designated as the Cumbraes Marine Consultation Area for Seabed habitats. MCAs are identified and listed as deserving distinction in respect to the quality and sensitivity of their marine environment. There are no other national or local designations within the cable installation corridor.

4.10. Impact on marine mammals, benthic ecology and waterfowl is minimized through compliance with our Construction Environmental Management Plan.

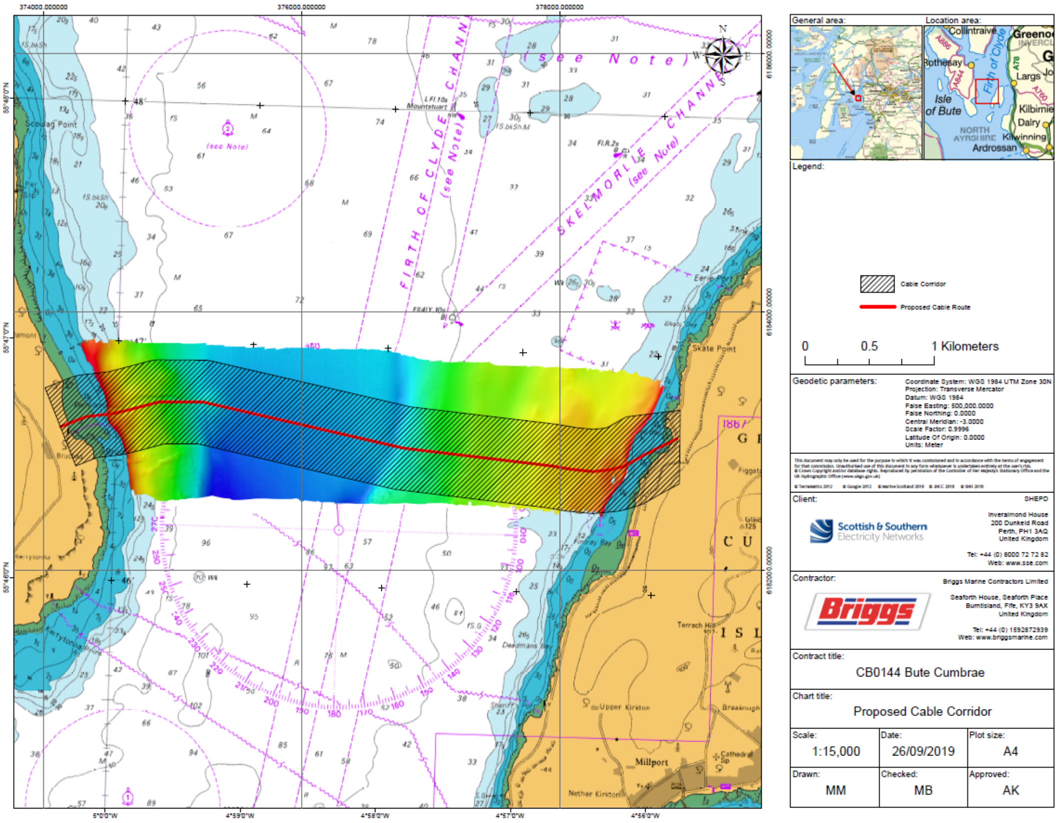



**Figure 5 Proposed cable route and route corridor centreline**

# 5. Project description

5.1 The project aim is to install a new 33kV submarine electricity cable from Kerrylamont Bay in Bute to Bell Bay in Cumbrae within the Firth of Clyde. This cable will operate at 11kV to allow for future network upgrades. The land infrastructure will be upgraded at both shore end landfalls to connect the submarine cable into existing island networks. On Bute a new underground cable will be installed and on Cumbrae the overhead line (OHL) will be upgraded and underground cable to connect to the upgraded OHL.

5.2 Following a review of pre-installation marine survey data, an optimum route for the cable utilising the marine survey corridor has been identified, see Figure 6. The application length for the proposed cable will be 5.8km in length between the two transition joints, which are located inshore from the MHWS limit. This allows for obstacle avoidance during the cable lay and tolerances with the cable lay operations.

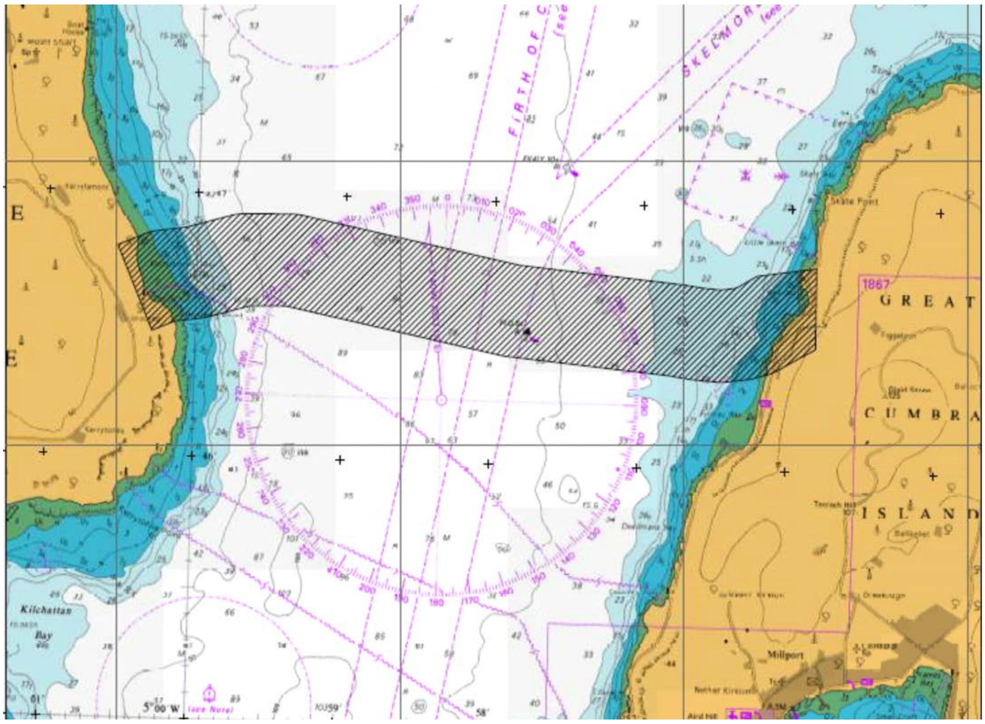



Figure 6 Proposed route corridor

5.3 Following assessment of the existing and alternative cable landing points, the decision was made to relocate the replacement cable route further north due to the rocky coastline and difficulty burying the cable at both shore landfalls on Bute and Cumbrae. This also meant that there would be no cable crossing issues with the existing cable and allows safer installation, operation, future maintenance and ongoing inspection of the cables.

5.4 The proposed new landfall position for Bute is shown in Figure 7 and Cumbrae is shown in Figure 8.

Figure 7 Shore End at Kerrylamont Bay, Bute

Figure 8 Shore End at Bell Bay, Cumbrae

5.5. The comment about shifting sands and mobile sediments at Bell Bay raised at the PAC event for Bute-Cumbrae has been noted by the design team at SSEN and further discussed with the team carrying out survey works by Briggs Marine. There have been no indication of this being the case based on a number of site visits and current survey works carried out to date. Following installation of the replacement cable, SSEN will ensure that shore end condition inspections are undertaken in line with our existing submarine electricity cable plan on an annual basis throughout the operational life of the cable allowing us to monitor cable exposure where this becomes an issue with sediment mobility. SSEN have also mitigated this risk by installing additional split pipe protection to the cable as well as burial in these locations to reduce the risk of exposure following installation. Should the cable become exposed over time, the additional split pipe covering the shore ends will protect the cable from external hazards and will protect the public/animals etc. from coming into contact with the cable. Depth probes are currently being carried out in the intertidal areas to confirm depth of sediment and burial potential at the shore ends. The cable burial risk assessment will be updated with this information on completion.

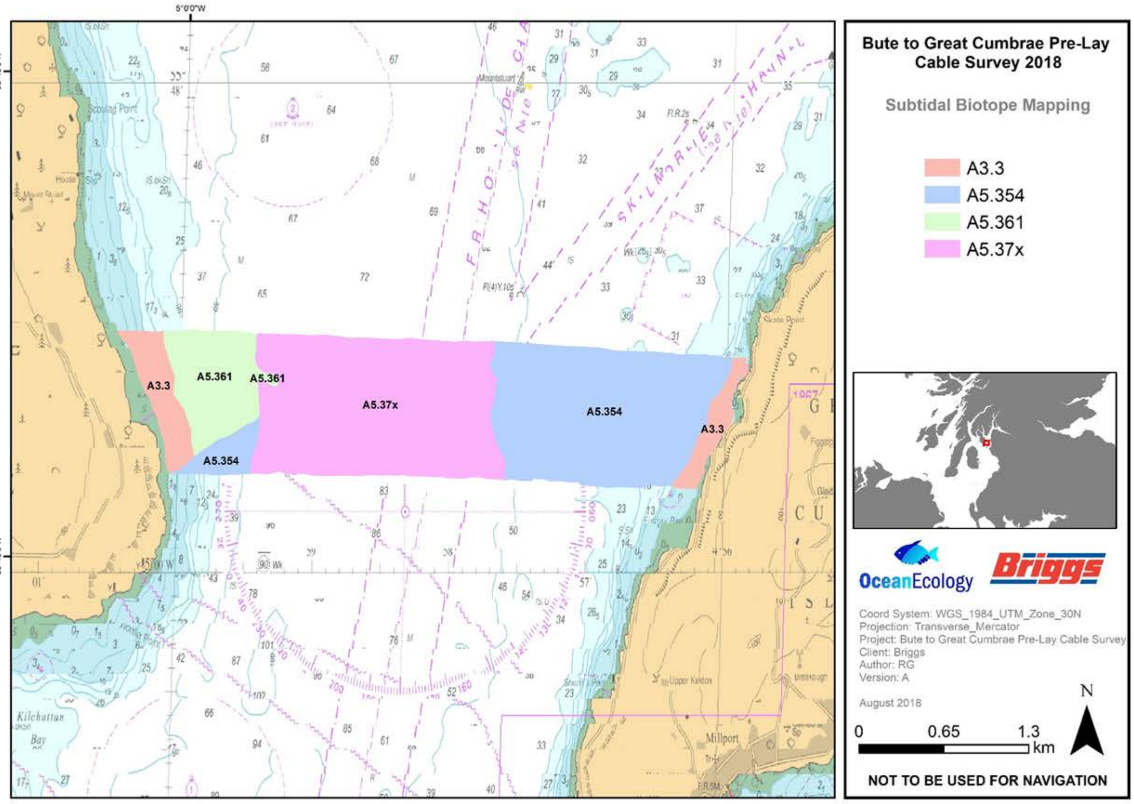
5.6. The proposed cable will be installed in a route corridor 650m wide. The coordinates of this corridor are shown in Appendix A. The proposed cable route lies within the previously surveyed corridor. The cable will be micro-routed within this corridor to avoid areas of significant bedrock and boulders to maximise burial potential, and to avoid or minimise the impact on sensitive marine features identified from the marine surveys.

5.7. The geophysical surveys carries out have shown a boulder field in the offshore section, close to the Bute shoreline. Further investigation will be carried out in this area, but targeted boulder clearance may be required in this area. Either a crane operated grab, operated from a boat, will be used to pick boulders and reposition them out of the way. Or a clearance tool, like a rake, but not penetrating the seabed will be used. The minimum amount of boulders to allow the safe installation and operation of the cable will be moved. The distance of movement will also be minimised, and it is expected to be no greater than 20m.

5.8. Marine features designated as Priority Marine Features (PMF), have been identified in the immediate vicinity of the survey area. In the intertidal area at Kerrylamont Bay, Mussel beds have been identified, but were not recorded as the predominant biotope in any area. The Mussel beds are a listed PMF, and while the blue mussel *Mytilus edulis* was recorded at Kerrylamont Bay, they did not represent significant beds and were not recorded as the predominant.

5.9. In the subtidal area Seapens and burrowing mud megafauna in circalittoral fine mud (A5.361) has been identified as a PMF. This biotope skirts the coast on the western part of the route and cannot feasibly be avoided in the cable routing. See Figure 9 Biotope Map. For further information refer to section 5, Benthic and intertidal ecology, of the Environmental Supporting information.

5.10. The recommendations in the Environmental Supporting Information around minimizing impact on the Subtidal and Intertidal Ecology will be complied with. In summary this will see the use of anchors and movements of anchors being minimized and undertaking cable installation in line with best industry practice




| Biotope Code | Description |
|---|---|
| A3.3 | Low energy rock |
| A5.354 | Sandy or shelly mud |
| A5.361 | Burrowed, fine mud |
| A5.37x | Deep, burrowed, fine mud |

**Figure 9 Biotope Map of Survey Corridor showing sediment types.**

5.11. In 1990, Great Cumbrae and Little Cumbrae were designated as a Marine Conservation Area for Seabed habitats and species. This covers 2,823 ha surrounding the whole Cumbrae region and therefore the cable landfall on Cumbrae falls within this designation. There are no other national or local designations within the cable installation corridor. See Figure 10.

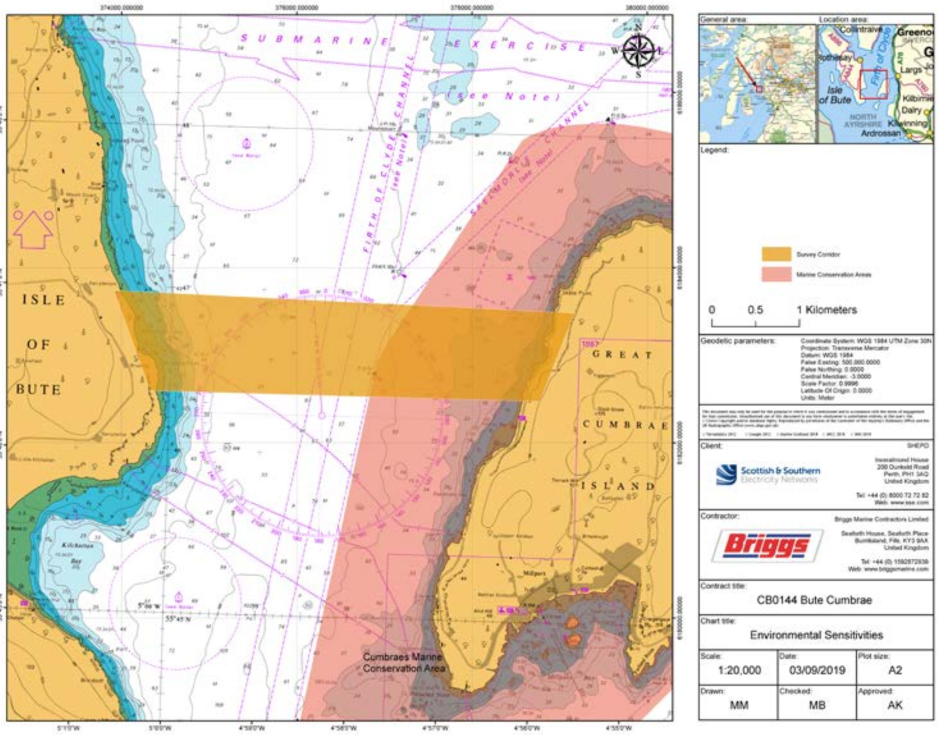



Figure 10 Environmental Designations

5.12. No marine cultural heritage statutory designations have been identified in the works area.

5.13. As it is proposed to create new shore end landfall positions, AtoN warning beacon locations will be installed. Ongoing maintenance and inspections associated with the warning beacon will be carried out in accordance with our *Operation, Inspection, Maintenance and Decommissioning Strategy* to ensure they are in good condition for sea user safety.

5.14. Details of relevant policies from Scotland's National Marine Plan (and Clyde Marine Spatial Plan) and consideration of these have been given as summarised in the Environmental Supporting Information.

5.15. The Scottish Government adopted the National Marine Plan (NMP) in early 2015 (Scottish Government, 2015) to provide an overarching framework for marine activity in Scottish waters, with an aim to enable sustainable development and the use of the marine area in a way that protects and enhances the marine environment whilst promoting both existing and emerging industries. This is underpinned by a core set of general policies which apply across existing and future development and use of the marine environment. For this project, the policies covering sea fisheries and submarine electricity cables are of particular relevance.

5.16. This project will facilitate existing and emerging industries, by providing a secure electricity supply to those industries. In accordance with GEN 7, the cable lay methodology takes seascape, landscape and visual impacts into account. After a short duration of installation (minimising noisy activity to a few days at a time, in line with GEN 13) this project will protect and enhance the marine environment by burying the cable under existing sediment, allowing existing ecosystems to re-establish, reducing visual impact and risk to other marine users.

5.17. The capacity for the cable to operate at 333kV future proofs the cable use, allowing an upgrade without further installation activity, promoting future sustainable development, providing economic benefit to Scottish communities in line with the marine plan.

5.18. *Appendix A* shows the 650m corridor in which the proposed cable will be laid. This is to enable micro-routeing where required.

# 6. The proposed installation and protection methods

6.1. Prior to cable laying activities it is important to prepare the route. This is carried out by performing Pre-Lay Grapnel Runs (PLGR). This will ensure that debris, in the form of redundant cables, fishing gear, discarded wires and ropes are removed from the proposed cable route. This helps protect the burial equipment from damage caused by debris on the seabed during the installation phase and safeguard the longevity of the cable after installation.

6.2. PLGR operations will be planned to be carried out 1-3 weeks before the cable lay operations.

6.3. The PLGR activity is carried out by towing a set of grapnels along the planned cable route. The grapnels will be towed by multi-purpose support vessel and the grapnels will be either spear or sand point grapnels best suited for particular sections of the seabed along the proposed route. The grapnels will have a depth of penetration of 0.5m and a width of 1m. This is a smaller footprint than the proposed cable burial phase of the works.

6.4. The PLGR activity will be carried out from the Kingdom of Fife or similar vessel between the 10m contours of the proposed route. The Kingdom of Fife is a DP1 Anchor Handling Tug.

6.5. Grapnels are selected to be best suited to different seabed types which have been identified during earlier Geophysical surveys elements of the project. Some example types are shown in Figure 11.

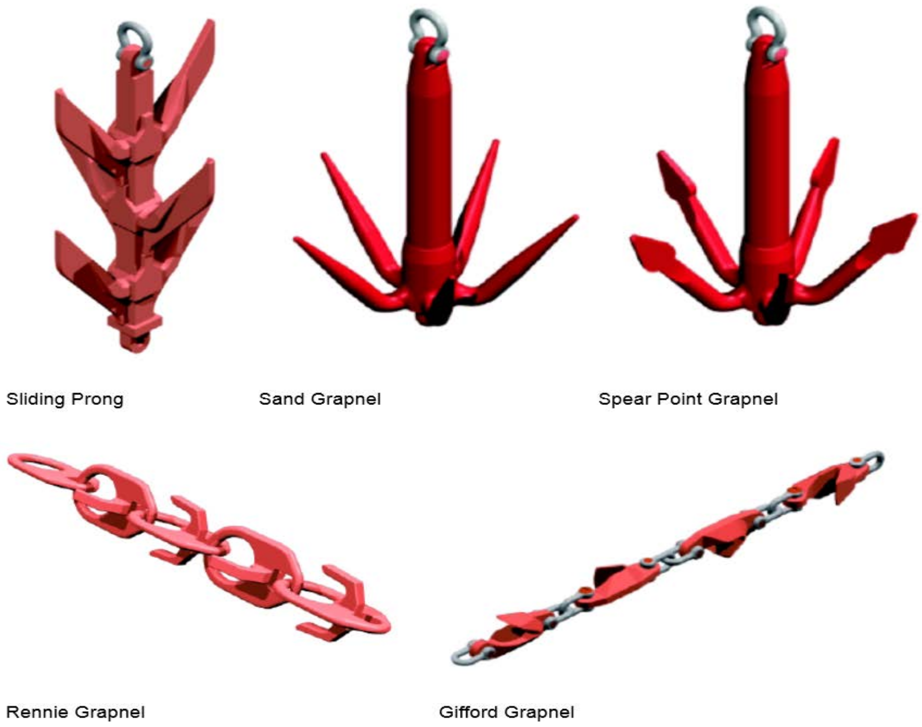



**Figure 11 Example PLGR grapnels,**

6.6. The grapnels will be used on a single pass of the route centre line of the route corridor. No PLGR operations will take place between the 10m contour and MLWS.

6.7. During the tow of the grapnels, the tow tensions will be monitored. If tensions increase above expected levels (based on water depth, seabed and grapnel rig setup) the grapnels will be recovered as this indicates debris has been picked up.

6.8. Debris recovered from the PLGR works will be disposed of ashore through approved waste disposal routes. See *CEMP*.

6.9. If the debris recovered is found to be an Out of Service (OoS) cable it will be dealt with in accordance with the ICPC Recommendation No 1: Management of Redundant and Out of Service Cables (https://www.iscpc.org/publications/recommendations/)

6.10. For cable laying activities, a CLV will be used to lay and bury (where technically feasible); with additional smaller support vessels used in the shallower shore locations. There will be a multicat acting as a dive support vessel (DSV) that will require a 2 x 1 tonne anchor, positioned in the nearshore area. A guard vessel is also likely to be used during the cable lay operations in order to ensure other vessels remain outside the area of operations to reduce collision risk.

6.11. The cable installation method within the marine environment from each MLWS location will initially be surface laid across the length of the route. The lay vessel will then reconfigure for cable burial using a Controlled Flow Excavation tool.

6.12. There is sediment suitable for burial along the majority of the route; post lay burial of the cable to a target of 1m should be achievable. This is based on trawler activity, anchoring depths and the strength of the sediment in the areas targeted for burial. For further details please see *Cable Burial Risk Assessment*. This is for cable protection and stability. The extent of burial may be reduced due to tolerances with the cable lay, engineering difficulties and differing levels of sediment onsite at the time of the burial operations.

6.13. Burial activities will be temporary in nature, lasting less than 2-3 days, minimising any impact on water quality from suspended sediments. Any temporary increase in levels of suspended sediment will quickly return to background levels.

6.14. The survey assessment of the deposits to the seabed are:

- at the Bute shore end it may be necessary to protect the first 230m of cable with split pipe.
- from Kilometre Point (Kp) 0.326 for 40m it is expected that boulders may have to be moved to allow the cable to be laid and then buried. Boulders would only be moved a maximum of 20m from the route centre line to facilitate installation.
- at the Cumbrae shore end it may be necessary to protect the last 200m of cable with split pipe.

6.15. On either shore above the MLWS limit, where sufficient cable burial cannot be achieved, split pipe will be fitted around the cable for additional protection in the event of exposure (Figure 12). On both Bute and Cumbrae intertidal areas and down to the 10m water depth we will install split pipe protection to the cable if burial cannot be achieved. The split pipe is an articulated cast iron shell design that locks around the cable and is fixed with bolted end clamps. There are a number of suppliers with differing shell designs and weights. As a guide, each shell has an 8mm wall thickness, with an effective length of 391mm and combined weight in air of 39.96 kg/m. The outer diameter of the split pipe is 213mm.

Figure 12 Split Pipe Diagram

6.16. It is proposed to install the cable by using an open-cut trench method of installation inshore from the MLWS tidal limits at both shore end landfall locations. An open cut trench will be excavated to install and bury the cable. This will utilise traditional terrestrial-based plant including excavators at low tide. The typical underground cable trench is illustrated in Figure 13. The submarine cable will be connected to the terrestrial cable in a transition joint pit buried in the ground located above the MHWS limit at each end. The footprint of the trenching activities will be up to 10m in width centred on the replacement cable route. To allow for micro-routing during cable installation the landfall excavation works will take place within 100m either side of the cable landfall positions shown. See Figure 6.

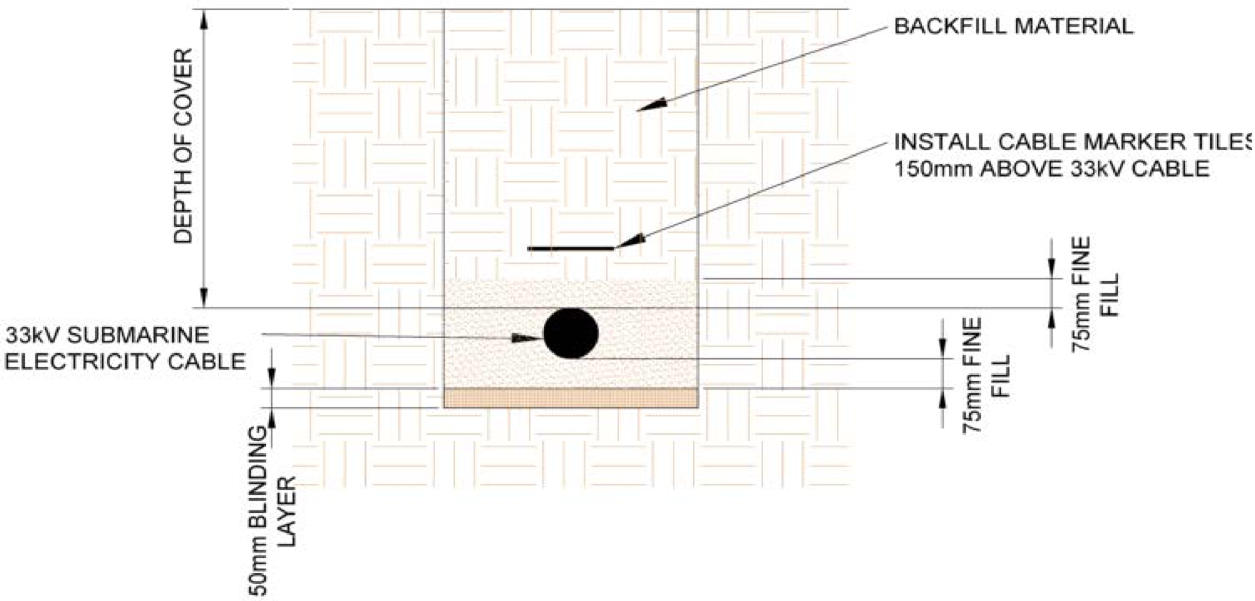



Figure 13 Open Cut Cable Trench Cross Section Inshore of MLWS Limit

6.17. The excavated material will be placed to one side of the trench for later reinstatement. Using a mechanical winch and cable rollers, the cable will be manoeuvred into the bottom of the trench and then covered with the excavated material using the mechanical excavator. The trench width will be minimised where possible however will be dependent on ground stability but will typically be 1m wide. The target depth of the trench will be 1.25m. Temporary trench shoring may be required to prevent collapse of the trench wall. The footprint of the excavator may be up to 5m, and a working width, including for the temporary storage of removed material, would be in the order of 10m.

6.18. The submarine cable will be connected to the terrestrial cable in a transition joint pit buried in the ground located above the MHWS limit at each end. On completion of jointing, spoil material will be backfilled into the trenches and the shore will be reinstated; grassed areas will be left to re-seed naturally. The upper surface layer will be stripped and stockpiled separately to allow a quicker reinstatement.

6.19. Underground and OHL cabling will be utilised to connect the new submarine cable into the existing electrical network on the islands, see 5.1.

6.20. At each shore landfall location, to facilitate the onshore works and ensure compliance with The Construction (Design and Management) Regulations 2015, a temporary site area will be required, approximately 25m x 25m in size, to provide welfare facilities and parking during the works. To minimise ground disturbance, ease reinstatement and recovery, the area will be covered with a membrane material and levelled with rock chippings.

6.21. Based on the summary in section 6.2.3 of the Environmental Supporting Information the proposed works will have minimal impact on cetacean species.

6.22. As summarised in the Environmental Supporting Information the works will have no impact on existing marine archaeology.

6.23. Our proposed cable installation methodology is summarised in Figure 14 and Figure 15 and is supported by SHEPD’s Cost Benefit Analysis methodology. The final recommendation is end-to-end burial of the proposed cable by controlled flow excavation.

6.24. SHEPD’s Cost Benefit Analysis methodology is used as supporting evidence that the installation solution proposed in this project description represents the best net societal value solution because it addresses the following risks, impacts and needs of stakeholders:

- It can be achieved based on the current survey information of the seabed.
- The CBA model indicates a positive value change for health and safety and socio-economic impacts compared with the baseline scenario of surface lay.
- This scenario has marginally higher engineering installation costs relative to the baseline; however, this is deemed necessary to reduce conflict with other marine users and to protect our infrastructure in the marine environment.

6.25. This includes for consideration of impacts on health and safety, socio-economic, environmental and wider economic and engineering impacts. A summary of the CBA modelling output can be found in the pre-application consultation report.

| **Location and Kilometre Point (Kp)** | **Installation type** | **Length of cable** |
|---|---|---|
| Kp 0 Bute TJP - Kp 0.220 | Shore end excavation | 220m |
| Kp 0.220 – Kp 0.550 | Diver burial | 230m |
| Kp 0.326 – Kp 0.368 | Potential boulder clearance | 40m |

| | | |
|---|---|---|
| Kp 0.550 – Kp 4.8 | Burial | 4250m |
| Kp 4.8 – Kp 5.0 | Diver burial | 200m |
| Kp 5.0 – 5.4 | Shore end excavation | 400m |

Figure 14 Table of Protection

| Protection method | Length | Weight |
|---|---|---|
| Cable | 5400m | 103 tonnes |
| Cast iron split pipe | 500m | 20 tonnes |
| Burial | 5400m | N/A |

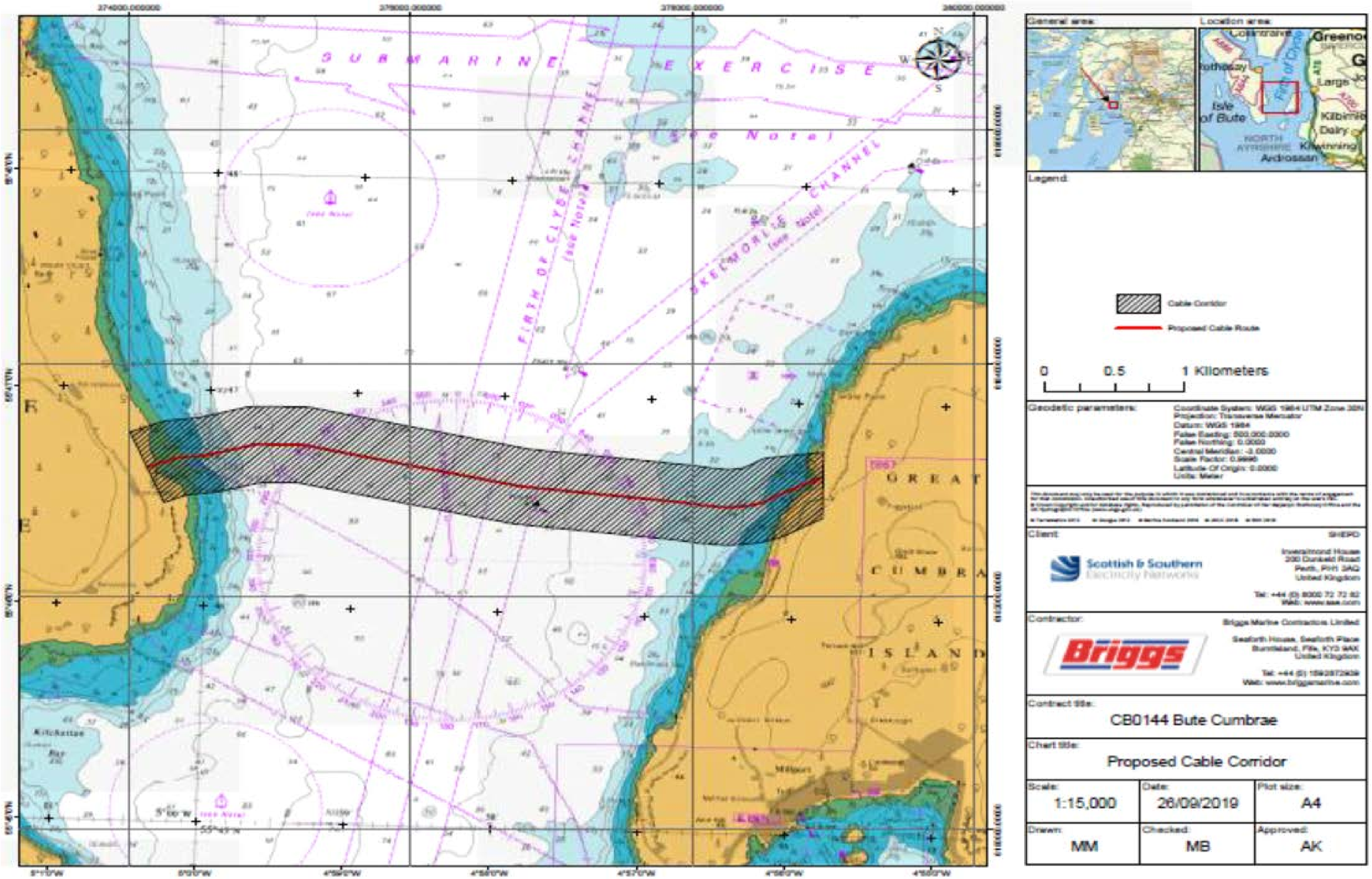
Figure 15 Summary of Protection Method

# 7. Unexploded ordnance strategy

7.1. BMC have undertaken a UXO desktop study to assess the risk of UXO within the area of the cable route. The desktop study took into account the historical information available along with assessing the magnetometer survey output. The results came back with a low risk of UXO within the proposed cable corridor. If further analysis of the survey data against the proposed cable route found a magnetic anomaly to require further investigation then a ROV mounted gradiometer array survey would be required. The gradiometer survey would require a ROV to be deployed from a support vessel. Operations would need to take place between November 2018 and January 2019 but be of a short duration of 2-3 operational days activity.

7.2. If a UXO were encountered that could not be avoided, a specialist contractor shall be engaged to clear, recover or remove the target from the working area.

# Appendix A: Cable corridor



**List of corridor co-ordinates:**

| Point | DD_Lat | DD_Lon | Latitude | Longitude | Easting | Northing |
|---|---|---|---|---|---|---|
| 1 | 55.77812 | -4.94103 | 55° 46' 41.238" N | 4° 56' 27.698" W | 378258.3 | 6183091 |
| 2 | 55.77823 | -4.9396 | 55° 46' 41.622" N | 4° 56' 22.559" W | 378348.1 | 6183100 |
| 3 | 55.77831 | -4.93916 | 55° 46' 41.910" N | 4° 56' 20.980" W | 378375.9 | 6183108 |
| 4 | 55.77897 | -4.93721 | 55° 46' 44.300" N | 4° 56' 13.949" W | 378500.4 | 6183179 |
| 5 | 55.77898 | -4.93717 | 55° 46' 44.341" N | 4° 56' 13.827" W | 378502.6 | 6183180 |
| 6 | 55.77905 | -4.93695 | 55° 46' 44.591" N | 4° 56' 13.037" W | 378516.6 | 6183187 |
| 7 | 55.77962 | -4.93032 | 55° 46' 46.645" N | 4° 55' 49.143" W | 378934.6 | 6183239 |
| 8 | 55.77449 | -4.93019 | 55° 46' 28.162" N | 4° 55' 48.685" W | 378926.6 | 6182668 |
| 9 | 55.77393 | -4.93198 | 55° 46' 26.146" N | 4° 55' 55.136" W | 378812.5 | 6182609 |
| 10 | 55.77313 | -4.93432 | 55° 46' 23.283" N | 4° 56' 3.559" W | 378663.3 | 6182524 |
| 11 | 55.77309 | -4.93447 | 55° 46' 23.112" N | 4° 56' 4.081" W | 378654 | 6182519 |
| 12 | 55.77302 | -4.93469 | 55° 46' 22.869" N | 4° 56' 4.897" W | 378639.6 | 6182512 |
| 13 | 55.77296 | -4.93493 | 55° 46' 22.649" N | 4° 56' 5.733" W | 378624.9 | 6182506 |
| 14 | 55.7729 | -4.93516 | 55° 46' 22.453" N | 4° 56' 6.587" W | 378609.8 | 6182500 |
| 15 | 55.77286 | -4.9354 | 55° 46' 22.283" N | 4° 56' 7.447" W | 378594.7 | 6182495 |
| 16 | 55.77259 | -4.93686 | 55° 46' 21.327" N | 4° 56' 12.690" W | 378502.5 | 6182468 |
| 17 | 55.77255 | -4.93708 | 55° 46' 21.191" N | 4° 56' 13.498" W | 378488.3 | 6182464 |
| 18 | 55.77252 | -4.93731 | 55° 46' 21.075" N | 4° 56' 14.317" W | 378474 | 6182461 |
| 19 | 55.77249 | -4.93754 | 55° 46' 20.981" N | 4° 56' 15.144" W | 378459.5 | 6182459 |
| 20 | 55.77247 | -4.93777 | 55° 46' 20.908" N | 4° 56' 15.977" W | 378444.9 | 6182457 |
| 21 | 55.77229 | -4.94019 | 55° 46' 20.257" N | 4° 56' 24.693" W | 378292.5 | 6182441 |
| 22 | 55.77229 | -4.94028 | 55° 46' 20.235" N | 4° 56' 25.011" W | 378286.9 | 6182440 |
| 23 | 55.77227 | -4.94054 | 55° 46' 20.188" N | 4° 56' 25.930" W | 378270.9 | 6182439 |
| 24 | 55.77227 | -4.94079 | 55° 46' 20.167" N | 4° 56' 26.851" W | 378254.8 | 6182439 |
| 25 | 55.77227 | -4.94105 | 55° 46' 20.172" N | 4° 56' 27.774" W | 378238.7 | 6182440 |
| 26 | 55.77228 | -4.94125 | 55° 46' 20.193" N | 4° 56' 28.495" W | 378226.2 | 6182441 |
| 27 | 55.77239 | -4.94401 | 55° 46' 20.601" N | 4° 56' 38.447" W | 378053.1 | 6182458 |
| 28 | 55.7724 | -4.94419 | 55° 46' 20.633" N | 4° 56' 39.079" W | 378042.2 | 6182460 |
| 29 | 55.77241 | -4.94436 | 55° 46' 20.677" N | 4° 56' 39.708" W | 378031.2 | 6182461 |
| 30 | 55.77259 | -4.94663 | 55° 46' 21.326" N | 4° 56' 47.853" W | 377889.9 | 6182485 |
| 31 | 55.77353 | -4.9649 | 55° 46' 24.717" N | 4° 57' 53.630" W | 376746.9 | 6182623 |
| 32 | 55.77354 | -4.96508 | 55° 46' 24.758" N | 4° 57' 54.290" W | 376735.4 | 6182624 |
| 33 | 55.77356 | -4.96526 | 55° 46' 24.812" N | 4° 57' 54.946" W | 376724 | 6182626 |
| 34 | 55.77358 | -4.96544 | 55° 46' 24.879" N | 4° 57' 55.599" W | 376712.7 | 6182629 |
| 35 | 55.77632 | -4.98977 | 55° 46' 34.763" N | 4° 59' 23.179" W | 375195.7 | 6182978 |
| 36 | 55.77627 | -4.99385 | 55° 46' 34.587" N | 4° 59' 37.876" W | 374939.5 | 6182979 |
| 37 | 55.77574 | -4.99708 | 55° 46' 32.652" N | 4° 59' 49.488" W | 374735.5 | 6182926 |
| 38 | 55.77572 | -4.99717 | 55° 46' 32.602" N | 4° 59' 49.799" W | 374730 | 6182924 |
| 39 | 55.77548 | -4.99875 | 55° 46' 31.713" N | 4° 59' 55.495" W | 374630 | 6182900 |
| 40 | 55.77545 | -4.99896 | 55° 46' 31.604" N | 4° 59' 56.260" W | 374616.6 | 6182897 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 41 | 55.77542 | -4.99918 | 55° 46' 31.512" N | 4° 59' 57.032" W | 374603.1 | 6182894 |
| 42 | 55.7754 | -4.99939 | 55° 46' 31.440" N | 4° 59' 57.811" W | 374589.4 | 6182892 |
| 43 | 55.77517 | -5.00223 | 55° 46' 30.609" N | 5° 0' 8.034" W | 374410.6 | 6182872 |
| 44 | 55.77456 | -5.00477 | 55° 46' 28.400" N | 5° 0' 17.179" W | 374249.3 | 6182808 |
| 45 | 55.77992 | -5.00885 | 55° 46' 47.721" N | 5° 0' 31.873" W | 374010.6 | 6183413 |
| 46 | 55.78069 | -5.00569 | 55° 46' 50.476" N | 5° 0' 20.470" W | 374211.7 | 6183492 |
| 47 | 55.78071 | -5.0056 | 55° 46' 50.546" N | 5° 0' 20.173" W | 374217 | 6183494 |
| 48 | 55.78076 | -5.00536 | 55° 46' 50.730" N | 5° 0' 19.310" W | 374232.2 | 6183499 |
| 49 | 55.7808 | -5.00512 | 55° 46' 50.891" N | 5° 0' 18.433" W | 374247.6 | 6183504 |
| 50 | 55.78084 | -5.00487 | 55° 46' 51.026" N | 5° 0' 17.542" W | 374263.2 | 6183508 |
| 51 | 55.78087 | -5.00462 | 55° 46' 51.137" N | 5° 0' 16.641" W | 374279 | 6183511 |
| 52 | 55.78089 | -5.00438 | 55° 46' 51.218" N | 5° 0' 15.785" W | 374294 | 6183513 |
| 53 | 55.78115 | -5.0012 | 55° 46' 52.151" N | 5° 0' 4.305" W | 374494.8 | 6183536 |
| 54 | 55.78134 | -4.99997 | 55° 46' 52.837" N | 4° 59' 59.907" W | 374572 | 6183555 |
| 55 | 55.78198 | -4.99613 | 55° 46' 55.145" N | 4° 59' 46.055" W | 374815.3 | 6183619 |
| 56 | 55.78202 | -4.99588 | 55° 46' 55.277" N | 4° 59' 45.185" W | 374830.6 | 6183623 |
| 57 | 55.78205 | -4.99563 | 55° 46' 55.387" N | 4° 59' 44.283" W | 374846.4 | 6183626 |
| 58 | 55.78208 | -4.99538 | 55° 46' 55.473" N | 4° 59' 43.373" W | 374862.4 | 6183628 |
| 59 | 55.78209 | -4.99513 | 55° 46' 55.533" N | 4° 59' 42.456" W | 374878.4 | 6183629 |
| 60 | 55.7821 | -4.99487 | 55° 46' 55.567" N | 4° 59' 41.536" W | 374894.4 | 6183630 |
| 61 | 55.7821 | -4.99477 | 55° 46' 55.573" N | 4° 59' 41.165" W | 374900.9 | 6183630 |
| 62 | 55.78217 | -4.98942 | 55° 46' 55.804" N | 4° 59' 21.923" W | 375236.2 | 6183627 |
| 63 | 55.78217 | -4.98927 | 55° 46' 55.806" N | 4° 59' 21.371" W | 375245.9 | 6183627 |
| 64 | 55.78216 | -4.98901 | 55° 46' 55.789" N | 4° 59' 20.449" W | 375261.9 | 6183626 |
| 65 | 55.78215 | -4.98876 | 55° 46' 55.746" N | 4° 59' 19.529" W | 375277.9 | 6183624 |
| 66 | 55.78213 | -4.9885 | 55° 46' 55.677" N | 4° 59' 18.615" W | 375293.8 | 6183622 |
| 67 | 55.78211 | -4.9883 | 55° 46' 55.602" N | 4° 59' 17.869" W | 375306.7 | 6183619 |
| 68 | 55.77933 | -4.96368 | 55° 46' 45.601" N | 4° 57' 49.246" W | 376841.6 | 6183266 |
| 69 | 55.7784 | -4.94555 | 55° 46' 42.237" N | 4° 56' 43.995" W | 377975.3 | 6183130 |
| 70 | 55.77839 | -4.94547 | 55° 46' 42.219" N | 4° 56' 43.686" W | 377980.6 | 6183129 |
| 71 | 55.77838 | -4.9453 | 55° 46' 42.177" N | 4° 56' 43.084" W | 377991.1 | 6183128 |
| 72 | 55.77821 | -4.94309 | 55° 46' 41.541" N | 4° 56' 35.112" W | 378129.4 | 6183104 |

## Appendix B: Proposed cable installation programme

| **Activity** | **Date** |
|---|---|
| Start of shore works | 4 February 2019 |
| Start of marine works | 1 February 2019 |
| Completion of submarine cable lay | 23 February 2019 |
| Completion of shore works | 23 February 2019 |
| Completion of post lay protection | 31 March 2019 |

**Table 1 Indicative Construction timeline**

Table 1 outlines the expected construction dates, which will be affected by weather conditions and tidal cycles. Therefore, table 2 outlines the dates requested in the licence to allow flexibility to ensure the work can be carried out as efficiently as possible.

| **Activity** | **Date** |
|---|---|
| Start of marine works (Commencement of licence) | 15 January 2019 |
| End of marine works (Closure of licence) | 31 March 2019 |

**Table 2. Licence period.**

# Appendix C: Cable burial risk assessment

**See CBRA Supporting Info.pdf**